E001

High feed cutter for machining of difficult-to-cut materials

SKS-GII 09 type

> Titanium alloy, stainless steel, heat resistant alloy, etc.

For **high-efficiency machining** of difficult-to-cut materials.

> Adopts an economical **4-corner square positive insert.**

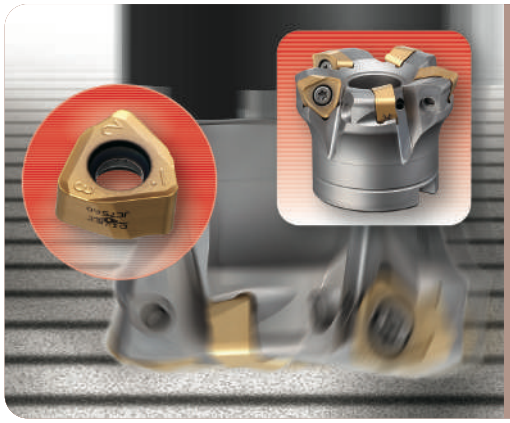
E013

Cutter for high cut, high feed and high efficiency machining

SKS-GII 10 & 14 type

> For mold materials and difficult-to-cut materials such as titanium alloys and stainless steel. For high efficiency machining.

> Adopts an **economical 4-corner square positive insert.**



E029

Extreme series

Cutter for high-speed and high-efficiency machining

SKS Extreme

> **Depth of cut (ap) with a maximum of 3 mm and feed fz = 2 mm / t** per tooth. High feed machining is possible.

> The insert can be used on both sides and is **economical with 6 corners.**

E039

Extreme series

Multi-cutter capable of high feed and shoulder cutting is possible with the same insert

SKS Extreme

> **Depth of cut (ap) with a maximum of 3 mm and feed fz = 2 mm / t** per tooth. High feed machining is possible.

> The insert can be used on both sides and is **economical with 6 corners.**

E060, E082

QM series

Multi-blade, high efficiency, high feed machining tool
QM MILL / QM MAX
> **Original low resistance 3D insert and multi-blade specifications.** Achieves high-speed and high-efficiency machining.
> The holder can be shared, and **high feed + shoulder cutting can be done with one.**
> We also have a lineup of high-precision types (MQT type) that support 5-axis machining.

E145

High-efficiency roughing cutter

Max Master

> **Outstanding metal removal rate.**
> **Wider range by adding new grades and new shapes for machining high hardness materials.** Compatible with work materials.
> The insert can be used on both sides and is **economical with 4 corners.**

E164

Indexable Milling Cutter SSV type

Multi functional indexable cutter “SIC-EVO” achieved high efficient and stable shoulder milling

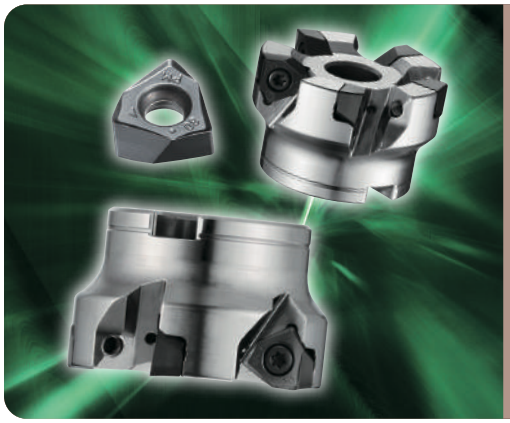
Max. depth of cut (ap)=15mm is possible. SIC-EVO is usable for wide applications such as face milling, slotting, pocket milling

High positive geometry with low cutting force

E186

Extreme series

High efficiency and high precision shoulder cutting cutter
Shoulder Extreme
> **Axial depth of cut (ap) is up to 15 mm,** flat surface cutting, grooving, can be used for a wide range of purposes such as plunge machining.
> Large diameter sizes with high standardization needs are **main body ϕ100, ϕ125 and added insert corner R2 and R3 types.**
> **Economical with 4-corner** specifications that can be used on both sides of the insert.



E225

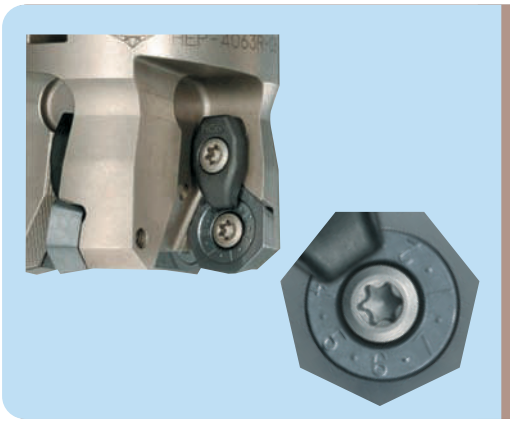
Extreme series

High efficiency shoulder cutting cutter

Shoulder 6

> **Excellent chip evacuation and rigidity, maximum shaft depth of cut (ap) of 10 mm,** can be used in a wide range of applications such as flat surface cutting, grooving, and plunge machining.

> The insert can be used on both sides and is **economical with 6 corners.**



E237

HEPTA MILL

HEP type
(Face mill type)

High metal removal
G-Body
Double clamp system
Supports high hardness materials from cast iron and general steel

HEPTA MILL
with Heptagon insert

Stronger heptagon insert
7 times indexability
Insert corner identification

E252

NEGA-HEPTA

Ideal for high-efficiency machining of cast iron, general steel, and stainless steel

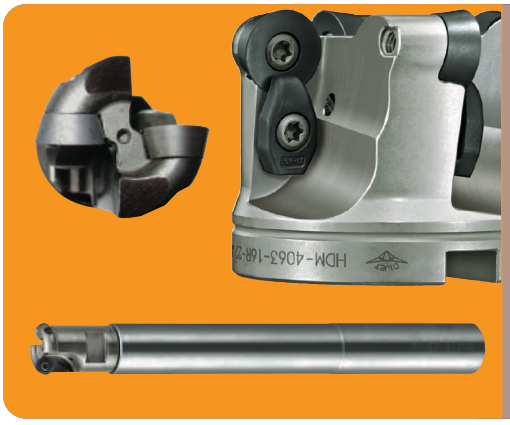
Multi-insert front milling cutter

14 Cutting Edges Insert

Shell type ϕ63 ～ϕ400

※ - Partly make to order

High efficiency machining with multiple inserts

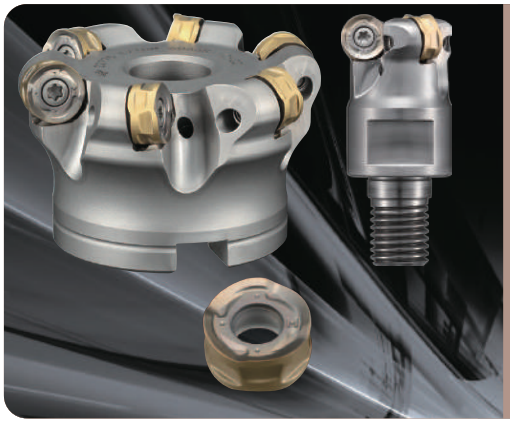


E261

High efficient machining tool with edge sharpness and strength.

Increased insert strength
Through coolant hole
Double clamp system
Adopted positive axial rake
Variation

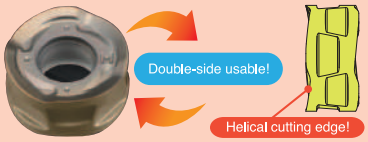
68% Stronger than ISO Standard Insert



E290

Indexable radius cutter for hard-to-cut material.

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



E299

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.

- DUM-6R type (Straight shank)
- DUM-MT type (MT shank)
- DUM-W※R type (Straight shank・with corner radius)

DUM-6R type (Straight shank)

DUM-W※R type (Straight shank・with corner radius)

E302

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

Internal Coolant Supply
High Precision
High Efficiency
Multi-purpose

G-Body

Aerospace Tooling

E314

Ultra rigid Longer tool life

SSE45/SSD90 Series

SSE45 type
- Entering angle : 45°
- For Face Milling (ϕ50～ϕ250)

Face Milling

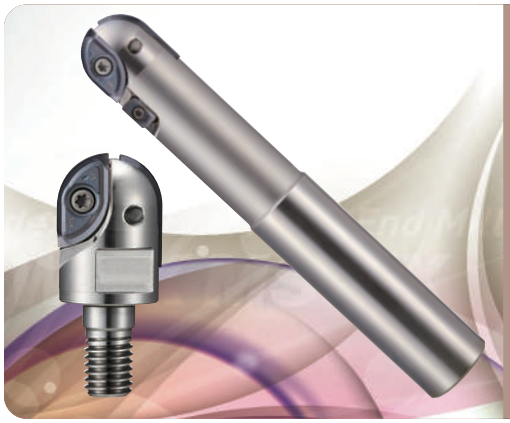
SSD90 type
- Entering angle : 90°
- For Shoulder Milling (ϕ50～ϕ200)

Face Milling Shoulder Milling

- Adopted ultra-rigid G-Body
- Carbide shim gives longer tool life of cutter body
- For SSE45 Ultra Fine Pitch type is available

Wide range of application from general steel to hardened steel

G-Body



E322

Swing Ball NEO

Indexable Ball Nose End Mill

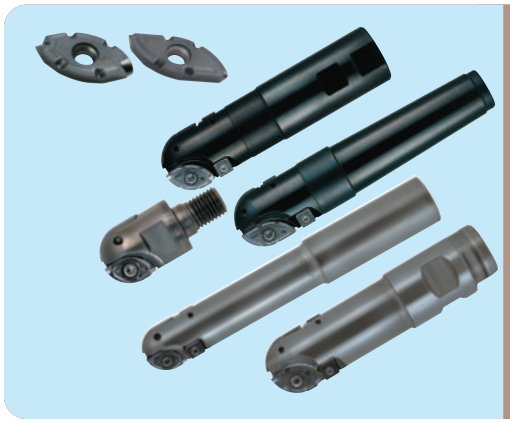
SWBX/MSWX

For steel

JC5240

For cast iron, mold steel and welding & hardend die steel.

JC8118 JC8015



E335

SWB / MSW type

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

1. Smooth and calm cutting and low cutting force at higher feed rate.
2. Plunge cutting is possible because of better crack resistance on nose
3. Reliable insert location and improved security for heavy operations.
4. Body variety is the best in the world.
5. G-Body

E351

FJM / FJM-BD type
Super Finishing Face Milling Application

1. The combination of 2 finishing cartridges & 2 semi-finishing cartridges gives stable finishing quality of unreliable removal stock on cast iron & 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.

E359

DIJET TOOLS
for high efficient 5-axis machining

Tulip S-Heads

STLP type

Mirror Barrel

KRM type

High precision QM MAX

MQT type

E374

Mirror series

High-precision replaceable cutting edge ball / radius end mill

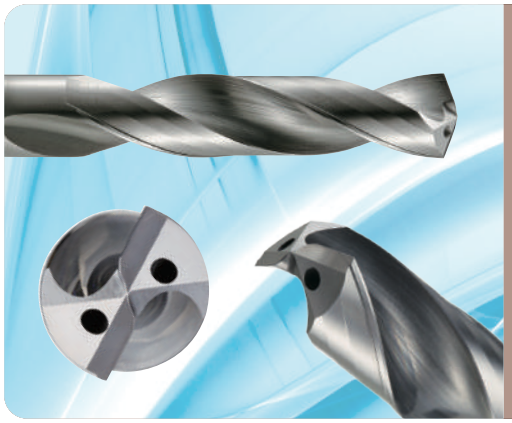
Mirror Ball / Mirror Radius

> A wide variety of inserts are available. **Achieves a beautiful finished surface with a wide range of work materials.**

> Suppresses chatter and improves machining efficiency.

> Modular head type (MBX type / MRX type) is also available.

> Added a new grade “DH111” that has doubled the life of conventional products.



F04

EZ Series

Carbide coating drill **Strike drill**

> Long life, wide range of work materials, and wide range of cutting conditions can be supported. > Improved cutting property due to unique thinning shape. > Thrust achieves stable machining with reduction.

> The unique margin shape suppresses cutting heat and cutting resistance, and the machined surface achieves improved roughness.

> With fine particle alloy material and value coat with excellent oxidation resistance achieves improved fracture resistance and wear resistance.

F28

EZ Series

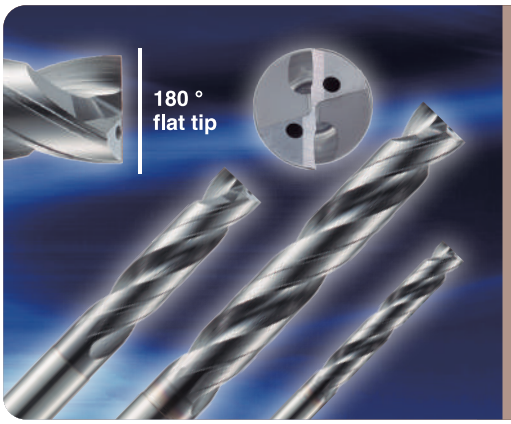
Low resistance replaceable cutting edge drill

TA-EZ drill

> **Power consumption is reduced by the original low resistance insert type (EZ blade type).** 30% cut compared to conventional products.

> Economical with replaceable insert.

> **Improved cutting performance.**



F46

180 ° flat tip drill for counterbore machining

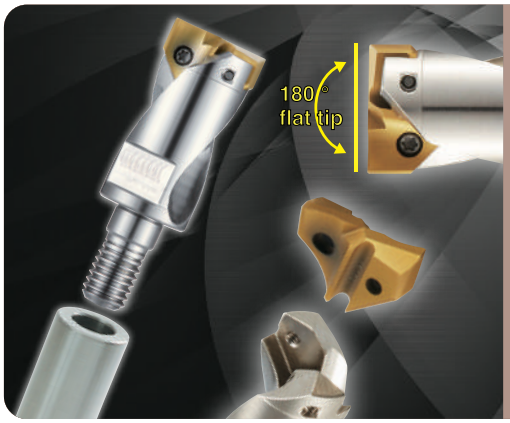
Flat drill

> The process can be shortened with **less bending of holes and less burrs.**

> **Stable machining is possible without pilot holes.**

> From carbon steel, tool steel, pre-hardened steel, stainless steel to cast iron. **Compatible with a wide range of work materials, including aluminum alloys.**

> The wide groove shape has excellent chip evacuation and **high-precision hole drilling is possible.**



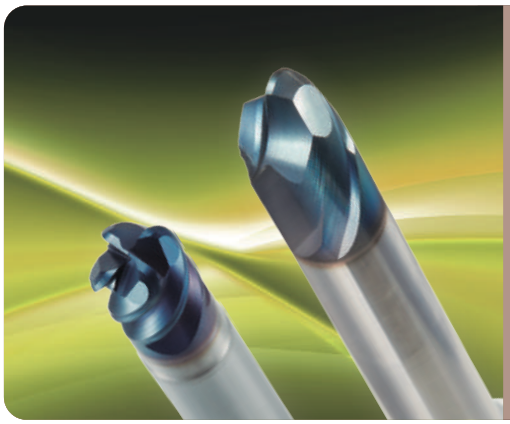
F56

Drill with a flat tip angle of 180 ° and a replaceable cutting edge for counterbore machining

Insert type flat drill

> Non-step machining is possible **without pilot holes even on inclined surfaces and crossed holes.**

> **Pre-hardened steel and pre-hardened stainless steel**



G04

Hard 1 series

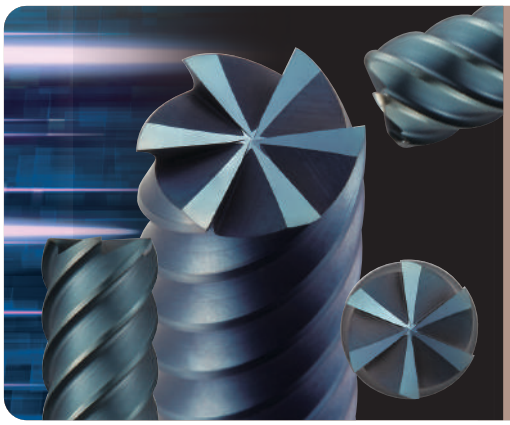
Solid end mill for high hardness materials

Hard 1 ball
Hard 1 radius

> **High efficiency machining** is possible with a super short type with a **cutting edge of 1D.**

> **Adopts a seamless shape,** Suppresses chipping during machining with a good finished surface.

> Achieves a longer life in machining high hardness materials with a new coating grade.



G09

Solid end mill for high hardness materials

One-Cut 70

> Short to long blade length and high-strength corner R type. We have a wide range of products, and support high-efficiency machining of high-hardness materials.

> **Thick core rigid body** design minimizes tool tipping and minimizes tool tilt. Achieves high-speed, high-efficiency machining of high-hardness materials.

> **Low resistance and high precision machining** are possible by adopting a unique cutting edge shape.

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QM Max	E082
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About Safety When Using Cutting Tool Products

1. Safety Precautions

When using hard tool materials and products, please observe them in order to prevent personal injury and property damage. The explanation is divided as follows. Please read the notes in the text carefully and use the product correctly.

■ Notes are classified as follows.
All of these are important safety issues, so be sure to observe them.

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.

<Example of pictorial display>

PROHIBITION - "Do Not"

COMPULSION - "Do By All Means"

2. Basic characteristics of hard tool materials

Meaning and proper use of terms in this pamphlet

1. Hard tool material
   A general term for tool materials such as cemented carbide, cermet, ceramics, CBN sintered body, diamond sintered body, and tungsten-carbide alloy.
2. Co-based hard tool material
   Hard tool material containing 0.1% or more of Co. WC-Co cemented carbide, cermet containing Co, CBN sintered body, diamond sintered body, etc.

Physical characteristics

1. Appearance: Gray, black, gold, etc., depending on the material.
2. Odorless
3. Hardness and specific density (Table 1) shows the hardness and specific gravity of hard tool materials.

(Table 1) Hardness and specific density of hard tool materials

Hard tool material	Hardness (HV)	Specific gravity
Cemented carbide	500～3000	9～16
Cermet	500～3000	5～9
Ceramic	1000～4000	2～7
CBN sintered body	2000～5000	3～5
Diamond sintered body	8000～12000	3～5
Tungsten-saving alloy	500～3000	5～9
(High speed steel)	200～1200	7～9
(Tool steel)	200～1200	7～9
(Diamond electrodeposition product)	8000～12000	3～5

4. Ingredients: Carbides such as W, Ti, Al, Si, Ta, B, V, nitrides, carbonitrides, oxides, and in addition to these, May contain metal components such as Fe, Co, Ni, Cr, Mo.

3. Safety of hard tool materials

Precautions for handling hard tool materials

- Be sure to observe the “Safety Precautions” described in (Table 2) to prevent occupational accidents and occupational illnesses.
- Before using the product, please read all of these "Safety Precautions" carefully and follow the instructions to use the product correctly.
- After reading, be sure to keep it in a place where the user can see it at any time.

(Table 2) Safety of hard tool materials

	Warning
!	(1) Hard tool materials are extremely hard but have brittle characteristics, and are damaged or scattered when subjected to excessive tightening or impact. Please note that it may happen.
!	(2) Handle hard tool materials with a specific density of 10 or more as heavy products if they are large products or in large quantities, and pay attention to the weight. Please handle it.
!	(3) When engraving on a hard tool material with a laser, electric pen, electrodeposition grindstone, etc., cracks may occur. Do not engrave the work part or the part where stress is applied.
!	(4) The coefficient of thermal expansion of hard tool materials may differ from that of general case steel materials. Shrink-fitting, cold-fitting and When designing and working with due consideration, it may be damaged or scattered in applications where the temperature is high.
!	(5) Hard tool materials may crack if a temperature change larger than the heat-resistant impact temperature is applied during brazing, etc. increase. Also, if it is not brazed at an appropriate temperature, it may fall off or be damaged. Braze under appropriate conditions.
⊘	(6) When repairing hard tool materials that have been used once, it is necessary to sufficiently remove worn parts such as cracks caused by use increase. Please do not make your own repairs.
!	(7) Hard tool materials generate dust when they are ground. Harmful to the body if swallowed or inhaled Therefore, please use protective equipment such as a local exhaust system and a protective mask.
!	(8) Hard tool materials generate dust when they are ground. When these come in contact with or adhere to the eyes or skin It is dangerous, so please use appropriate protective equipment such as protective goggles properly.
!	(9) If ground dust adheres to your skin or eyes, wash it off with water. If swallowed in large amounts or if it gets in your eyes, see a specialist immediately.
!	(10) Cobalt and its inorganic compounds are designated as specified chemical substances. Applies to tools in normal use Excluded, but subject to physical changes (processing materials and repairing products) Specific chemicals in the workplace It is necessary to handle in accordance with the disability prevention rules (specialization rules).
!	(11) For details of first aid, measures in case of fire, measures in case of leakage, precautions for disposal, etc., see the MSDS of the material. Please respond appropriately.
	Caution
⊘	(12) Hard tool materials that are not provided with corrosion resistance will corrode with grinding fluid, lubricating fluid, and other moisture, reducing their strength. I may invite you.
!	(13) The strength of hard tool materials may decrease significantly depending on the surface condition after grinding, so appropriate machining. Please finish according to the conditions.
!	(14) When electric discharge machining of hard tool materials, microcracks and affected layers are formed on the surface and the strength is reduced. Grind and remove microcracks and affected layers for properties.

About Safety When Using Cutting Tool Products

4. Precaution for using cutting tools

(Table 3) -1 Precautions for using cutting tools

		⚠ Caution	! Counter plan
General Cutting Tools	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 resistance and 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 during operation 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. Direct touch 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 or parts 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.

(Table 3) -1 Precautions for using cutting tools

Milling Cutters and Other Milling tools	⚠ Warning	Counter plan
	⑫ 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
	⑬ 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
	⑭ 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, and covers at the chucking.
	⚠ Caution	Counter plan
	⑮ 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.
Others	⚠ Warning	Counter plan
	⑯ 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

- This catalog is current as of September 2022.
- Please note that the products listed in this catalog are constantly being researched and improved, and the dimensions and specifications of the products may change from the specifications in the catalog.
- Please note that the packaging specifications of the products listed in this catalog are subject to change without notice.
- Inventory is displayed for the products listed in this catalog, but please note that they may be revised or abolished due to the development of new grades and new products.
- From February 2019, the product body listed in this catalog will not come with a wrench and clamp screw seizure preventive agent (MOLY) (sold separately). Please purchase separately.

REGARDING STOCK STATUS

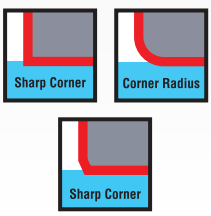
- ● : Standard stock items
- □ : Stock in Japan
- ◎ : Soon to be stocked
- ○ : Soon to be deleted
- ※ : Production after order received

Note) Please contact our distributors or retailers to place an order.
If you have any questions about materials, dimensions, etc. other than those listed in this catalog, please contact our sales office.

APPLICATION ICONS

GRADE ICONS

CORNER R ICONS



OTHERS

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

Coolant Hole — Internal coolant hole

Tolerance -0.05 -0.15 — Body unit by master insert Indicates the tolerance of the outer diameter.

Environment-Conscious Products

"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	★

2022-23

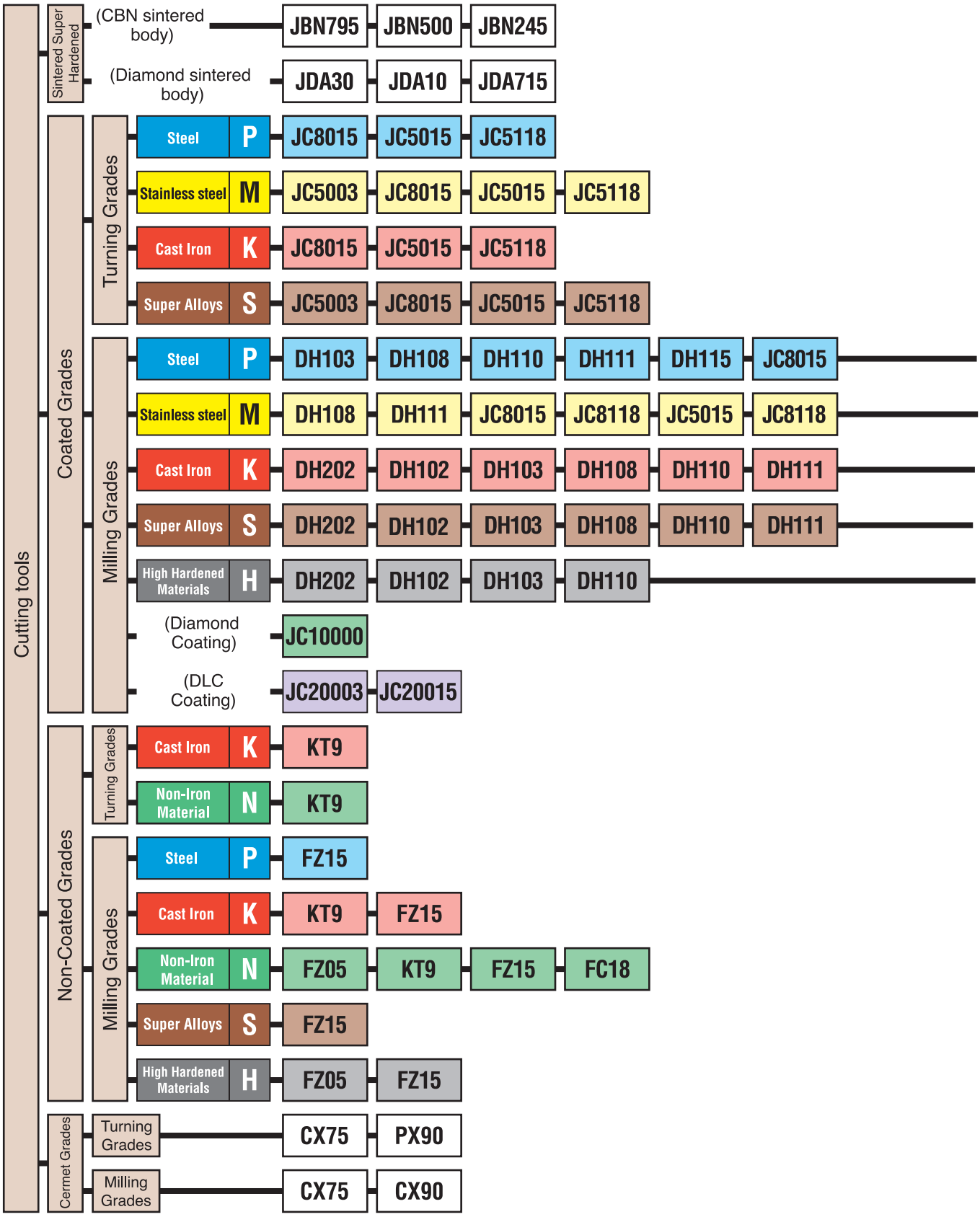
DIJET®

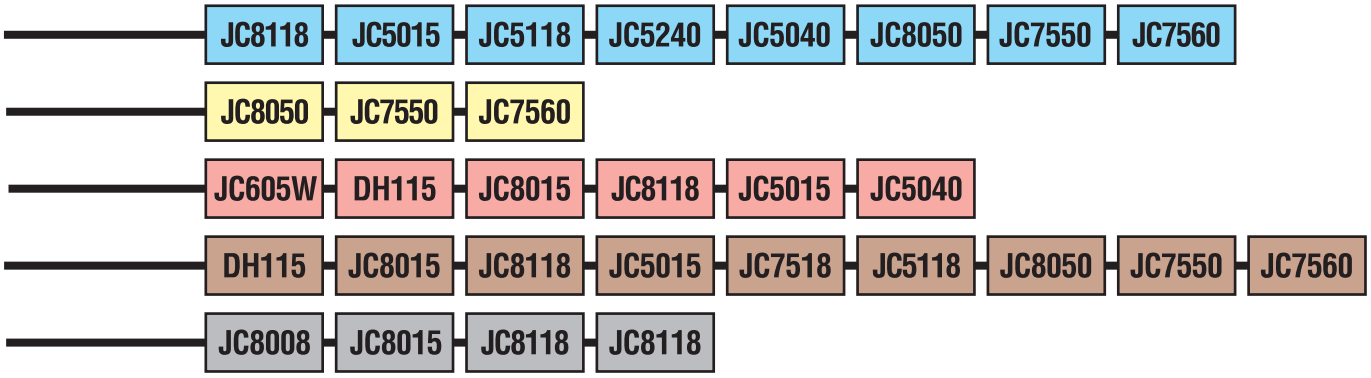
Products Guide Vol.4

C
01

Tool material

Dijet Carbide Grades For Milling Tools




JC8118 JC5015 JC5118 JC5240 JC5040 JC8050 JC7550 JC7560
JC8050 JC7550 JC7560
JC605W DH115 JC8015 JC8118 JC5015 JC5040
DH115 JC8015 JC8118 JC5015 JC7518 JC5118 JC8050 JC7550 JC7560
JC8008 JC8015 JC8118 JC8118

Tool material

Coating Grade For Turning

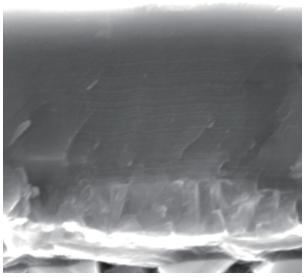
Features and applications

Work Material		Insert Grade	Coating Composition	Speciality
Steel	Excellent wear resistance ⇕ Excellent defect resistance	JC8015	AlTiCrN	High reliability is ensured by adopting a value coat with improved adhesion. For finishing steel to light cutting.
		JC5015	TiAlN	Uses tough fine particle cemented carbide as the base material. For light cutting of steel.
		JC5118	TiAlN	Cemented carbide with optimized hardness and toughness is used as the base material. For light to medium cutting of steel.
Stainless steel	Excellent wear resistance ⇕ Excellent defect resistance	JC5003	TiAlN	Has excellent wear resistance. For finishing to light cutting of stainless steel.
		JC8015	AlTiCrN	High reliability is ensured by adopting a value coat with improved adhesion. For finishing to light cutting of stainless steel.
		JC5015	TiAlN	Uses tough fine particle cemented carbide as the base material. For light to medium cutting of stainless steel.
		JC5118	TiAlN	Extremely excellent boundary wear resistance. For light to medium speed cutting of stainless steel.
Ordinary cast iron Ductile cast iron	Excellent wear resistance ⇕ Excellent defect resistance	JC8015	AlTiCrN	High reliability is ensured by adopting a value coat with improved adhesion. For finishing cast iron to light cutting.
		JC5015	TiAlN	Uses tough fine particle cemented carbide as the base material. For finishing cast iron to light cutting.
		JC5118	TiAlN	Cemented carbide with optimized hardness and toughness is used as the base material. For light to medium cutting of cast iron.
Titanium alloy	Excellent wear resistance ⇕ Excellent defect resistance	JC5003	TiAlN	Has excellent wear resistance. For finish cutting of superalloys.
		JC8015	AlTiCrN	High reliability is ensured by adopting a value coat with improved adhesion. For finishing superalloys to light cutting.
		JC5015	TiAlN	Uses tough fine particle cemented carbide as the base material. For light to medium cutting of superalloys.
		JC5118	TiAlN	Uses tough fine particle cemented carbide as the base material. For light to medium cutting of superalloys.

Tool material

Milling Coating Grade

The new grade "DH Coat Series" is a combination of a high-strength fine-grained cemented carbide base material and a PVD coating "DH (Dijet Hard) Coat" that has excellent high-temperature oxidation resistance, impact resistance, film toughness, and adhesion. The best grade for finishing high hardness materials. In addition, the main grades "DZ (JC5000) Coat Series" and "Value Coat DV (JC8000) Series" have abrasion resistance and chipping resistance due to the combination of a dedicated cemented carbide base material and PVD coating according to each application. It has excellent properties and exhibits stable cutting performance even in intermittent cutting, and all of them are applied to a wide range of tools such as inserts, end mills, and drills.



Organization of DH202

Features and applications-1

Work Material		Insert Grade	Coating Composition	Speciality
Steel	Excellent wear resistance	DH103	AlCrN/AlTiCrN/TiSiN	High oxidation and wear resistance is with excellent plasticity and deformation resistance. Suitable for light cutting of high hardened steel, high speed machining of general steel and finishing of cast iron.
		DH108	AlCrN/AlTiCrN/TiSiN	This coating has a good balance between wear and fracture resistance. Suitable for finishing of difficult-to-cut materials, medium to high-speed cutting of cast iron and steel, and light cutting of stainless steel.
		DH110	AlCrN/AlTiCrN/TiSiN	This coating has a good balance of wear resistance and fracture resistance. Suitable for light cutting of high hardness steel, cast iron, and medium to high speed cutting of general steel.
		DH111	AlCrN/AlTiCrN/TiSiN	It is the most versatile grade in the DH series coating and excellent cutting performance for a wide range of work materials.
		DH115	AlCrN/AlTiCrN/TiSiN	This coating has a best fracture resistance in the DH series. Medium finish of high hardness steel, Suitable for medium to high-speed machining of cast iron and general steel.
		JC8015	AlTiCrN	This grade is called as a Dijet value coating grade (DV) with excellent oxidation resistance .For light cutting of general steel to high hardness steel, cast iron and stainless steel.
		JC8118	AlTiCrN	An extremely versatile grade with highest wear resistance and fracture resistance. Suitable for machining difficult-to-cut materials, general steel to high-hardness steel, cast iron and stainless steel.
		JC5015	TiAlN	A general-purpose grade, a PVD coating with excellent adhesion to the fine particle alloy base material. Suitable for machining general steel, cast iron and stainless steel.
		JC5118	TiAlN	Multipurpose PVD coating grade, highly adhesive coating on the substrate material. The balance between wear resistance and fracture resistance. For medium cutting of general steel, cast iron and stainless steel.
		JC5240	AlTiN	Uses M-class cemented carbide base material with excellent fracture resistance. Suitable for machining general steel, die steel, and cast iron.
		JC5040	TiAlN	Uses M-class cemented carbide base material with excellent fracture resistance. Suitable for machining general steel and die steel.
		JC8050	AlTiCrN	This coating has a excellent fracture resistance and with high wear resistance, Highly versatile PVD grade. Suitable for machining general steel and die steel.
	Excellent defect resistance	JC7550	TiAlN/AlCrN	PVD coating grade with enhanced thermal crack resistance, fracture resistance and oxidation resistance, and excellent thermal impact resistance. Suitable for machining Ti alloys.
Stainless Steel	Excellent wear resistance	DH111	AlCrN/AlTiCrN/TiSiN	It is the most versatile grade in the DH series coating and excellent cutting performance for a wide range of work materials.
		DH108	AlCrN/AlTiCrN/TiSiN	This coating has a good balance between wear and fracture resistance. Suitable for finishing of difficult-to-cut materials, medium to high-speed cutting of cast iron and steel, and light cutting of stainless steel.
		JC8015	AlTiCrN	This grade is called as a Dijet value coating grade (DV) with excellent oxidation resistance .For light cutting of general steel to high hardness steel, cast iron and stainless steel.
		JC8118	AlTiCrN	An extremely versatile grade with highest wear resistance and fracture resistance. Suitable for machining difficult-to-cut materials, general steel to high-hardness steel, cast iron and stainless steel.
		JC5015	TiAlN	A general-purpose grade, a PVD coating with excellent adhesion to the fine particle alloy base material. Suitable for machining general steel, cast iron and stainless steel
		JC5118	TiAlN	A highly versatile PVD grade that uses a highly adhesive coating on the base material that emphasizes the balance between wear resistance and fracture resistance. For medium cutting of general steel, cast iron and stainless steel.
		JC8050	AlTiCrN	This coating has a excellent fracture resistance and with high wear resistance, Highly versatile PVD grade. Suitable for machining general steel and die steel.
		JC7550	TiAlN/AlCrN	PVD coating grade with enhanced thermal crack resistance, fracture resistance and oxidation resistance, and excellent thermal impact resistance. Suitable for machining Ti alloys.
	Excellent defect resistance	JC7560	TiAlN/AlCrN	A PVD coating grade that has enhanced thermal crack resistance, fracture resistance, and oxidation resistance, extremely excellent thermal impact resistance. Suitable for machining Titanium alloys.

Tool material

Dijet Carbide Grades For Milling Tools

Features and applications-2

Work Material		Insert Grade	Coating Composition	Speciality
Ordinary cast iron Ductile cast iron	Excellent wear resistance	DH202	AlCrN/AlTiCrN/TiSiN	This coating has a very hard layer with a hardness of 4000 Hv. Works well for on finishing operations of high hardness materials over 60HRC.
		DH102	AlCrN/AlTiCrN/TiSiN	This coating has extremely high oxidation and wear resistance is used for the high-strength fine grain substrates material. Shows excellent performance in finishing of high hardness materials.
		DH103	AlCrN/AlTiCrN/TiSiN	High oxidation and wear resistance is with excellent plasticity and deformation resistance. Suitable for light cutting of high hardened steel, high speed machining of general steel and finishing of cast iron.
		DH108	AlCrN/AlTiCrN/TiSiN	This coating has a good balance between wear and fracture resistance. Suitable for finishing of difficult-to-cut materials, medium to high-speed cutting of cast iron and steel, and light cutting of stainless steel.
		DH110	AlCrN/AlTiCrN/TiSiN	This coating has a good balance of wear resistance and fracture resistance. Suitable for light cutting of high hardness steel, cast iron, and medium to high speed cutting of general steel.
		DH111	AlCrN/AlTiCrN/TiSiN	It is the most versatile grade in the DH series coating and excellent cutting performance for a wide range of work materials.
		JC605W	TiCN/Al2O3/TiN	A CVD grade containing a high-strength aluminum oxide layer with a smooth surface. Shows excellent wear resistance in high-speed cutting of ordinary cast iron and ductile cast iron.
		DH115	AlCrN/AlTiCrN/TiSiN	This coating has a best fracture resistance in the DH series. Medium finish of high hardness steel, Suitable for medium to high-speed machining of cast iron and general steel.
		JC8015	AlTiCrN	This grade is called as a Dijet value coating grade (DV) with excellent oxidation resistance .For light cutting of general steel to high hardness steel, cast iron and stainless steel.
		JC8118	AlTiCrN	An extremely versatile grade with highest wear resistance and fracture resistance. Suitable for machining difficult-to-cut materials, general steel to high-hardness steel, cast iron and stainless steel.
		JC5015	TiAlN	A general-purpose grade, a PVD coating with excellent adhesion to the fine particle alloy base material. Suitable for machining general steel, cast iron and stainless steel.
	Excellent defect resistance	JC5240	AlTiN	This coating grade has a excellent fracture resistance. Suitable for machining general steel, die steel, and cast iron.
Titanium alloy	Excellent wear resistance	DH202	AlCrN/AlTiCrN/TiSiN	This coating has a very hard layer with a hardness of 4000 Hv. Works well for on finishing operations of high hardness materials over 60HRC.
		DH102	AlCrN/AlTiCrN/TiSiN	This coating has extremely high oxidation and wear resistance is used for the high-strength fine grain substrates material. Shows excellent performance in finishing of high hardness materials.
		DH103	AlCrN/AlTiCrN/TiSiN	High oxidation and wear resistance is with excellent plasticity and deformation resistance. Suitable for light cutting of high hardened steel, high speed machining of general steel and finishing of cast iron.
		DH108	AlCrN/AlTiCrN/TiSiN	This coating has a good balance between wear and fracture resistance. Suitable for finishing of difficult-to-cut materials, medium to high-speed cutting of cast iron and steel, and light cutting of stainless steel.
		DH110	AlCrN/AlTiCrN/TiSiN	This coating has a good balance of wear resistance and fracture resistance. Suitable for light cutting of high hardness steel, cast iron, and medium to high speed cutting of general steel.
		DH111	AlCrN/AlTiCrN/TiSiN	It is the most versatile grade in the DH series coating and excellent cutting performance for a wide range of work materials.
		DH115	AlCrN/AlTiCrN/TiSiN	This coating has a best fracture resistance in the DH series. Medium finish of high hardness steel, Suitable for medium to high-speed machining of cast iron and general steel.
		JC8015	AlTiCrN	This grade is called as a Dijet value coating grade (DV) with excellent oxidation resistance .For light cutting of general steel to high hardness steel, cast iron and stainless steel.
		JC8118	AlTiCrN	An extremely versatile grade with highest wear resistance and fracture resistance. Suitable for machining difficult-to-cut materials, general steel to high-hardness steel, cast iron and stainless steel.
		JC5015	TiAlN	A general-purpose grade, a PVD coating with excellent adhesion to the fine particle alloy base material. Suitable for machining general steel, cast iron and stainless steel.
		JC7518	TiAlN/AlCrN	A coating with excellent welding resistance is used for the base material with optimized wear resistance and fracture resistance. Suitable for Titanium and INCONEL alloys.
		JC5118	TiAlN	Multipurpose PVD coating grade, highly adhesive coating on the substrate material. The balance between wear resistance and fracture resistance. For medium cutting of general steel, cast iron and stainless steel.
		JC8050	AlTiCrN	This coating has a excellent fracture resistance and with high wear resistance, Highly versatile PVD grade. Suitable for machining general steel and die steel.
		JC7550	TiAlN/AlCrN	PVD coating grade with enhanced thermal crack resistance, fracture resistance and oxidation resistance, and excellent thermal impact resistance. Suitable for machining Ti alloys.
	Excellent defect resistance	JC7560	TiAlN/AlCrN	A PVD coating grade that has enhanced thermal crack resistance, fracture resistance, and oxidation resistance, extremely excellent thermal impact resistance. Suitable for machining Titanium alloys.

Tool material

Dijet Carbide Grades For Milling Tools

■ Features and applications-3

Work Material		Insert Grade	Coating Composition	Speciality
High Hardness Material	Excellent wear resistance ↕ Excellent defect resistance	DH202	AlCrN/AlTiCrN/TiSiN	This coating has a very hard layer with a hardness of 4000 Hv. Works well for on finishing operations of high hardness materials over 60HRC.
		DH102	AlCrN/AlTiCrN/TiSiN	This coating has extremely high oxidation and wear resistance is used for the high-strength fine grain substrates material. Shows excellent performance in finishing of high hardness materials.
		DH103	AlCrN/AlTiCrN/TiSiN	High oxidation and wear resistance is with excellent plasticity and deformation resistance. Suitable for light cutting of high.
		DH110	AlCrN/AlTiCrN/TiSiN	This coating has a good balance of wear resistance and fracture resistance. Suitable for light cutting of high hardness steel, cast iron, and medium to high speed cutting of general steel.
		JC8008	AlTiCrN	PVD grade that has both chipping resistance and wear resistance.
		JC8015	AlTiCrN	This grade is called as a Dijet value coating grade (DV) with excellent oxidation resistance .For light cutting of general steel to high hardness steel, cast iron and stainless steel.
		JC8118	AlTiCrN	Multipurpose grade with highest wear resistance and fracture resistance. Suitable for machining difficult-to-cut materials, general steel to high-hardness steel, cast iron and stainless steel.
		JC5118	TiAlN	Multipurpose PVD grade with highest wear resistance and fracture resistance. Suitable for machining difficult-to-cut materials, general steel to high-hardness steel, cast iron and stainless steel.

2022-23

DIJET®

Products Guide Vol.4

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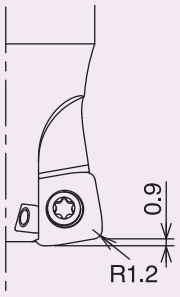
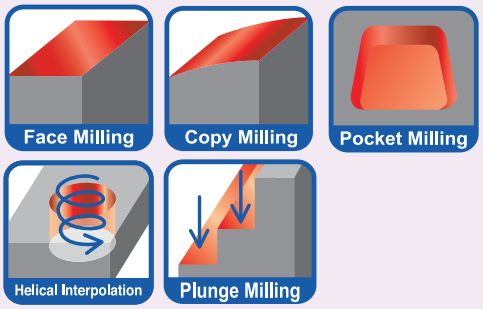
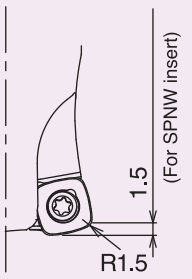
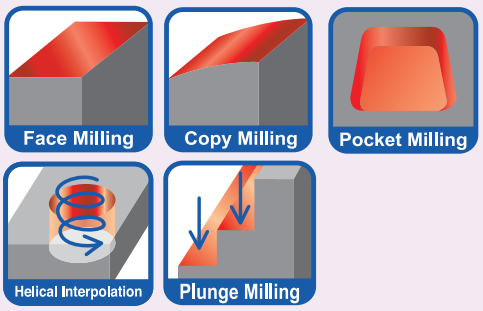
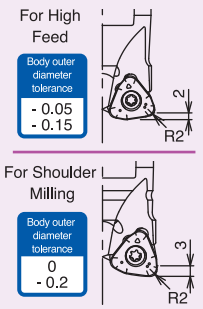
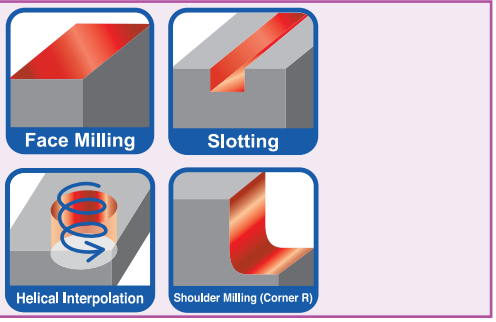
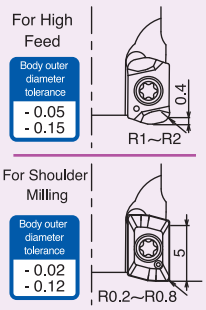
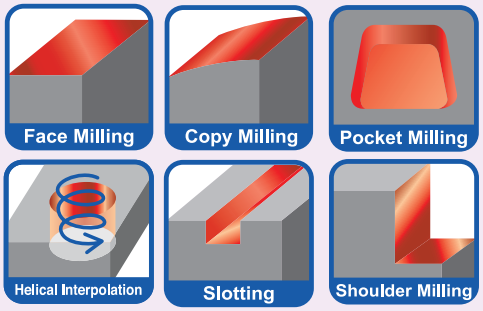
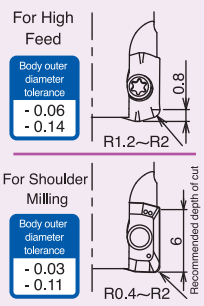
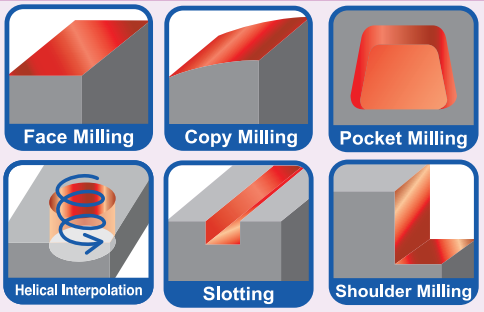
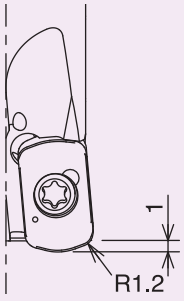
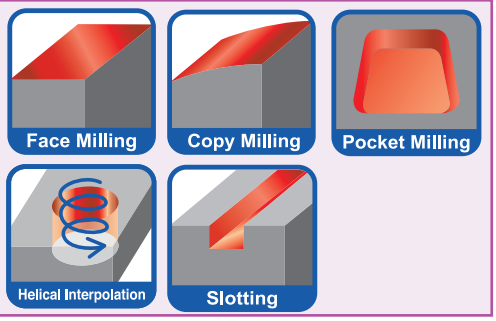
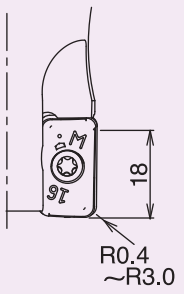
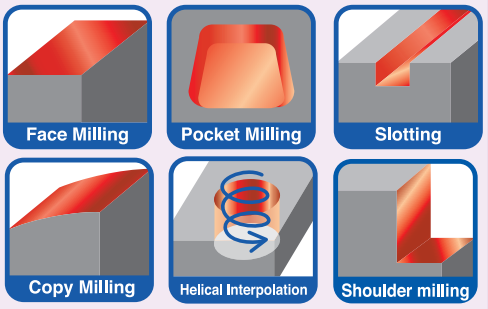
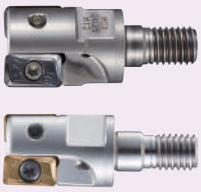
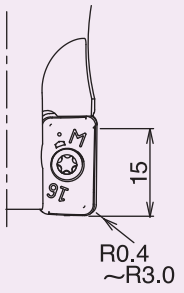
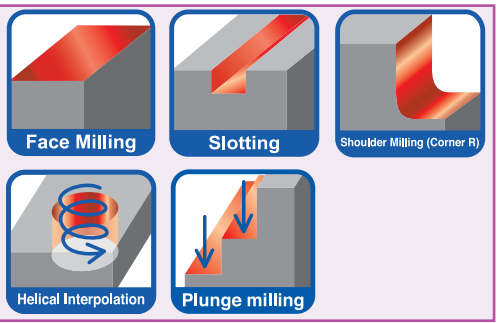
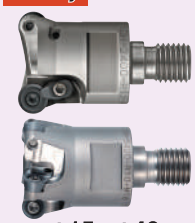
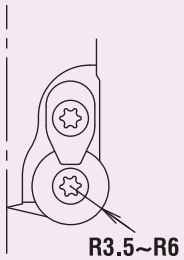
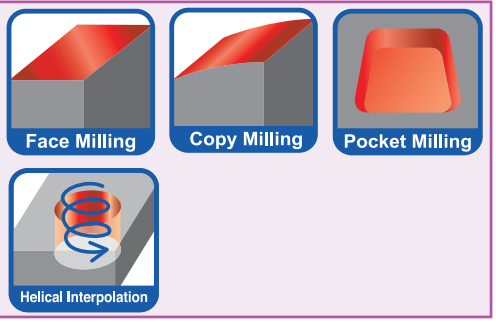
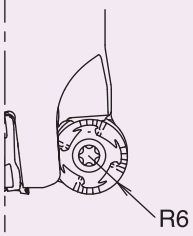
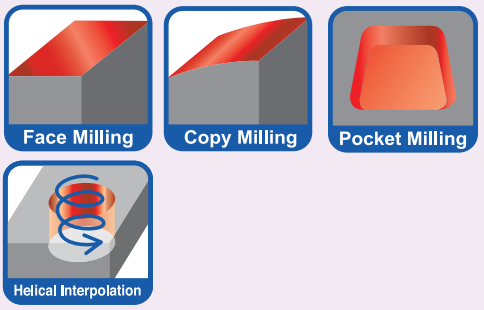
For high efficient machining

Replaceable modular head tool

Modular Head Series

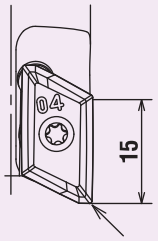
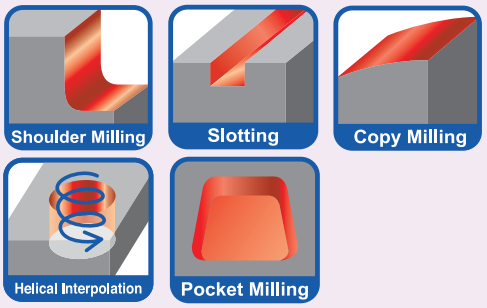
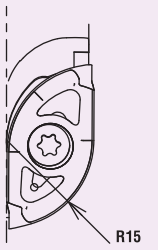
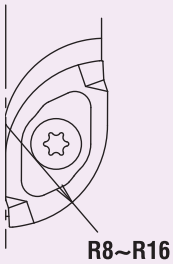
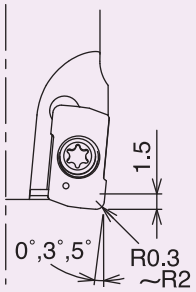
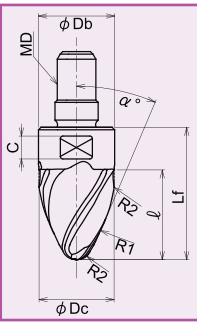
Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For High Feed Machining	SKG-II 09 Modular head **MSG-09 Type** E004	Body outer diameter tolerance 0 / - 0.1; Insert E Class; G-Body ϕ20～ϕ42		
For High Feed Machining	SKS-GII 10 Modular head **MSG-10 Type** E017	Body outer diameter tolerance 0 / - 0.1; Insert N,E,M Class; G-Body ϕ25～ϕ42		
For High Feed / Shoulder Machining	Multi Extreme Modular head **MEX-07 Type** E044, E045	Insert M Class ϕ32～ϕ42		
For High Feed, Profile milling and Shoulder Milling, For Bottom / Side Finishing	QM Mill Modular head **MPM Type** E063	G-Body; Insert H, M Class ϕ10～ϕ32		
For High Feed, Profile milling and Shoulder Milling, For Bottom / Side Finishing	QM Max Modular head **MQX Type** E085	G-Body; Insert H, M Class ϕ16～ϕ42		

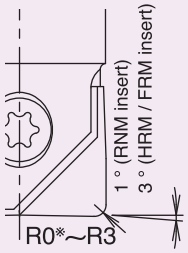
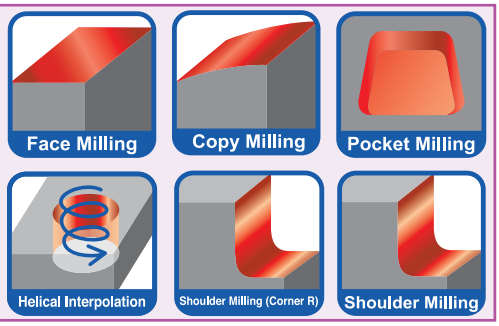
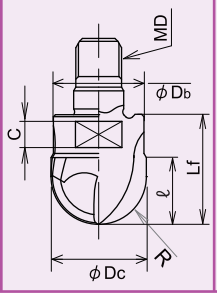
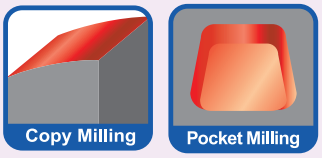
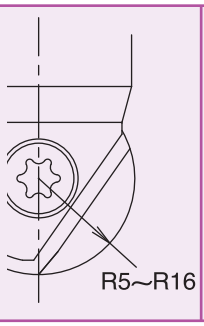
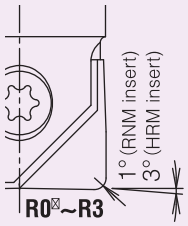
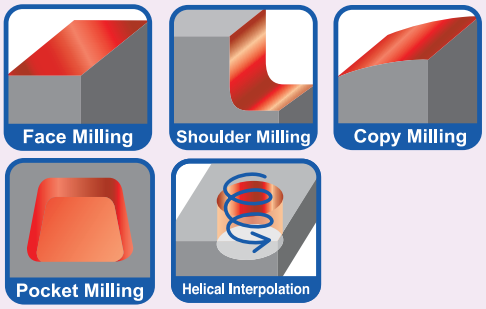
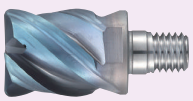
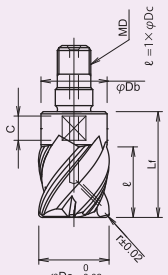
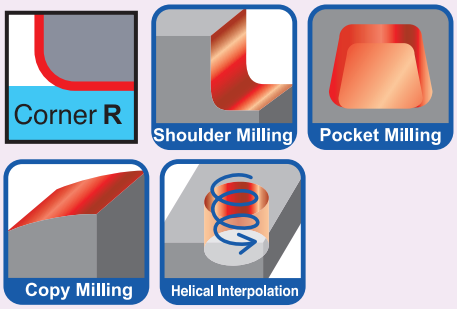
Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For High Feed / Finish Machining	QM MAX G-II **MXG Type** E151	Body outer diameter tolerance - 0.05 - 0.15, Insert M Class G-Body ϕ16~ϕ42		
For High efficient and Stable Shoulder Milling	Multi-functional indexable cutter SIC - EVO **SSV Type** E168	Body outer diameter tolerance 0 - 0.01, Insert M Class ϕ25~ϕ40		
For High-Efficiency Shoulder Milling and Multi-Functional milling	Extreme Shoulder Mill Modular head 11 & 17 type **MSX Type** E192, E196	Body outer diameter tolerance - 0.05 - 0.15, Insert G Class  ϕ16~ϕ40		
Copy Milling on common & difficult to cut materials	Super Diemaster Standard type Fine pitch type **SDH Type** E266, E267	G-Body  ϕ15~ϕ40 ϕ20~ϕ42		
For Difficult-To-Cut Materials and Profile machining	EXTDM Extreme Diamate Modular head **MTX Type** E293	Body outer diameter tolerance 0 - 0.1, Insert M Class ϕ32~ϕ40		

For high efficient machining

Replaceable head tool

Modular Head Series

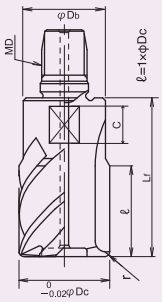
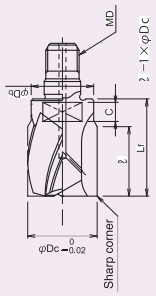
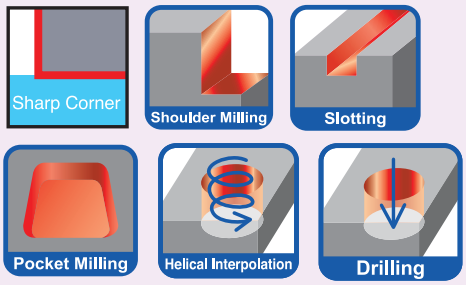
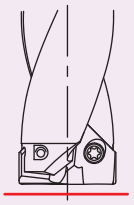
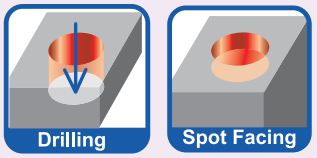
Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Aerospace Tooling	Aero Chipper **MAL Type** E306	G-Body ϕ20~ϕ40	 R0.2~ R3.2	
For Roughing and Shape milling	Swing Ball Neo **MSWX Type** E326	Body outer diameter tolerance 0 - 0.03 Insert H, M Class ϕ16~ϕ30		
Copy Roughing	Swing Ball **MSW Type** E343	G-Body ϕ16~ϕ32	 R8~R16	
For Finishing of Tapered walls and Shoulder Finishing	High precision type QM Max Modular head **MQT Type** E364	Body outer diameter tolerance 0 - 0.03 Insert H, M Class ϕ16~ϕ35		
For Finishing of Tapered walls and Shoulder Finishing	High precision type Solid Modular head **STLP Type** E369	Body outer diameter tolerance 0 - 0.03 Insert H, M Class ϕ16~ϕ20		

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For Finishing, High Feed and Profile machining	Mirror Ball Modular head **KRM Type** E370	Body outer diameter tolerance 0 -0.002 -0.018 / Insert F Class ϕ16～ϕ20	 ※R0 type is R0.1 or less	
For Finishing / Profile milling	Mirror ball **SMHB Type** E372	Body outer diameter tolerance 0 -0.03 / Insert H, M Class ϕ16～ϕ20		
For Finishing and Profile machining	Mirror Ball Modular head **MBX Type** E379	Body outer diameter tolerance ±0.008 / Insert F Class ϕ10～ϕ32		
Shoulder Finishing & Copy Milling	Mirror Radius Modular head **MRX Type** E414	 ϕ10～ϕ32	 ☒R0 : corner radius below 0.1mm.	
For machining solid and difficult-to-cut materials	Anti-Vibration S head (Solid Modular head) **SMSR Type** E438	 ϕ16～ϕ32		

For high efficient machining

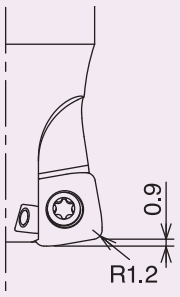
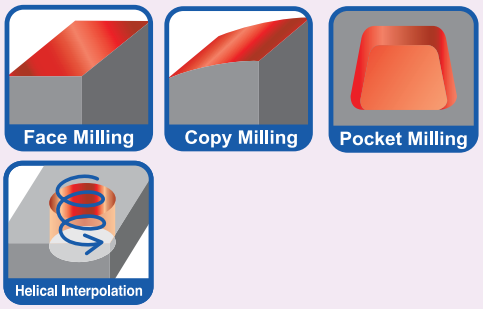
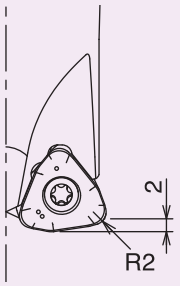
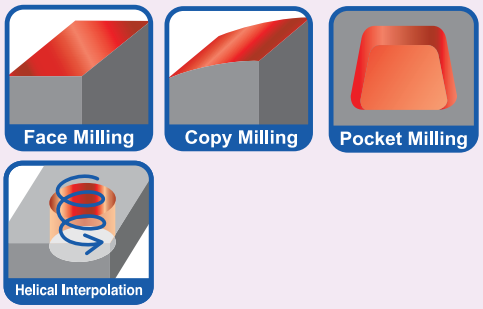
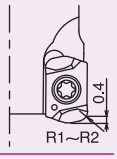
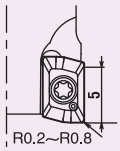
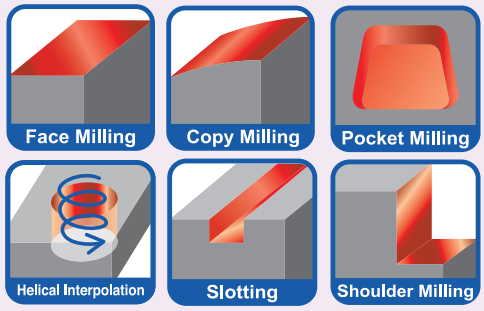
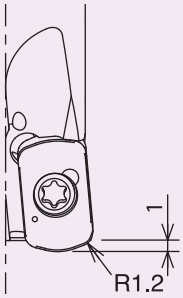
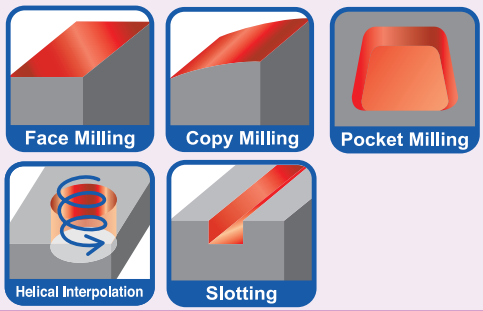
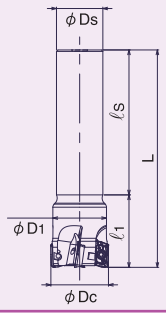
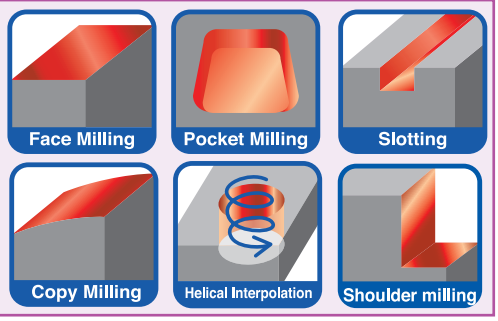
Replaceable head tool

Modular Head Series

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For general steel and difficult-to-cut materials	S head (Solid modular head) **SMSA Type** E442	 ϕ16~ϕ32		
For solid aluminium machining	S head for aluminium (Solid modular head) **SMAL Type** E447	 ϕ18~ϕ32		
For Counterbore Drilling & Spotting	TLZD Type For Spot Facing **TLZD Type** F64	Body outer diameter tolerance h7 ϕ14~ϕ32	 (Tip angle 180 ° flat)	
For High Efficiency and Deep machining	Carbide Shank Arbor **MSN Type** E432	 End mill ϕ10 ~ ϕ32 Straight arbor ϕ9.8 ~ ϕ32	• Prevents chattering even with very high outstick, helps for efficient machining by increased cutting parameters by 2 to 3 times, ultimately productivity improvement by 2 to 3 times • Roughing to Finishing can be done by just replacing modular head and these shanks remains fixed in the adaptors always. • No compromise on rigidity, even internal threads to hold modular head made on carbide body of the shanks. • Body of these shanks made out of Tuff Carbide material.	
For High Efficiency Machining	Steel Shank Arbor **MGN Type** E435	G-Body ϕ16~ϕ32	• High Density Material G-Body with Anti Vibration, rigidity, and Durability property. • We recommend these Shanks for Shorter Out stick. • Eco friendly as whole cutter is not required to be replaced if used with replacable Modular heads	

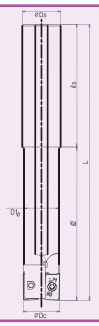
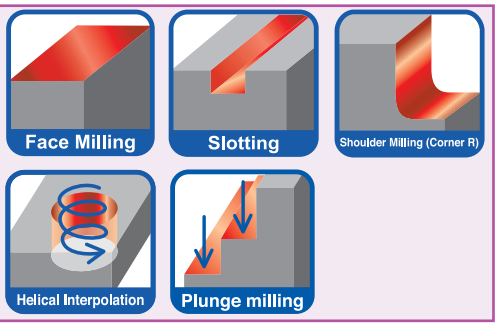
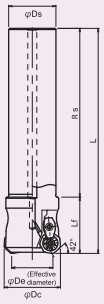
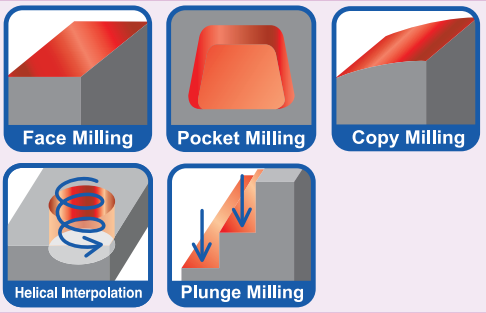
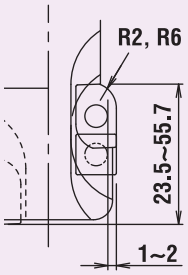
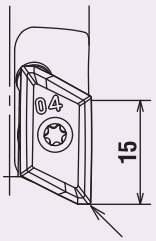
For high efficient machining

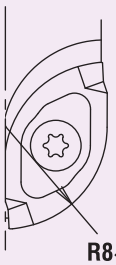
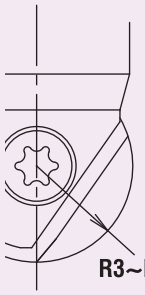
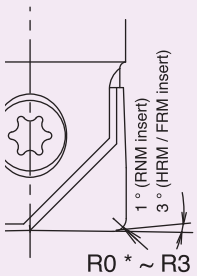
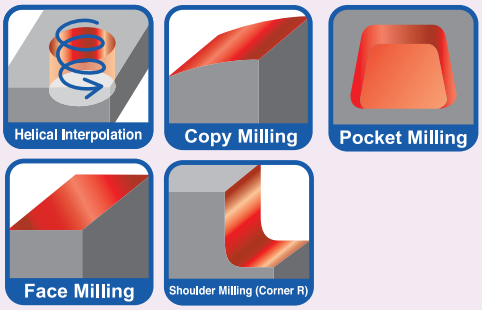
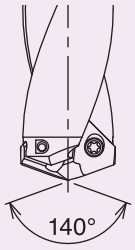
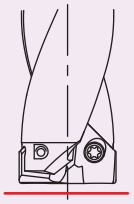
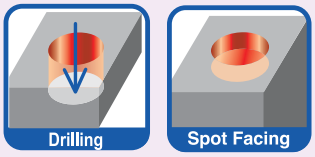
Shank Type Milling Series

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For High Feed / Profile Machining	SKG-II 09 **SKG-09 Type** E003	Body outer diameter tolerance 0 / - 0.1 · Insert E Class ϕ25~ϕ35		
For High Feed / Profile Machining	Multi Extreme **EXM-07 Type** E044	Body outer diameter tolerance - 0.05 / - 0.15 · Insert M Class ϕ32~ϕ40		
For High Feed / Profile Machining	QM Mill **PME Type PME-LS Type** E064	Insert H,M Class ϕ10~ϕ14	For High Feed · Body outer diameter tolerance - 0.05 / - 0.15  For Shoulder Milling · Body outer diameter tolerance - 0.02 / - 0.12 	
For High Feed / Profile Machining	QM-MAX G-II QMG-type **GMX Type** E150	Body outer diameter tolerance - 0.05 / - 0.15 · Insert M Class ϕ16~ϕ32		
For High efficient and Stable Shoulder Milling	Multi-functional indexable cutter SIC - EVO **SSV Type** E167	Body outer diameter tolerance 0 / - 0.01 · Insert M Class ϕ25~ϕ40		

For high efficient machining

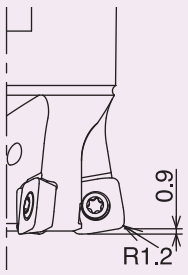
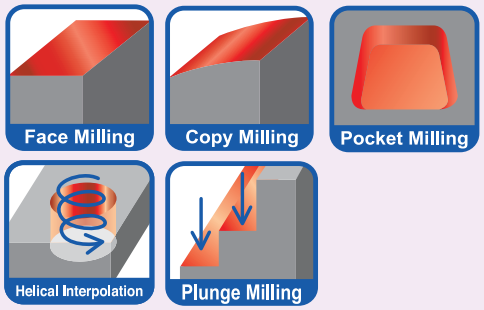
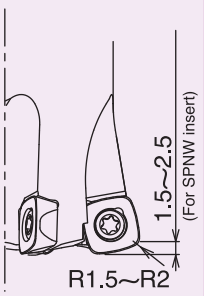
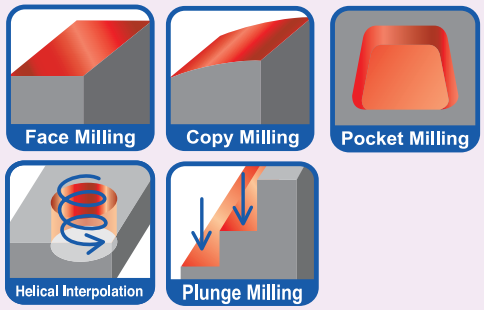
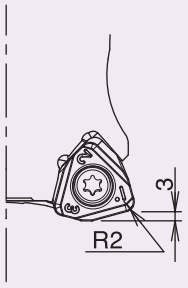
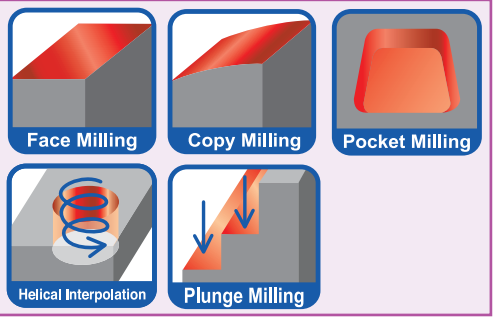
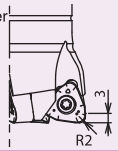
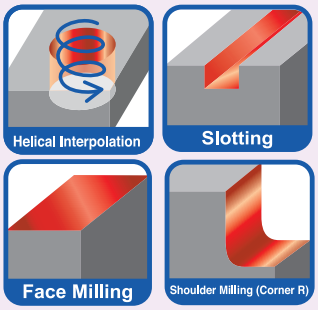
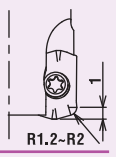
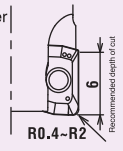
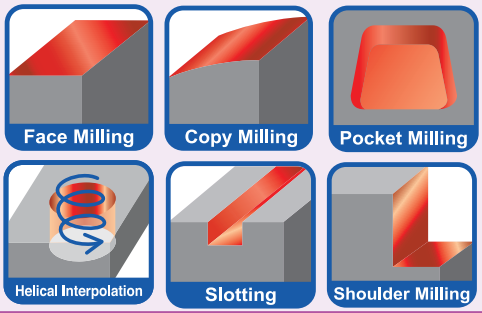
Shank Type Milling Series

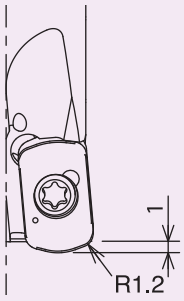
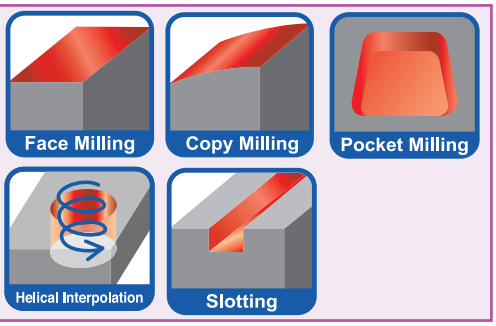
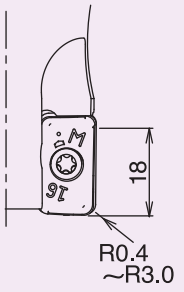
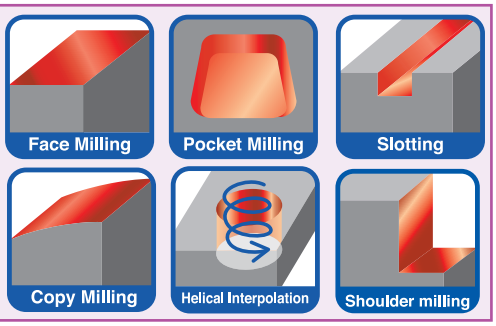
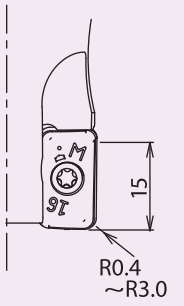
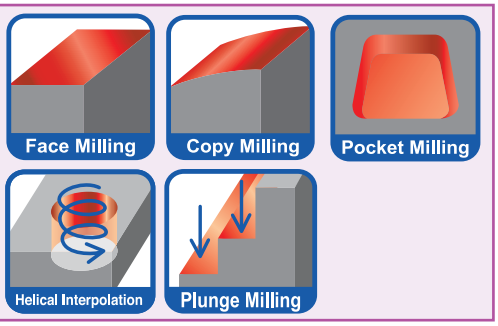
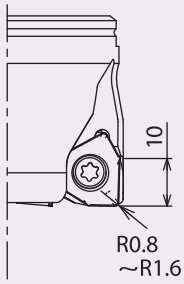
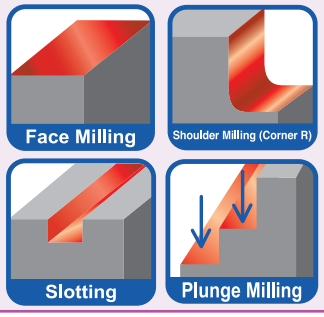
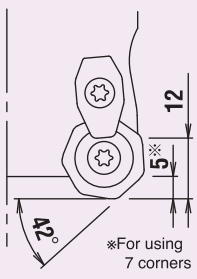
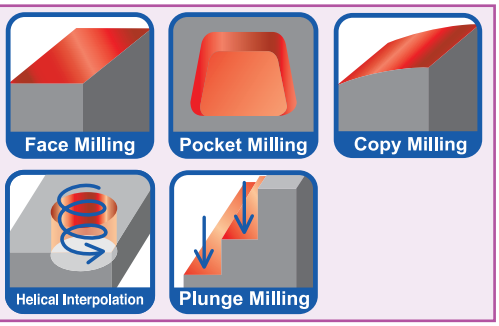
Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For High-Efficiency Shoulder Milling and Multi-Functional milling	Extreme Shoulder Mill Modular head 11 & 17 type EXSAP MSX Type E191	Body outer diameter tolerance - 0.05 - 0.15, Insert G Class G-Body ϕ16～ϕ40		
High Metal Removal Roughing	Hepta Mill HEP TYPE E242	G-Body ϕ50～ϕ200		
Under Milling	Under Cutter DUM-W※R TYPE E299	 ϕ25～ϕ50		
Aerospace Tooling	Aero Chipper ALX Type E305	G-Body ϕ20～ϕ40		
For Roughing and Shape milling	Swing Ball Neo SWBX Type E324	Body outer diameter tolerance 0 - 0.03, Insert H, M Class ϕ16～ϕ30		

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Copy Roughing	Swing Ball **SWB Type** E337	G-Body ϕ32~ϕ50	 R8~R16	
Copy Milling	Mirror Ball **BNMTYPE** E374	 ϕ6~ϕ30	 R3~R16	
For Finishing, High Feed and Profile machining	Mirror Radius End Mill **RNM Type** E411	Body outer diameter tolerance - 0.002 - 0.018 Insert F Class ϕ6~ϕ32	 R0 * ~ R3 * R0 type is R0.1 or less.	
For General - Purpose Drilling	TA-EZ Insert type Drill **TEZD Type** F28	Body outer diameter tolerance h7 ϕ13.6~ϕ32.1	 (150 ° for bridges)	
For Counterbore Drilling or Spotting	Spot Facing Insert type drill **TLZD Type** F56	Body outer diameter tolerance h7 ϕ14~ϕ32	 (Tip angle 180 ° flat)	

For high efficient machining

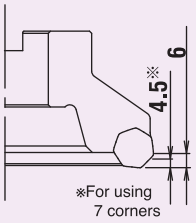
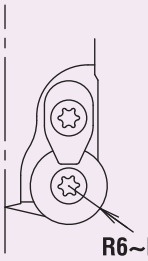
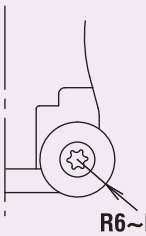
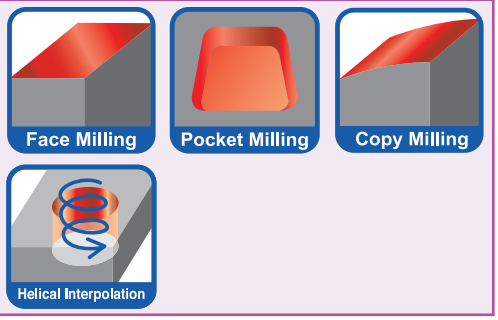
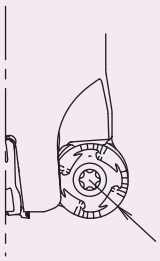
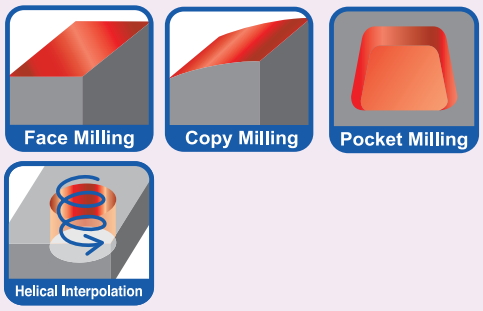
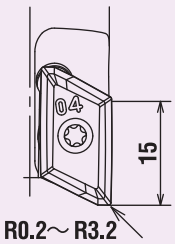
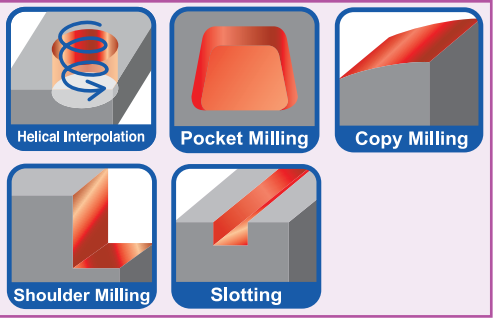
Shell Mill Type Cutter Series

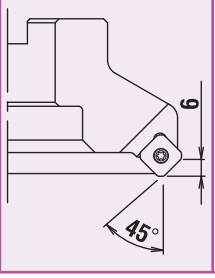
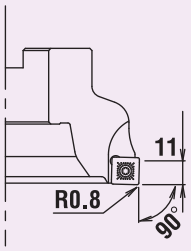
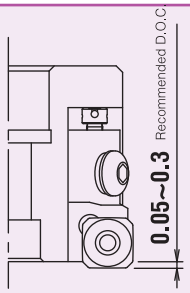
Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For High-Efficiency Shoulder Cutting and Multi-Functional machining	SKG-09 **SKG-09 Type** E003	Body outer diameter tolerance 0 / - 0.2; Insert E Class; G-Body ϕ40~ϕ80		
For High Feed and Profile Machining	SKG-GII **SKG 10 & 14 Type** E013	Body outer diameter tolerance - 0.05 / - 0.015; Insert M Class; G-Body ϕ50~ϕ160		
For High Feed, Flat Surface and Profile Machining	Extreme SKS type **EXSKS-09 Type** E032	Body outer diameter tolerance - 0.05 / - 0.015; Insert M Class; G-Body ϕ50~ϕ160		
For High Feed Shoulder Cutting	Multi Extreme **EXM-07 Type** E042	Insert M Class ϕ50~ϕ80	For High Feed: Body outer diameter tolerance - 0.05 / - 0.15 For Shoulder Milling: Body outer diameter tolerance 0 / - 0.2 	
For High Feed, Profile Machining, and Shoulder Cutting. For Bottom / Side Finishing	QM Max **QXP Type** E086	G-Body; Insert H, M Class ϕ40~ϕ66	For High Feed: Body outer diameter tolerance - 0.05 / - 0.15  For Shoulder Milling: Body outer diameter tolerance - 0.02 / - 0.12 	

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
For High Feed / Profile Machining	QMG Max Master **GMX Type** E145	Body outer diameter tolerance - 0.05 - 0.15 / Insert M Class G-Body ϕ50~ϕ66		
For High efficient and Stable Shoulder Milling	Multi-functional indexable cutter SIC - EVO **SSV Type** E166	Body outer diameter tolerance 0 - 0.01 / Insert M Class ϕ45~ϕ125		
For High-Efficiency Shoulder Cutting and Multi-Functional Machining	Extreme Shoulder with 4 corners **EXSAP 11 & 17 Type** E187	Body outer diameter tolerance - 0.05 - 0.15 / Insert G Class G-Body ϕ40~ϕ125		
For High-Efficiency Shoulder Cutting and Multi-Functional Machining	Shoulder milling with 6 corner **EXSIX Type** E225	Body outer diameter tolerance 0 - 0.2 / Insert M Class ϕ50~ϕ160		
High Metal Removal Roughing	Hepta Mill **HEP TYPE** E241	G-Body ϕ50~ϕ200		

For high efficient machining

Shell Mill Type Cutters Series

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
High Efficient Face Milling	Nega Hepta NHP TYPE E252	 ϕ63~ϕ250 (ϕ400)		
Copy Milling on common & difficult to cut materials	Super Diemaster Standard type HDM TYPE E264	G-Body ϕ50~ϕ125 (ϕ160)		
Copy Milling on common & difficult to cut materials	Super Diemaster Fine pitch type HDM TYPE E265	G-Body ϕ50~ϕ80		
For Difficult-To-Cut Materials and Profile machining	Extreme Diamate EXTDM Type E292	Body outer diameter tolerance - 0.05 - 0.015 Insert M Class ϕ50~ϕ66		
Aerospace Tooling	Aero Chipper ALX TYPE E304	G-Body ϕ50~ϕ63		

Type	Tool	Type and Range	Entering Angle/Max. ap	Applications
Face Milling	DIJET Mill 45 SSE45TYPE E314	G-Body φ50~φ200 (φ250)		
Shoulder Milling	DIJET Mill 90 SSD90TYPE E314	G-Body φ50~φ160 (φ200)		
Super Finishing	Finish Jet Mill FJMTYPE FJM-BDTYPE E351	 φ80~φ250		

High feed for profile roughing

High Feed Tool Roughing Application

Type of high feed cutters

1

> Highly Rigid Inserts with wide flutes pockets.
> Can Achieve High Metal Removal Rates.
> Profile or 3D Machining possible.
> Maximum Depth-of-Cut can go upto 3mm or less for high efficiency.

SKS series
(High rigidity insert type)

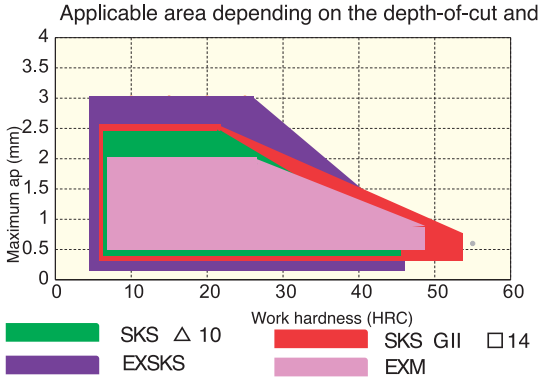
SKS series (high rigidity insert type)

High cut / high rigidity high feed cutter appropriate model: High output machine of BT50 or higher

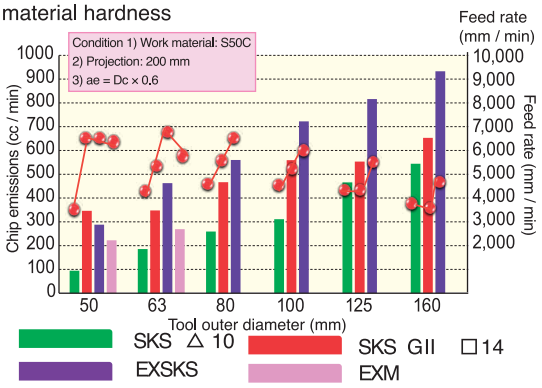
High feed die master (SKS, MSH)	SKS GII (SKG, MSG)	SKS Extreme (EXSKS)	Multi Extreme (EXM, MEX)
	Page E003	Page E029	Page E039
◦ One sided, 3 Edge positive inserts. ◦ Depth-of-Cut possible up to 2.5 mm with WDMW10 size inserts. ◦ Excellent for Ramping. ◦ Very good for Pocket Machining.	◦ One sided, 4 Edge positive inserts. ◦ Depth-of-Cut possible up to 2.5 mm with SPNW14 size inserts. ◦ Excellent for Ramping. ◦ Very good for Pocket Machining. ◦ High Depth-of-Cut and High Feed is possible	◦ Double sided, 6 Edge inserts. ◦ Depth-of-Cut possible up to 3mm possibe. ◦ Very High Metal Removal Rate possibe ◦ Excellent for Ramping. ◦ Very good for High Power with BT50/HSK100 Spindles ◦ High Depth-of-Cut and High Feed is possible	◦ Both sided, 6 Edge positive ◦ Depth-of-Cut possible up to 2 mm possibe ◦ Excellent for Ramping. ◦ Very good for Pocket Machining. ◦ With one Insert High Feed Profile Millling and Side wall rough machining possible.

SKS series

Applicable area depending on the depth-of-cut and material hardness



SKS series



Type of high feed cutters

2

> Small and low cutting force geometry inserts can be called as New generation High feed Cutters.
> Maximum Depth of Cut possible upto 1mm.
> High Speed and High Efficient Machining possible with minimum amount of Uncut material remains.

QM series
(Small insert type)

QM series (small insert type)

Small diameter multi-blade, high efficiency high feed tool Appropriate model: BT30-BT50 high-speed milling machine

QM mill (MPM, PME)

Page E060

- One sided, 2 Edge positive inserts.
- Low cutting force Insert for High Metal Removal Rate
- Depth-of-Cut possible up to 0.4mm or less.
- Excellent for Ramping.
- Roughing to Finishing possible with one cutter and variety of Inserts.
- Very good for small Pocket Machining.
- Suitable for High Speed BT30 and BT40 spindles.
- Programming Corner Radius recommended is R1.0

QM Max (MQX, QXP, MQT)

Page E082

- One sided, 2 Edge positive inserts.
- Low cutting force Inserts for High Metal Removal Rate.
- Depth-of-Cut possible up to 1 mm Max or less.
- Excellent for Ramping.
- Roughing to Finishing possible with one cutter and variety of Inserts.
- Very good for Pocket Machining.
- Suitable for High Speed BT40 and BT50 spindles.
- Programming Corner Radius recommended is R1.5

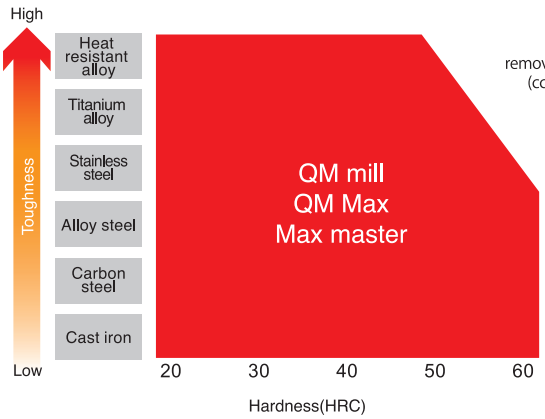
Max master (MXG, GMX)

Page E149

- Double sided, 4 Edge inserts.
- Low cutting Force Inserts for High Metal Removal Rate.
- Depth-of-Cut possible up to 1 mm or less.
- Excellent for Ramping.
- Roughing to Semifinishing Possible.
- Very good for Pocket Machining.
- Suitable for High Speed BT40 and BT50 Spindles.
- Programming Corner Radius recommended is R1.5

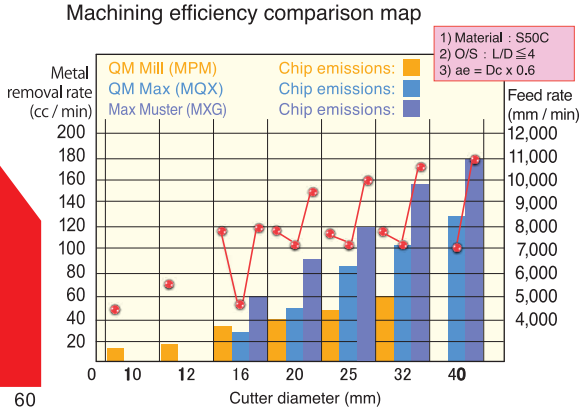
QM series

Application by work material



QM series

Machining efficiency comparison map



For high efficiency machining

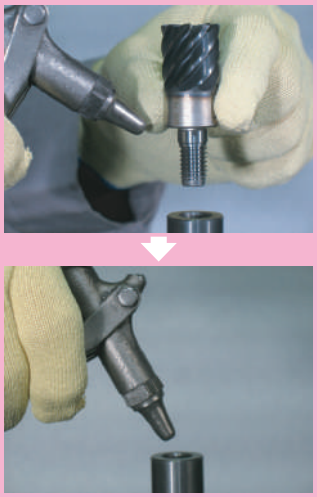
Tuff Modular Head System (VIP)

Instructions for Tuff Modular Head System

⚠ Mounting Modular head and MSN / MGN shank holder

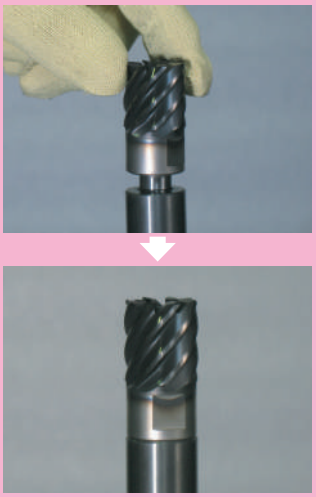
Tightening procedure

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.

⚠ Very Important Notes

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	Spanner size 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	Spanner size 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	19, 22	DS-19, DS-22
M16	20～25N·m	27	DS-27

Note)
1. The spanner is not attached to the modular head body.
2. A dedicated spanner DS-8 or DS-12 is also available for modular heads with a width across flats W = 8 or 12 (see the star mark).

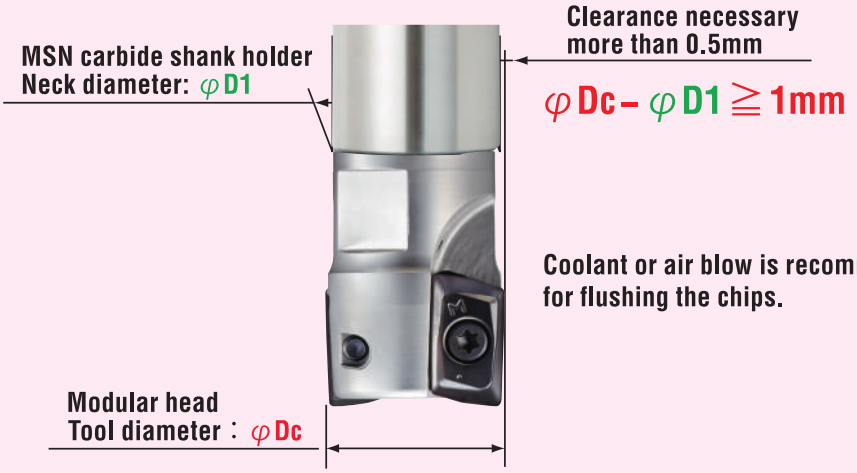
For high efficiency machining

Tuff Modular Head System (VIP)

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 than modular head diameter (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 a carbide shank and a modular head on the shrink-fit holder, please shrink-fit the only carbide shank without mounting a modular head. Please mount a modular 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 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 clamp screw

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.

For high efficiency machining

Replaceable modular head tool

Tuff Modular Head System

Roughing | Finishing | Multi Function Milling | Up & Down Milling | Chamfering

High Efficiency × Intensive Tool Management = Cost Reduction

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 drastically 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 21 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.
4. All Carbide Shank Arbor <Tough carbide> has been certified as the highest rank of environmentally friendly products by the Japan Machine Tool Manufacturers Association (formerly Carbide Tool Association) due to high efficiency machining with excellent anti-vibration effect and long insert life.

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.

☆☆☆

For high efficiency machining

Replaceable modular head tool

Tuff Modular Head System

Performance comparison case study MSN carbide shank vs Steel shank L/D = 9

How to save your machining hours!!

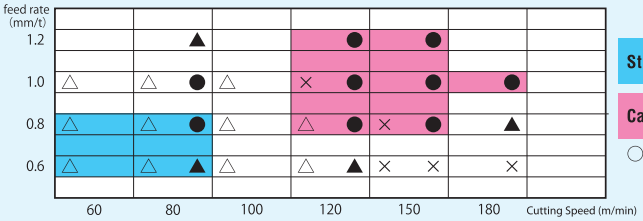
- Depth of cut : ap=0.3mm
- Pick feed : ae=12mm
- Coolant : Air blow
- Machine : Vertical MC
- Overhung length : 190mm
- Down cutting

CUTTING CONDITIONS

- Tool : Steel shank : SKS-2020-130-S20
  Carbide shank MSN-M10-140-S20C + MSH-2020-M10
- Insert No. : WDMW050316ZTR (JC5040)
- Work material : S55C
- Hardness : 201HB

	Low speed	High speed
Cutting speed	Vc= 80m/min	Vc= 150m/min
Spindle speed	n = 1,270min^{-1}	n = 2,390min^{-1}
Feed speed	Vf= 2,000mm/min	Vf= 4,800mm/min
Feed per revolution	f = 1.6mm/rev	f = 2.0mm/rev

CUTTING REGION'S COMPARISON



Steel shank body : SKS-2020-130-S20S20 (○,△,×)

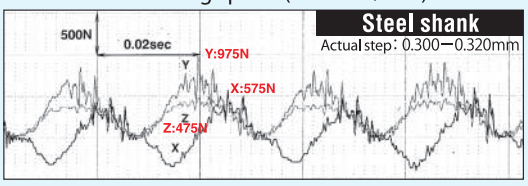
Carbide shank body : MSN-M10-140-S20C + MSH-2020-M10 (●,▲,×)

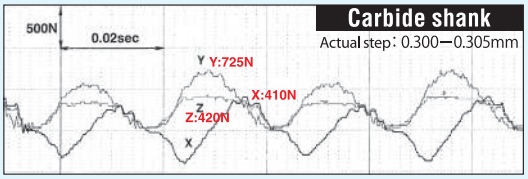
○, ● : No chatter △, ▲ : Small chatter × : Big chatter

Improved efficiency by 3 times!

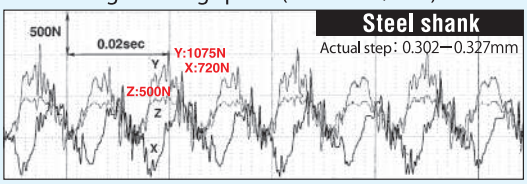
VIBRATIONS COMPARISON

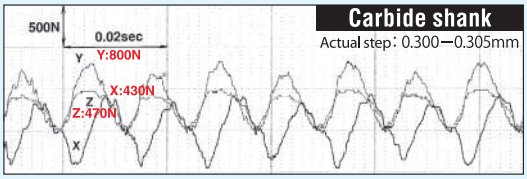
Low cutting speed (Vc=80m/min)



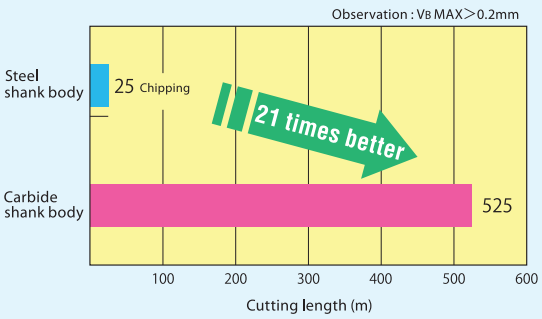


High cutting speed (Vc=150m/min)

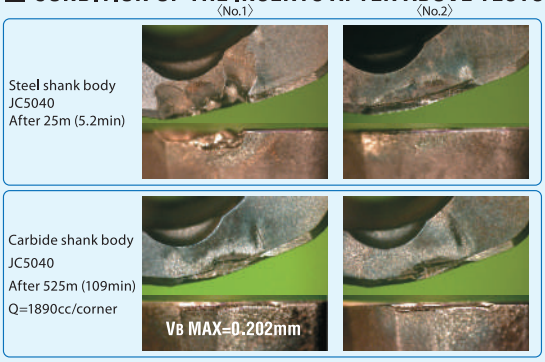




TOOL LIFE COMPARISON



CONDITION OF THE INSERTS AFTER ABOVE TESTS



OBSERVATIONS

- Tool life was highly improved with MSN carbide shank as against steel shank type end mill cutter.
- No chatter in low speed and high speed conditions.

High feed
For proflie machining

SKS-GII 09 type

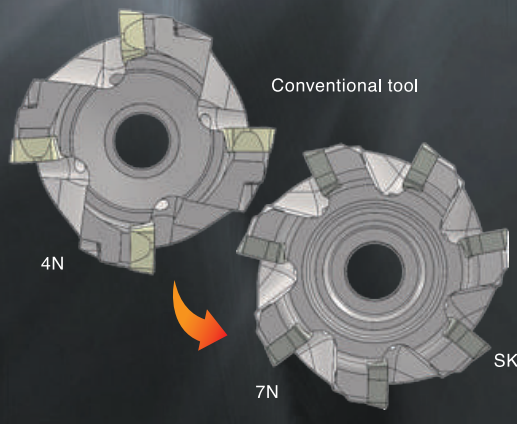
SKG-09 TYPE

Designed for High efficient Machining of Heat resistant alloys, Titanium alloys, Hardened Stainless steels

Feature 1

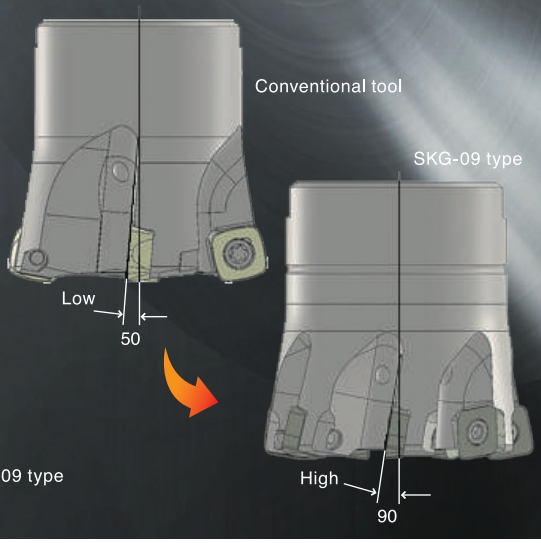
Superior Machining performance by using multiple cutting edges and small Inserts. Maximum ap = 0.9 mm possible on Titanium, Stainless steel materials and Heat resistant alloys.

Tool diameter ϕ50



Feature 2

Straight cutting edge and High axial rakes angle with low cutting force geometry helps for smooth of difficult-to-cut materials also.



High feed
For proflie machining

SKS-GII 09 type

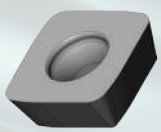
SKG-09 TYPE

Feature 3

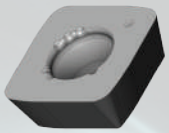
4 Corner cutting edges, positive geometry and E class ground Insert reduces the initial wear, and helps in achieving longer tool life. Inserts with Chip breaker Geometry and Non chip breaker available

Line up

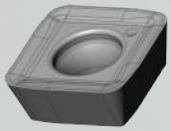
Wear resistance → Fracture resistance



SDEW090312ZER(JC7518)



SDEW090312ZER(JC7550)



SDET090312ZDER-SM(JC7550)

Application

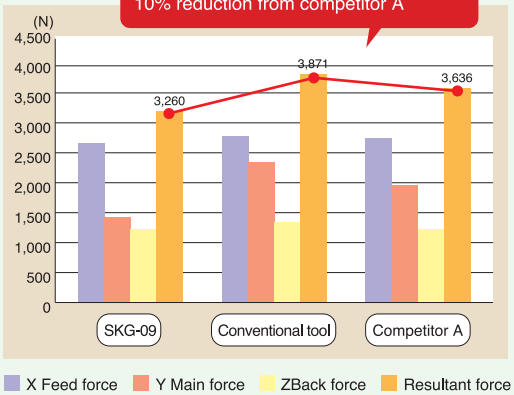
	Titanium Alloy	Inconel	SUS630	SUS316
SDEW090312ZER (JC7518)	●	●	●	
SDEW090312ZER (JC7550)	■			●■
SDET090312ZDER-SM(JC7550)		■	■	

● : Stable machining ■ : Unstable machining

■ Cutting Performance

Cutting force comparison

16% reduction from Conventional tool, 10% reduction from competitor A



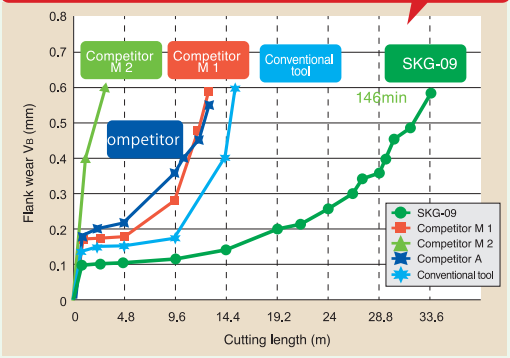
X Feed force Y Main force ZBack force Resultant force

Material: Titanium Alloy (Ti-6Al-4V)

- Tool dia .: ϕ50mm (Insert model number: SDEW090312ZER (JC7518))
- Cutting conditions: n = 380 / min, Vc = 60m / min, fz = 0.6mm / t, ap = 0.8mm, ae = 20mm, face milling (roughing), Overhung length: 135mm, 1-down cut, Air (internal)

Tool life comparison

SKG-09 achieved 14 times longer tool life compared with competitor M 2, 3.1 times longer compared with competitor M 1, and 2.2 times longer compared with conventional tool.



Material: Titanium Alloy (Ti-6Al-4V)

- Tool diameter: ϕ50 mm (Insert model number: SDEW090312ZER (JC7518))
- Cutting conditions: n = 380 / min, Vc = 60m / min, fz = 0.6mm / t, ap = 0.8mm, ae = 20mm, Face milling (roughing), Overhung length: 135mm, 1-blade down cut, wet

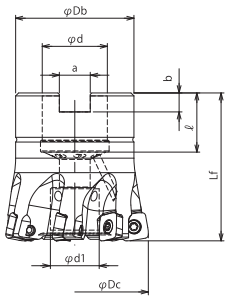
High feed
For proflie machining

SKS-GII 09 type

SKG-09 TYPE

G-Body

Through coolant hole



Clamp screw	Wrench (Not included)
DSW-307H	A-10

Clamp screw	Recommended torque (N·m)
DSW-307H	2.1

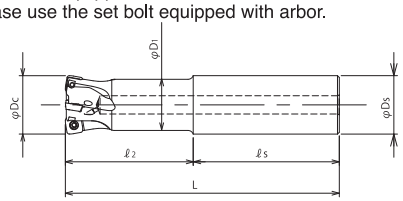
■ Body / Facemill type

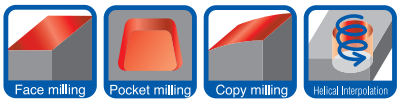
Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Set bolt	Weight (kg)	Applicable insert
SKG-5040R-09-16	☆	5	40	40	37	16	13.5	8.4	5.6	18	M8	0.21	SDEW090312ZER SDET090312ZDER-SM
SKG-7050R-09-22	●	7	50	50	40	22	16.5	10.4	6.3	20	M10	0.35	
SKG-7052R-09-22	☆	7	52	50	40	22	16.5	10.4	6.3	20	M10	0.37	
SKG-8063R-09-22	●	8	63	50	48	22	17	10.4	6.3	20	M10	0.58	
SKG-8066R-09-27	☆	8	66	50	50	27	20	12.4	7	22	M12X1.75X30★	0.60	
SKG-9080R-09-27	●	9	80	50	60	27	20	12.4	7	22	M12X1.75X30★	0.97	

Set bolt: Head cap screw (JIS standard)

Note) 1. All cutters are supplied without inserts.
2. Please refer to E011 - E012 for recommended cutting conditions.
3. All cutters are supplied without wrench & MOLY.
4. ★ 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.

Through coolant hole





■ Body / Shank type

Cat No.	Stock	No. of insert	Dimensions (mm) φDC	ℓ2	ℓS	L	φD1	φDS	Applicable insert
SKG-3025-60-09-S25	●	3	25	60	80	140	23	25	SDEW090312ZER SDET090312ZDER-SM
SKG-3025-100-09-S25	●	3	25	100	80	180	23	25	
SKG-4032-70-09-S32	●	4	32	70	80	150	28	32	
SKG-4032-120-09-S32	●	4	32	120	80	200	28	32	
SKG-5035-70-09-S32	●	5	35	70	80	150	31	32	
SKG-5035-120-09-S32	●	5	35	120	80	200	31	32	

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
3. Please refer to E010 for recommended cutting conditions.

Clamp screw	Wrench (Not included)
DSW-307H	A-10

Clamp screw	Recommended torque (N·m)
DSW-307H	2.1

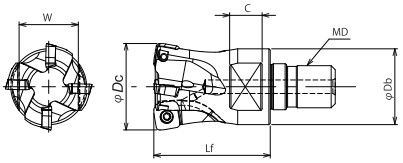
●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

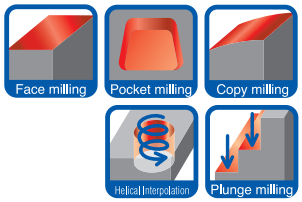
High feed
For profile machining

SKS-GII 09 type MSG-09 TYPE

G-Body

Through coolant hole





■ Body / Modular head type

Cat No.	Stock	No. of insert	Dimensions (mm) φDC	Lf	φDb	MD	C	W	Applicable insert	Parts: Clamp screw	Parts: Wrench (Not included)
MSG-2020-09-M10	●	2	20	30	19	M10	9	14	SDEW090312ZER SDET090312ZDER-SM	DSW-306H	A-10
MSG-2022-09-M10	●	2	22	30	19	M10	9	14			
MSG-3025-09-M12	●	3	25	35	23	M12	11	19			
MSG-4028-09-M12	●	4	28	35	23.6	M12	11	19		DSW-307H	
MSG-4032-09-M16	●	4	32	43	28	M16	12	22			
MSG-5035-09-M16	●	5	35	43	29	M16	12	22			
MSG-5040-09-M16	●	5	40	43	32	M16	14	26			
MSG-5042-09-M16	☆	5	42	43	32	M16	14	26			

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
3. Please refer to E007 - E009 for recommended cutting conditions.
4. Refer to D16 for the recommended tightening torque of the modular head.

Clamp screw	Recommended torque (N•m)
DSW-306H	1.8
DSW-307H	2.1

■ Insert

Fig.1

Fig.2

Fig.1

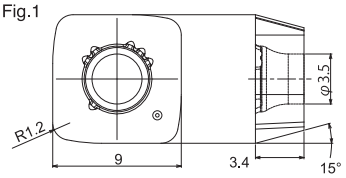
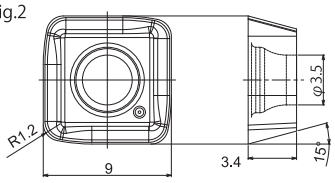


Fig.2



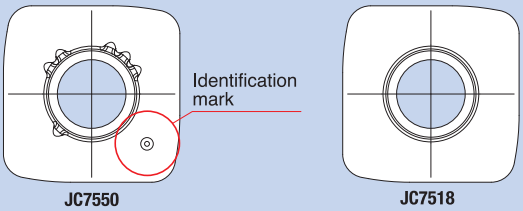
Cat. No.	Tolerance	PVD Coated JC7550	PVD Coated JC7518	Fig.
SDEW090312ZER	E	●	●	1
SDET090312ZDER-SM	E	●		2

10 inserts per case.

Identification of grade for SKS-GII 09 type insert

Each grade shows identification mark on the insert surface.

Fig.1



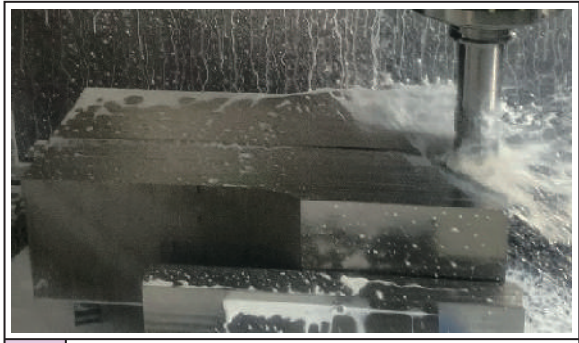
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed
For proflie machining

SKS-GII 09 type SKG-09 TYPE

■ Cutting data

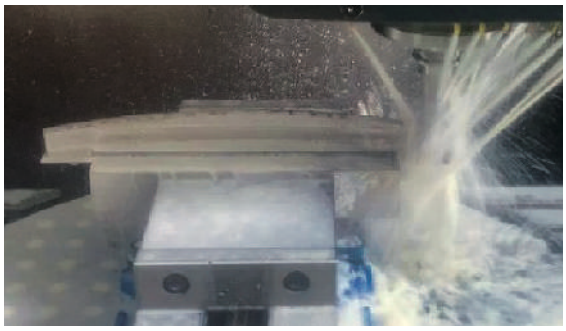
1. Machining on Ti-alloy



Work	Part name		Test piece
	Material		Ti-6Al-4V
	Hardness		—
Tool	Tool no.		SKG-7050R-09-22
	Insert no.		SDEW090312ZER (JC7518)
Cutting Conditions	Spindle speed	n	380 (min^{-1})
	Cutting speed	Vc	60 (m/min)
	Feed speed	Vf	1,600 (mm/min)
		fz	0.6 (mm/t)
	ap		0.6 (mm)
	ae		20 (mm)
	Coolant		Wet (Internal)
	Machine		Vertical MC (HSK-63)

Result: No chatter, Stable machining.
Able to machine for about 2 hours / corner.

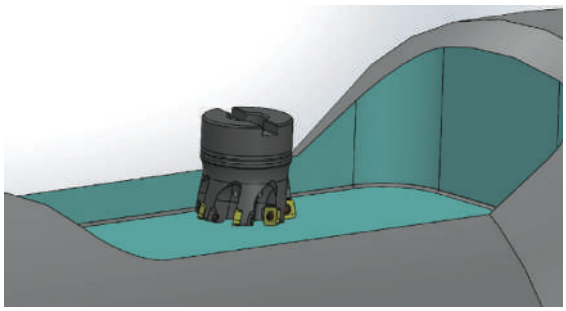
2. Machining on Inconel



Work	Part name		Aircraft parts
	Material		INCONEL625
	Hardness		—
Tool	Tool no.		SKG-7050R-09-22
	Insert no.		SDEW090312ZER (JC7518)
Cutting Conditions	Spindle speed	n	230 (min^{-1})
	Cutting speed	Vc	37 (m/min)
	Feed speed	Vf	760 (mm/min)
		fz	0.47 (mm/t)
	ap		0.5 (mm)
	ae		20 (mm)
	Coolant		Wet (External)
	Machine		Vertical MC (HSK-63)

Result: SKG can complete this application by only one corner of insert. Possible to use continuously after machining 30 minutes.

3. Machining on Stainless Steel



Work	Part name		Excavator parts
	Material		Nonmagnetic, Austenitic Mn-Cr-steel
	Hardness		36HRC
Tool	Tool no.		SKG-7050R-09-22
	Insert no.		SDEW090312ZER (JC7550)
Cutting Conditions	Spindle speed	n	460 (min^{-1})
	Cutting speed	Vc	73.4 (m/min)
	Feed speed	Vf	1,803 (mm/min)
		fz	0.56 (mm/t)
	ap		0.635 (mm)
	ae		12.8 (mm)
	Coolant		Air (Internal)
	Machine		Vertical MC (CAT40)

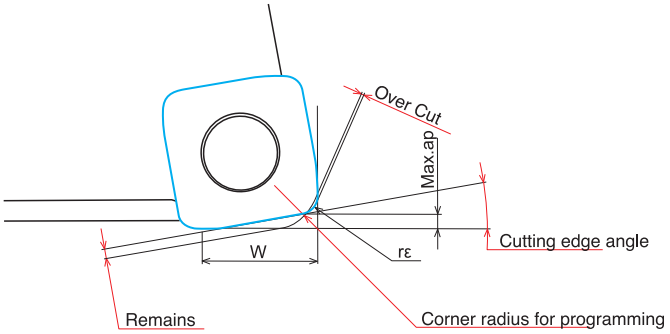
Result: Improved machining efficiency by 12% compared with current tool. Machining time is 70 minutes.
(1.75 times longer than current tool.) This application is completed by using only one corner of insert.

High feed
For proflie machining

SKS-GII 09 type SKG-09 / MSG-09 TYPE

Definition of corner shape for programming

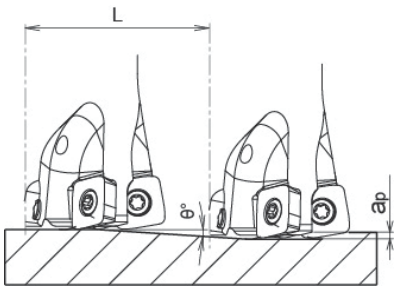
■ Common inserts
SDET090312ZDER-SM
SDEW090312ZER



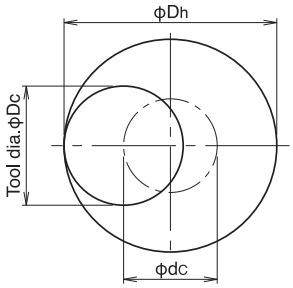
Corner R for programming	Remains	Over cut	Max.ap	W	Cutting edge angle	Insert corner R (rε)
1.5	0.81	0	0.9	7.1	10°	1.2
2 (Basic)	0.73	0				
2.5	0.65	0.08				

Attention for profile milling

Ramping



Helical interpolation



●Calculation of tool pass dia.

$$\phi dc = \phi Dh - \phi Dc$$

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.

Note :
◎ 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 at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
MSG-2020-09-M10	20	5.6	0.9	1°	51.6	27	38
MSG-2022-09-M10	22	7.7	0.9	1°	51.6	31	42
MSG-3025-09-M12	25	10.7	0.9	1°	51.6	37	48
MSG-4028-09-M12	28	13.7	0.9	1°	51.6	43	54
MSG-4032-09-M16	32	17.6	0.9	1°	51.6	51	62
MSG-5035-09-M16	35	20.6	0.9	1°	51.6	57	68
MSG-5040-09-M16	40	25.7	0.9	1°	51.6	67	78
MSG-5042-09-M16	42	27.7	0.9	1°	51.6	71	82
SKG-3025-60-09-S25	25	10.7	0.9	1°	51.6	37	48
SKG-3025-100-09-S25	25	10.7	0.9	1°	51.6	37	48
SKG-4032-70-09-S32	32	17.6	0.9	1°	51.6	51	62
SKG-4032-120-09-S32	32	17.6	0.9	1°	51.6	51	62
SKG-5035-70-09-S32	35	20.6	0.9	1°	51.6	57	68
SKG-5035-120-09-S32	35	20.6	0.9	1°	51.6	57	68
SKG-5040R-09-16	40	25.7	0.9	1°	51.6	67	78
SKG-7050R-09-22	50	35.6	0.9	1°	51.6	87	98
SKG-7052R-09-22	52	37.6	0.9	1°	51.6	91	102
SKG-8063R-09-22	63	48.7	0.9	0°45'	68.8	113	124
SKG-8066R-09-27	66	51.7	0.9	0°45'	68.8	119	130
SKG-9080R-09-27	80	65.7	0.9	0°30'	103.1	147	158

High feed
For proflie machining

SKS-GII 09 type MSG-09 TYPE

■ RECOMMENDED CUTTING CONDITIONS

MSG-09 and MSN type

Work Materials	Insert No.	Grades	Tool dia. (mm)														
			20					22					25				
			No. of teeth 2N					No. of teeth 2N					No. of teeth 3N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Stainless steel Austenitic (AISI 304, 316, 317)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~60	0.8	~5	2,390	4,780	~60	0.8	~6	2,170	4,340	~75	0.8	~9	1,910	5,730
			100	0.6	~5	2,390	4,780	100	0.6	~6	2,170	4,340	125	0.6	~9	1,910	5,730
			140	0.6	~5	1,990	3,180	140	0.6	~6	1,810	2,900	175	0.6	~9	1,720	4,390
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~60	0.8	~5	3,020	6,040	~60	0.8	~6	2,750	5,500	~75	0.8	~9	2,420	7,260
			100	0.6	~5	3,020	6,040	100	0.6	~6	2,750	5,500	125	0.6	~9	2,420	7,260
			140	0.6	~5	2,470	3,950	140	0.6	~6	2,240	3,580	175	0.6	~9	2,160	5,510
Super duplex stainless steel (S32750)	SDEW 090312 ZER	JC7518 (JC7550)	~60	0.8	~5	1,590	950	~60	0.8	~6	1,450	870	~75	0.8	~9	1,270	1,140
			100	0.6	~5	1,590	950	100	0.6	~6	1,450	870	125	0.6	~9	1,270	1,140
			140	0.6	~5	1,350	680	140	0.6	~6	1,230	620	175	0.6	~9	1,150	860
Titanium alloy 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~60	0.8	~5	950	1,140	~60	0.8	~6	870	1,040	~75	0.8	~9	760	1,370
			100	0.6	~5	950	1,140	100	0.6	~6	870	1,040	125	0.6	~9	760	1,370
			140	0.6	~5	800	800	140	0.6	~6	720	720	175	0.6	~9	700	1,050
Inconel 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~60	0.5	~5	480	580	~60	0.5	~6	430	520	~75	0.5	~9	380	680
			100	0.4	~5	480	580	100	0.4	~6	430	520	125	0.4	~9	380	680
			140	0.4	~5	400	400	140	0.4	~6	360	360	175	0.4	~9	320	480

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

■ Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommend to reduce the depth of cut ap or Spindle speed and keep same feed per tooth.
3. If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4. Use air blow.
5. Wet machining is recommended while machining stainless steel, titanium alloys, and heat-resistant alloys.

High feed
For proflie machining

SKS-GII 09 type

MSG-09 TYPE

■ RECOMMENDED CUTTING CONDITIONS

MSG-09 and MSN type

Work Materials	Insert No.	Grades	Tool dia. (mm)														
			28					32					35				
			No. of teeth 4N					No. of teeth 4N					No. of teeth 5N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Stainless steel Austenitic (AISI 304, 316, 317)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~75	0.8	~12	1,710	6,840	~90	0.8	~15	1,490	5,960	~90	0.8	~18	1,360	6,800
			125	0.6	~12	1,710	6,840	150	0.6	~15	1,490	5,960	150	0.6	~18	1,360	6,800
			175	0.6	~12	1,530	5,200	210	0.6	~15	1,240	3,970	210	0.6	~18	1,140	4,560
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~75	0.8	~12	2,160	8,640	~90	0.8	~15	1,890	7,560	~90	0.8	~18	1,730	8,650
			125	0.6	~12	2,160	8,640	150	0.6	~15	1,890	7,560	150	0.6	~18	1,730	8,650
			175	0.6	~12	1,930	6,560	210	0.6	~15	1,540	4,930	210	0.6	~18	1,410	5,640
Super duplex stainless steel (S32750)	SDEW 090312 ZER	JC7518 (JC7550)	~75	0.8	~12	1,140	1,370	~90	0.8	~15	990	1,190	~90	0.8	~18	910	1,370
			125	0.6	~12	1,140	1,370	150	0.6	~15	990	1,190	150	0.6	~18	910	1,370
			175	0.6	~12	1,020	1,020	210	0.6	~15	850	850	210	0.6	~18	770	960
Titanium alloy 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~75	0.8	~12	680	1,630	~90	0.8	~15	600	1,440	~90	0.8	~18	550	1,650
			125	0.6	~12	680	1,630	150	0.6	~15	600	1,440	150	0.6	~18	550	1,650
			175	0.6	~12	630	1,260	210	0.6	~15	500	1,000	210	0.6	~18	450	1,130
Inconel 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~75	0.5	~12	340	820	~90	0.5	~15	300	720	~90	0.5	~18	270	810
			125	0.4	~12	340	820	150	0.4	~15	300	720	150	0.4	~18	270	810
			175	0.4	~12	280	560	210	0.4	~15	250	500	210	0.4	~18	230	580

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

■ Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommend to reduce the depth of cut ap or Spindle speed and keep same feed per tooth.
3. If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4. Use air blow.
5. Wet machining is recommended while machining stainless steel, titanium alloys, and heat-resistant alloys.

High feed
For profile machining

SKS-GII 09 type MSG-09 TYPE

■ RECOMMENDED CUTTING CONDITIONS

MSG-09 and MSN type

Work Materials	Insert No.	Grades	Tool dia. (mm)									
			40					42				
			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)
Stainless steel Austenitic (AISI 304, 316, 317)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~120	0.8	~23	1,190	5,950	~120	0.8	~24	1,140	5,700
			200	0.6	~23	1,190	5,950	200	0.6	~24	1,140	5,700
			280	0.6	~23	990	4,210	280	0.6	~24	950	4,040
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~120	0.8	~23	1,510	7,550	~120	0.8	~24	1,440	7,200
			200	0.6	~23	1,510	7,550	200	0.6	~24	1,440	7,200
			280	0.6	~23	1,230	5,230	280	0.6	~24	1,170	4,970
Super duplex stainless steel (S32750)	SDEW 090312 ZER	JC7518 (JC7550)	~120	0.8	~23	800	1,200	~120	0.8	~24	760	1,140
			200	0.6	~23	800	1,200	200	0.6	~24	760	1,140
			280	0.6	~23	680	850	280	0.6	~24	640	800
Titanium alloy 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~120	0.8	~23	480	1,440	~120	0.8	~24	450	1,350
			200	0.6	~23	480	1,440	200	0.6	~24	450	1,350
			280	0.6	~23	400	1,000	280	0.6	~24	380	950
Inconel 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~120	0.5	~23	240	720	~120	0.5	~24	230	690
			200	0.4	~23	240	720	200	0.4	~24	230	690
			280	0.4	~23	200	500	280	0.4	~24	190	480

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

■ Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommend to reduce the depth of cut ap or Spindle speed and keep same feed per tooth.
3. If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4. Use air blow.
5. Wet machining is recommended while machining stainless steel, titanium alloys, and heat-resistant alloys.

High feed
For proflie machining

SKS-GII 09 type

SKG-09 TYPE

■ RECOMMENDED CUTTING CONDITIONS

Shank type

Work Materials	Insert No.	Grades	Tool dia. (mm)														
			25					32					35				
			No. of teeth 3N					No. of teeth 4N					No. of teeth 5N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Stainless steel Austenitic (AISI 304, 316, 317)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~70	0.6	~9	1,910	5,730	~90	0.6	~15	1,490	5,960	~90	0.6	~18	1,360	6,800
			70~120	0.6	~9	1,590	3,820	90~140	0.6	~15	1,240	3,970	90~140	0.6	~18	1,140	4,560
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~70	0.6	~9	2,420	7,260	~90	0.6	~15	1,890	7,560	~90	0.6	~18	1,730	8,650
			70~120	0.6	~9	1,970	4,730	90~140	0.6	~15	1,540	4,930	90~140	0.6	~18	1,410	5,640
Super duplex stainless steel (S32750)	SDEW 090312 ZER	JC7518 (JC7550)	~70	0.6	~9	1,270	1,140	~90	0.6	~15	990	1,190	~90	0.6	~18	910	1,370
			70~120	0.6	~9	1,080	810	90~140	0.6	~15	850	850	90~140	0.6	~18	770	960
Titanium alloy 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~70	0.6	~9	760	1,370	~90	0.6	~15	600	1,440	~90	0.6	~18	550	1,650
			70~120	0.6	~9	640	960	90~140	0.6	~15	500	1,000	90~140	0.6	~18	450	1,130
Inconel 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~70	0.5	~9	380	680	~90	0.5	~15	300	720	~90	0.5	~18	270	810
			70~120	0.5	~9	320	480	90~140	0.5	~15	250	500	90~140	0.5	~18	230	580

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

■ Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommend to reduce the depth of cut ap or Spindle speed and keep same feed per tooth.
3. If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4. Use air blow.
5. Wet machining is recommended while machining stainless steel, titanium alloys, and heat-resistant alloys.

High feed
For proflie machining

SKS-GII 09 type

SKG-09 TYPE

■ RECOMMENDED CUTTING CONDITIONS

Facemill type

Work Materials	Insert No.	Grades	Tool dia. (mm)														
			40					50					52				
			No. of teeth 5N					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)
Stainless steel Austenitic (AISI 304, 316, 317)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~150	0.6	~23	1,190	5,950	~150	0.8	~32	950	6,650	~150	0.8	~33	920	6,440
			200	0.4	~23	1,190	5,950	200	0.6	~32	950	6,650	200	0.6	~33	920	6,440
			250	0.3	~23	990	4,950	250	0.4	~32	800	5,600	250	0.4	~33	770	5,390
			300	-	-	-	-	300	0.3	~32	800	5,600	300	0.3	~33	770	5,390
			350	-	-	-	-	350	0.3	~32	800	4,760	350	0.3	~33	770	4,580
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~150	0.6	~23	1,510	7,550	~150	0.8	~32	1,210	8,470	~150	0.8	~33	1,160	8,120
			200	0.4	~23	1,510	7,550	200	0.6	~32	1,210	8,470	200	0.6	~33	1,160	8,120
			250	0.3	~23	1,230	6,150	250	0.4	~32	990	6,930	250	0.4	~33	950	6,650
			300	-	-	-	-	300	0.3	~32	990	6,930	300	0.3	~33	950	6,650
			350	-	-	-	-	350	0.3	~32	990	5,890	350	0.3	~33	950	5,650
Super duplex stainless steel (S32750)	SDEW 090312 ZER	JC7518 (JC7550)	~150	0.6	~23	800	1,200	~150	0.8	~32	640	1,340	~150	0.8	~33	610	1,280
			200	0.4	~23	800	1,200	200	0.6	~32	640	1,340	200	0.6	~33	610	1,280
			250	0.3	~23	680	1,020	250	0.4	~32	540	1,130	250	0.4	~33	520	1,090
			300	-	-	-	-	300	0.3	~32	540	1,130	300	0.3	~33	520	1,090
			350	-	-	-	-	350	0.3	~32	540	950	350	0.3	~33	520	910
Titanium alloy 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~150	0.6	~23	480	1,440	~150	0.8	~32	380	1,600	~150	0.8	~33	370	1,550
			200	0.4	~23	480	1,440	200	0.6	~32	380	1,600	200	0.6	~33	370	1,550
			250	0.3	~23	400	1,200	250	0.4	~32	320	1,340	250	0.4	~33	310	1,300
			300	-	-	-	-	300	0.3	~32	320	1,340	300	0.3	~33	310	1,300
			350	-	-	-	-	350	0.3	~32	320	1,120	350	0.3	~33	310	1,090
Inconel 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~150	0.5	~23	240	720	~150	0.5	~32	190	800	~150	0.5	~33	180	760
			200	0.35	~23	240	720	200	0.4	~32	190	800	200	0.4	~33	180	760
			250	0.25	~23	200	600	250	0.25	~32	160	670	250	0.25	~33	150	630
			300	-	-	-	-	300	0.2	~32	160	670	300	0.2	~33	150	630
			350	-	-	-	-	350	0.2	~32	160	560	350	0.2	~33	150	530

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

■ Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommend to reduce the depth of cut ap or Spindle speed and keep same feed per tooth.
3. If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4. Use air blow.
5. Wet machining is recommended while machining stainless steel, titanium alloys, and heat-resistant alloys.

High feed
For proflie machining

SKS-GII 09 type

SKG-09 TYPE

RECOMMENDED CUTTING CONDITIONS

Facemill type

Work Materials	Insert No.	Grades	Tool dia. (mm)														
			63					66					80				
			No. of teeth 8N					No. of teeth 8N					No. of teeth 9N				
			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)
Stainless steel Austenitic (AISI 304, 316, 317)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~150	0.8	~43	760	6,080	~150	0.8	~46	720	5,760	~150	0.8	~59	600	5,400
			200	0.6	~43	760	6,080	200	0.6	~46	720	5,760	200	0.6	~59	600	5,400
			250	0.4	~43	630	5,040	250	0.4	~46	600	4,800	250	0.4	~59	500	4,500
			300	0.3	~43	630	5,040	300	0.3	~46	600	4,800	300	0.3	~59	500	4,500
			350	0.3	~43	630	4,280	350	0.3	~46	600	4,080	350	0.3	~59	500	3,830
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	SDEW 090312 ZER (SDET 090312 ZDER-SM)	JC7550	~150	0.8	~43	960	7,680	~150	0.8	~46	920	7,360	~150	0.8	~59	760	6,840
			200	0.6	~43	960	7,680	200	0.6	~46	920	7,360	200	0.6	~59	760	6,840
			250	0.4	~43	780	6,240	250	0.4	~46	750	6,000	250	0.4	~59	620	5,580
			300	0.3	~43	780	6,240	300	0.3	~46	750	6,000	300	0.3	~59	620	5,580
			350	0.3	~43	780	5,300	350	0.3	~46	750	5,100	350	0.3	~59	620	4,740
Super duplex stainless steel (S32750)	SDEW 090312 ZER	JC7518 (JC7550)	~150	0.8	~43	510	1,220	~150	0.8	~46	480	1,150	~150	0.8	~59	400	1,080
			200	0.6	~43	510	1,220	200	0.6	~46	480	1,150	200	0.6	~59	400	1,080
			250	0.4	~43	430	1,030	250	0.4	~46	410	980	250	0.4	~59	340	920
			300	0.3	~43	430	1,030	300	0.3	~46	410	980	300	0.3	~59	340	920
			350	0.3	~43	430	860	350	0.3	~46	410	820	350	0.3	~59	340	770
Titanium alloy 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~150	0.8	~43	300	1,440	~150	0.8	~46	290	1,390	~150	0.8	~59	240	1,300
			200	0.6	~43	300	1,440	200	0.6	~46	290	1,390	200	0.6	~59	240	1,300
			250	0.4	~43	250	1,200	250	0.4	~46	240	1,150	250	0.4	~59	200	1,080
			300	0.3	~43	250	1,200	300	0.3	~46	240	1,150	300	0.3	~59	200	1,080
			350	0.3	~43	250	1,000	350	0.3	~46	240	960	350	0.3	~59	200	900
Inconel 35~43HRC	SDEW 090312 ZER	JC7518 (JC7550)	~150	0.5	~43	150	720	~150	0.5	~46	140	670	~150	0.5	~59	120	650
			200	0.4	~43	150	720	200	0.4	~46	140	670	200	0.4	~59	120	650
			250	0.25	~43	130	620	250	0.25	~46	120	580	250	0.25	~59	100	540
			300	0.2	~43	130	620	300	0.2	~46	120	580	300	0.2	~59	100	540
			350	0.2	~43	130	520	350	0.2	~46	120	480	350	0.2	~59	100	450

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

Note

1. The figure to be adjusted according to the machine rigidity or work rigidity.
2. In case of chatter occurring, recommend to reduce the depth of cut ap or Spindle speed and keep same feed per tooth.
3. If machine does not have enough power, recommend to reduce the depth of cut ap or Spindle speed and Feed speed.
4. Use air blow.
5. Wet machining is recommended while machining stainless steel, titanium alloys, and heat-resistant alloys.

High feed
For profile machining

SKS-GII 10 & 14 type G-Body SKG / MSG TYPE

"SKS-GII" SKG TYPE, innovative high feed cutter achieved extremely excellent chip removal rate!

Features of product

Features 1

Possible to Machine deep Moulds with high feed and higher cutting parameters.

Features 2

Due to Low Cutting Force geometry of the inserts, it is possible to achieve stable machining even at High Feed rates with all 4 cutting edges

High feed
For profile machining

SKS-GII 10 & 14 type G-Body SKG / MSG TYPE

Features 3

High depth of cuts are possible, Max ap = 1.5 mm in case of Size 10 insert, and 2.5 mm in case of size 14 Inserts.

Features 4

3-PVD coated Inserts grade "JC8118", "JC8050" & "JC7550" are suitable for machining of the wide applications like High Hardened Mold/Die Steel, Titanium alloys, Stainless steel etc.

Features 5

For difficult-to-cut materials like titanium alloys and Die / Mold Materials, Inserts with Chip-breaker geometry also has been added in to the product range, considering low rigid machine or fixtures, also uneven surfaces where interrupted cutting is required, these inserts with Low cutting Geometry helps to get maximum output from the CNC Machines as well as Milling Cutters.

SM breaker for difficult-to-cut material machining

PM breaker for mold material machining

JC8118
For mold steel more than 38HRC & high hardened die steel less than 50HRC.

JC8050
For general & mold steel less than 36HRC.

JC7550
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 6

Large chip pockets achieved excellent chip removal rate.

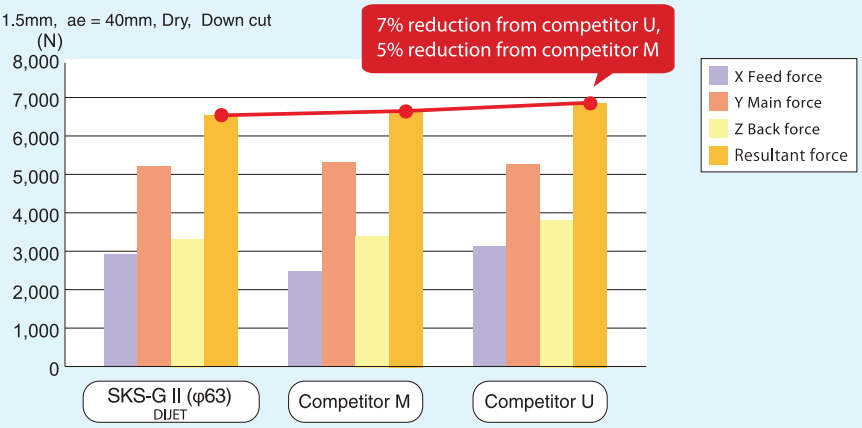
High feed
For profile machining

SKS-GII 10 & 14 type G-Body SKG / MSG TYPE

■ Cutting performance

● Cutting force comparison

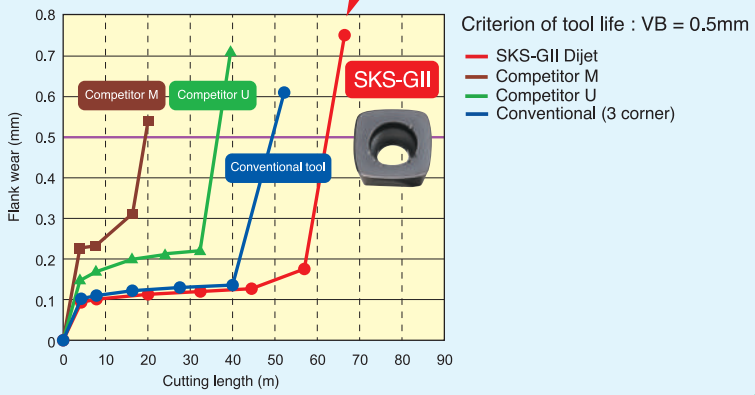
Material : NAK80 P21
Tool dia. : φ63mm Insert No. : SPNW100415ZTR (JC8118)
Cutting condition :
Vc = 80m/min, fz : 1.5mm/t, ap = 1.5mm, ae = 40mm, Dry, Down cut



● Tool life comparison ① Insert without breaker

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.

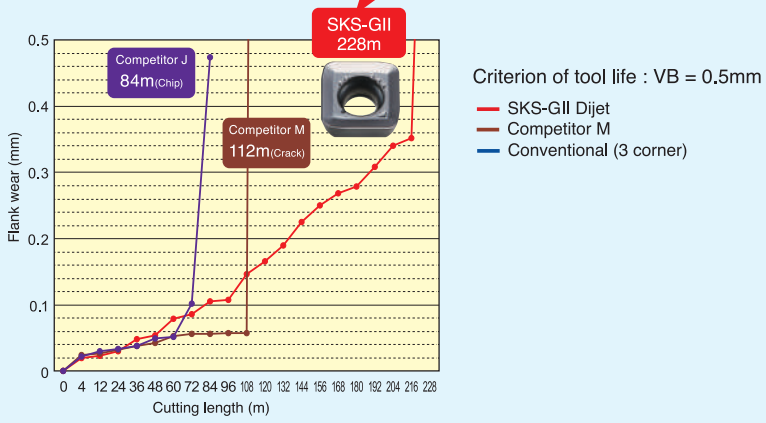
Material : P20 (32HRC), Tool dia. : φ63mm
Insert No. : SPNW100415ZTR (JC8118)
Cutting condition : Vc = 150m/min, fz : 1mm/t,
ap = 1.5mm, ae = 37.5mm, Air blow, Down cut,
Test by one insert



● Tool life comparison ② Insert with breaker

Achieved twice the life of competitor M and 2.7 times longer than competitor J.

Material : PX5 (P20), Tool dia. : φ63mm
Insert No. : SPMT140520ZPTR-PM (JC8118)
Cutting condition : Vc = 140m/min,
fz : 1.8mm/t, ap = 2.0mm, ae = 37.5mm,
Air blow, Down cut,
Test by one insert



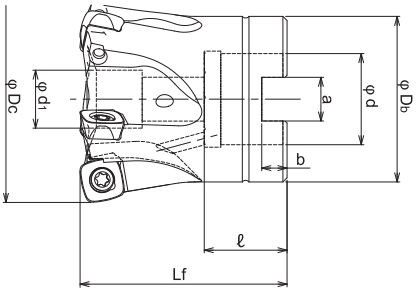
High feed
For profile machining

SKS-GII 10 type SKG TYPE

Line up

● Facemill type (Insert 10-type) Through Coolant Hole

G-Body



BODY

Type	Cat No.	Stock	No. of inserts	Dimensions (mm) φ Dc	Lf	φ Db	φ d	φ d1	a	b	ℓ	Set bolt		Weight
Metric Bore	SKG-4050R-10-22	●	4	50	50	40	22	14	10.4	6.3	20	M10×1.5×35★	Head cap screw (Slim head)	0.3
	SKG-5050R-10-22	●	5	50	50	40	22	14	10.4	6.3	20	M10×1.5×35★		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	M12×1.75×30★		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	M12×1.75×30★		0.5
	SKG-6066R-10-27	☆	6	66	50	50	27	20	12.4	7	22	M12×1.75×30★		0.6
	SKG-6080R-10-27	●	6	80	50	60	27	20	12.4	7	22	M12×1.75×30★		0.9

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. The ★ mark indicates the size, so a set bolt for arbor is attached. For other items, please use the bolts attached to the arbor body.
3. Arbor set bolt M10 x 1.5 x 35 is a small head type with a screw head diameter of ϕ13.
4. Please refer to pages E024 - E025 for recommended cutting conditions.
5. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

PARTS

Applicable insert	Clamp Screw	Wrench
SPNW10** SPET10** SPMT10**	TSW-3509H	A-15T

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

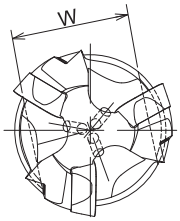
High feed
For profile machining

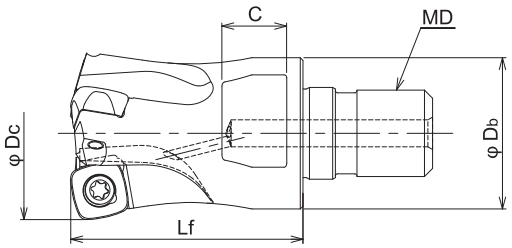
SKS-GII 10 type SKG / MSG TYPE

● Modular head type (Insert 10-type)

G-Body

Through Coolant Hole





■ BODY

Cat No.	Stock	No. of inserts	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Applicable inserts	Parts: Clamp screw	Parts: Wrench
MSG-2025-10-M12	●	2	25	35	23	M12	11	19	SPNW10＊＊ SPET10＊＊ SPMT10＊＊	TSW-3509H	A-15 (Not included)
MSG-3032-10-M16	●	3	32	43	28	M16	12	22			
MSG-3035-10-M16	●	3	35	43	30	M16	14	26			
MSG-4040-10-M16	●	4	40	43	32	M16	14	26			
MSG-4042-10-M16	☆	4	42	43	32	M16	14	26			

Note) 1. The insert is not installed in the main body.
2. Refer to D16 for the recommended tightening torque of the modular head.
3. MSG-4040 / 4042-10-M16 is recommended to be combined with the tough carbide straight arbor type.
4. Please refer to page E023 for recommended cutting conditions.
5. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

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

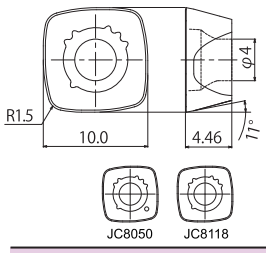
■ Compatible inserts (for SKG-10 and MSG-10 types)

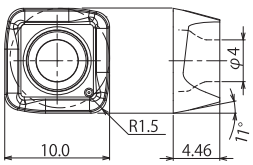
Fig.1 SPNW100415ZTR

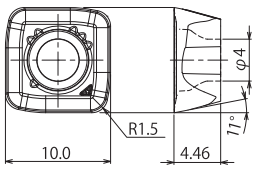
Fig.2 SPET100415ZPER-SM

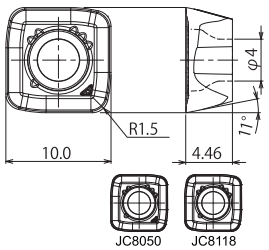
Fig.3 SPMT100415ZPER-SM

Fig.4 SPMT100415ZPTR-PM









Cat No.	Tolerance	PVD Coated JC7550	JC8050	JC8118	Fig.
SPNW100415ZTR	N		●	●	1
SPET100415ZPER-SM	E	●			2
SPMT100415ZPER-SM	M	●			3
SPMT100415ZPTR-PM	M		●	●	4

10 inserts per case.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

High feed
For profile machining

SKS-GII 14 type

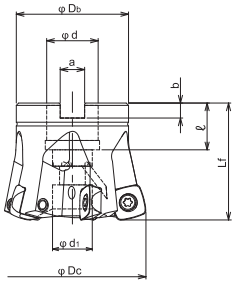
SKG TYPE

Line up

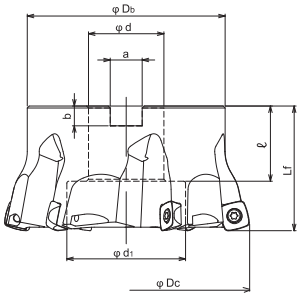
Face mill type (Insert 14-type)

G-Body

Through coolant hole



Without coolant hole



BODY

Type	Cat No.	Stock	No. of inserts	Dimensions (mm) φ Dc	Lf	φ Db	φ d	φ d1	a	b	ℓ	Set bolt		Weight	Fig.
Metric Bore	SKG-4050R-14-22	●	4	50	50	40	22	9.6	10.4	6.3	19.05	M10×1.5×35★	Head cap screw (Slim head)	0.3	1
	SKG-4052R-14-22	☆	4	52	50	42	22	17	10.4	6.3	19.05	M10×1.5×35★		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	M12×1.75×35★		0.5	1
	SKG-5066R-14-27	☆	5	66	50	50	27	20	12.4	7	22	M12×1.75×35★		0.5	1
	SKG-5080R-14-27	●	5	80	50	60	27	37	12.4	7	22	M12×1.75×35★		0.8	1
	SKG-6100R-14-32	●	6	100	63	70	32	45	14.4	8	25	M16		1.6	1

Note) 1. The insert is not installed in the main body.
2. The ★ mark indicates the size, so a set bolt for arbor is attached. For other items, please use the bolts attached to the arbor body.
3. Arbor set bolt M10 x 1.5 x 35 is a small head type with a screw head diameter of ϕ13.
4. Please refer to pages E026 - E028 for recommended cutting conditions.
5. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
6. Diameter of ϕ125 & ϕ160 are not shown in above chart. Are made to order.

PARTS

Applicable insert	Clamp Screw	Wrench
SPNW14∗∗ SPMT14∗∗	CSW-513H	A-20

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

Compatible inserts (for SKG-14 type)

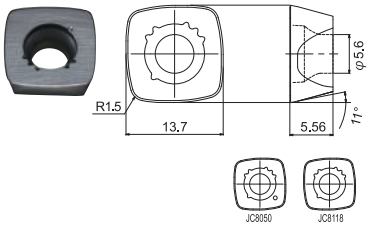


Fig.1 SPNW140515ZTR

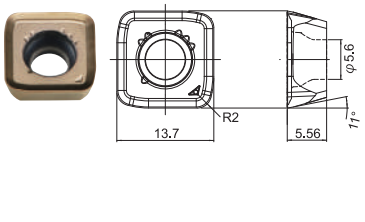


Fig.2 SPMT140520ZPER-SM

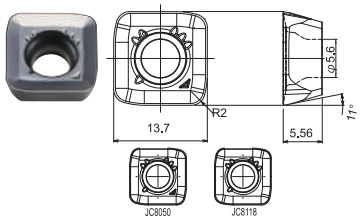


Fig.3 SPMT140520ZPTR-PM

Cat. No.	Tolerance	PVD Coated JC7550	JC8050	JC8118	Fig.
SPNW140515ZTR	N		●	●	1
SPMT140520ZPER-SM	M	●			2
SPMT140520ZPTR-PM	M		●	●	3

10 inserts per case.

● : Standard stock items ☐ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

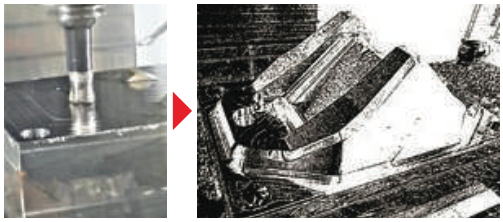
High feed
For profile machining

SKS-GII 10 & 14 type SKG TYPE

Case Studies

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

Overhung length : 130mm
Contouring & slotting



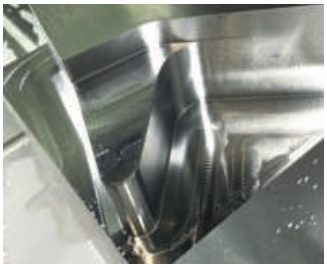
Result

Achieved high metal removal rate (Q=126cm³/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	n	2,000 (min^{-1})
		V_c	201 (m/mi n)
	Feed speed	V_f	6,300 (mm/mi n)
		f_z	1.1 (mm/t)
	a_p		0.8 (mm)
	a_e		25 (mm)
	Coolant		Air blow
	Machine		Vertical MC

② High efficient machining on Ti-alloy (Insert 10-type)

Overhung length : 110mm



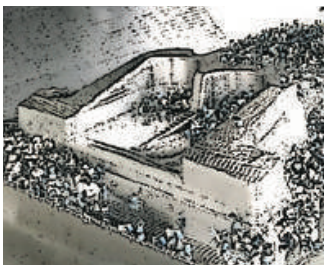
Result

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

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	n	597 (min^{-1})
		V_c	60 (m/min)
	Feed speed	V_f	1,075 (mm/min)
		f_z	0.6 (mm/t)
	a_p		1 (mm)
	a_e		12.8 (mm)
	Coolant		Wet (internal)
	Machine		Vertical MC

③ High feed machining on mold steel (Insert 14-type)

Overhung length : 220mm



Result

Achieved high metal removal rate (Q=330cm³/min) by 1.2 times compared with competitor's tool. And able to machine about 3 hours per 1 corner.

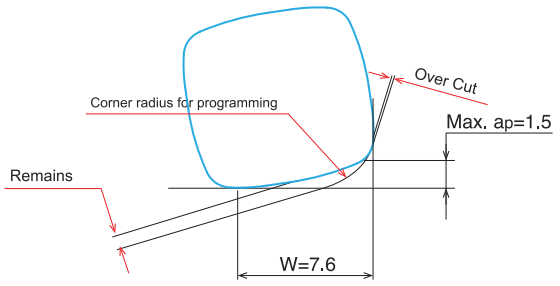
Work	Part name		Plastic mold
	Material		Mold steel (1.2738)
	Hardness		36HRC
Tool	Tool No.		SKG-6080R-14-27
	Insert No.		SPNW140515ZTR (JC8118)
Cutting conditions	Cutting speed	n	560 (min^{-1})
		V_c	140 (m/min)
	Feed speed	V_f	4,000 (mm/min)
		f_z	1.2 (mm/t)
	a_p		1.5 (mm)
	a_e		55 (mm)
	Coolant		Air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

High feed
For profile machining

SKS-GII 10 & 14 type SKG / MSG TYPE

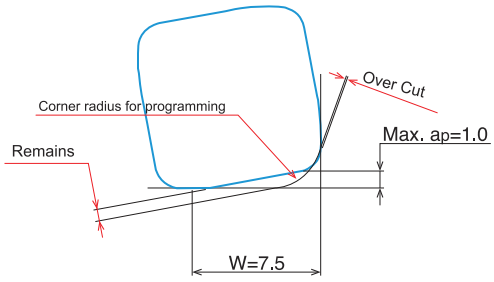
Definition of corner shape for programming

● SPNW100415ZTR type inserts



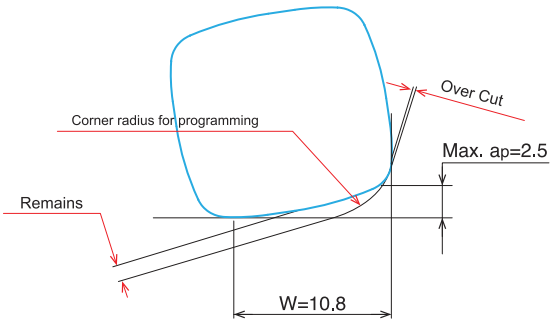
Corner R for programming	Over cut	Remains
R2.5	0	0.99
R3.0 (Standard)	0	0.84
R3.5	0.09	0.71
R4.0	0.23	0.59

● SPE (M) T100415ZPER-SM type,
SPMT100415ZPTR-PM type insert



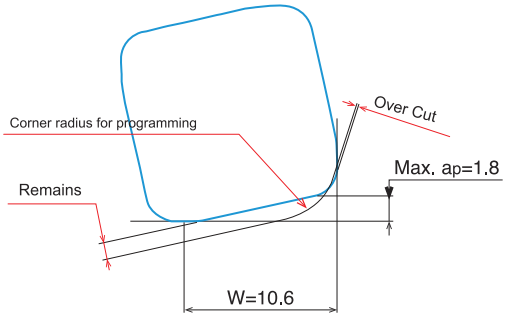
Corner R for programming	Over cut	Remains
R2.5 (Standard)	0	0.77
R3.0	0.09	0.68
R3.5	0.25	0.60
R4.0	0.43	0.52

● SPNW140515ZTR type inserts



Corner R 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

● SPMT140520ZPER-SM type,
SPMT140520ZPTR-PM type insert



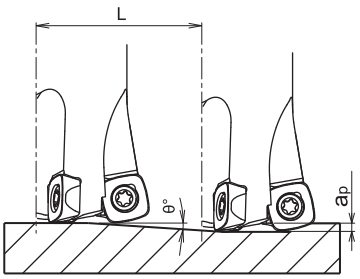
Corner R for programming	Over cut	Remains
R3.5 (Standard)	0	1.35
R4.0	0.02	1.25
R4.5	0.14	1.12
R5.0	0.29	1.05

High feed
For profile machining

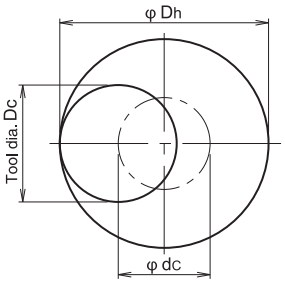
SKS-GII 10 & 14 type SKG / MSG TYPE

Attention for profile milling

Ramping



Helical interpolation



Calculation of tool pass dia.

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

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.

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

● For SPNW100415ZTR / SPNW140515ZTR type inserts

Cat. No.	Tool dia. (mm)	Eff. Cutting dia. (mm)	Max. depth of cut (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length at Max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
MSG-2025-10	25	9.8	1.5	1°	85.9	36	48
MSG-3032-10	32	16.8	1.5	1°	85.9	50	62
MSG-3035-10	35	19.8	1.5	1°	85.9	56	70
MSG-4040-10	40	24.8	1.5	1°	85.9	66	78
MSG-4042-10	42	26.8	1.5	1°	85.9	70	82
SKG-*050R-10	50	34.8	1.5	1°	85.9	86	98
SKG-5052R-10	52	36.8	1.5	1°	85.9	90	102
SKG-*063R-10	63	47.8	1.5	0°45'	114.6	112	124
SKG-6066R-10	66	50.8	1.5	0°45'	114.6	118	130
SKG-6080R-10	80	64.8	1.5	0°30'	171.9	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	103.4	2.5	0°20'	430	230	248
SKG-7160R-14	160	138.4	2.5	0°15'	573	300	318

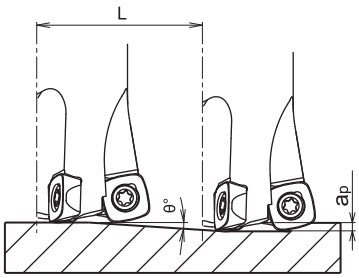
Note : Please follow and refer above ramping angles only.

High feed
For profile machining

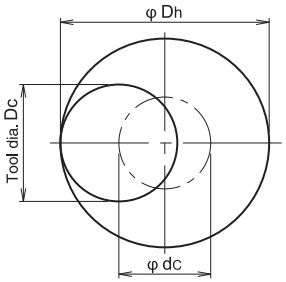
SKS-GII 10 & 14 type SKG / MSG TYPE

■ 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.

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

● For SPE (M) T100415ZPER-SM type, SPMT100415ZPTR-PM type inserts
● For SPMT140520ZPER-SM type and SPMT140520ZPTR-PM type inserts

Cat. No.	Tool dia. (mm)	Eff. Cutting dia. (mm)	Max. depth of cut (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length at Max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
MSG-2025-10	25	10	1.0	1°	57.3	36	48
MSG-3032-10	32	17	1.0	1°	57.3	50	62
MSG-3035-10	35	20	1.0	1°	57.3	56	70
MSG-4040-10	40	25	1.0	1°	57.3	66	78
MSG-4042-10	42	27	1.0	1°	57.3	70	82
SKG-*050R-10	50	35	1.0	1°	57.3	86	98
SKG-5052R-10	52	37	1.0	1°	57.3	90	102
SKG-*063R-10	63	48	1.0	0°45'	76.4	112	124
SKG-6066R-10	66	51	1.0	0°45'	76.4	118	130
SKG-6080R-10	80	65	1.0	0°30'	114.6	146	158
SKG-4050R-14	50	28.8	1.8	1°	103.1	80	98
SKG-4052R-14	52	30.8	1.8	1°	103.1	84	102
SKG-*063R-14	63	41.8	1.8	0°45'	137.5	106	124
SKG-5066R-14	66	44.8	1.8	0°45'	137.5	112	130
SKG-5080R-14	80	58.8	1.8	0°30'	206.3	140	158
SKG-6100R-14	100	78.8	1.8	0°20'	206.3	180	198
SKG-6125R-14	125	123.8	1.8	0°20'	206.3	230	248
SKG-7160R-14	160	138.8	1.8	0°15'	412.5	300	318

Note : Please follow and refer above ramping angles only.

High feed
For profile machining

SKS-GII Modular Head MSG TYPE

RECOMMENDED CUTTING CONDITIONS

Modular Head MSG / MSN Type + Anti-Vibration Carbide Shank

Work Materials	Insert Grades	Tool dia. (mm)														
		25					32/35					40/42				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118) SPNW type SPMT-PM type	~75	1	~9	2,290	6,870	~100	1	~14	1,640	7,380	~100	1	~24	1,430	8,580
		125	0.8	~9	2,290	6,870	150	0.8	~14	1,640	7,380	150	0.8	~24	1,430	8,580
		175	0.6	~9	2,290	6,410	210	0.6	~14	1,640	6,890	210	0.6	~24	1,430	8,010
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118) SPNW type SPMT-PM type	~75	1	~9	1,910	5,730	~100	1	~14	1,360	6,120	~100	1	~24	1,190	7,140
		125	0.8	~9	1,910	5,730	150	0.8	~14	1,360	6,120	150	0.8	~24	1,190	7,140
		175	0.6	~9	1,910	5,350	210	0.6	~14	1,360	5,710	210	0.6	~24	1,190	6,660
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~75	1	~9	1,910	5,730	~100	1	~14	1,360	6,120	~100	1	~24	1,190	7,140
		125	0.8	~9	1,910	5,730	150	0.8	~14	1,360	6,120	150	0.8	~24	1,190	7,140
		175	0.6	~9	1,910	5,350	210	0.6	~14	1,360	5,710	210	0.6	~24	1,190	6,660
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~75	1	~9	1,400	3,640	~100	1	~14	1,000	3,900	~100	1	~24	880	4,580
		125	0.8	~9	1,400	3,640	150	0.8	~14	1,000	3,900	150	0.8	~24	880	4,580
		175	0.6	~9	1,400	3,360	210	0.6	~14	1,000	3,600	210	0.6	~24	880	4,220
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 SPNW type	~75	0.6	~9	1,270	3,050	~100	0.6	~14	910	3,280	~100	0.6	~24	800	3,840
		125	0.4	~9	1,270	3,050	150	0.4	~14	910	3,280	150	0.4	~24	800	3,840
		175	0.3	~9	1,270	2,540	210	0.3	~14	910	2,730	210	0.3	~24	800	3,200
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 SPNW type SPMT-PM type	~75	1.2★	~9	2,290	6,870	~100	1.2★	~14	1,640	7,380	~100	1.2★	~24	1,430	8,580
		125	1	~9	2,290	6,870	150	1	~14	1,640	7,380	150	1	~24	1,430	8,580
		175	0.8	~9	2,290	6,870	210	0.8	~14	1,640	7,380	210	0.8	~24	1,430	8,580
Stainless steel SUS304 Below 250HB	JC7550 SPMT-SM type SPET-SM type	~75	1	~9	1,910	3,820	~100	1	~14	1,360	4,080	~100	1	~24	1,190	4,760
		125	0.8	~9	1,910	3,820	150	0.8	~14	1,360	4,080	150	0.8	~24	1,190	4,760
		175	0.6	~9	1,660	2,990	210	0.6	~14	1,180	3,190	210	0.6	~24	1,030	3,710
Titanium alloy (Ti-6Al-4V)	JC7550 SPMT-SM type SPET-SM type	~75	1	~9	760	910	~100	1	~14	550	990	~100	1	~24	480	1,150
		125	0.8	~9	760	910	150	0.8	~14	550	990	150	0.8	~24	480	1,150
		175	0.6	~9	760	760	210	0.6	~14	550	830	210	0.6	~24	480	960

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

NOTE

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

★ : When using an insert with a breaker (SPMT / SPET type), use with ap ≤ 1.0.

High feed
For profile machining

SKS-GII

SKG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Facemill type milling cutter (SKG-10 type)

Work Materials	Insert Grades	Tool dia. (mm)														
		50					50/52					63				
		No. of teeth 4N					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)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.5★	~32	1,020	7,340	~150	1.5★	~32	1,020	9,180	~150	1.5★	~44	810	7,290
		200	1.2★	~32	1,020	7,340	200	1.2★	~32	1,020	9,180	200	1.5★	~44	810	7,290
		250	0.8	~32	890	5,340	250	0.8	~32	890	6,680	250	1.2★	~44	710	5,330
		300	0.6	~32	830	4,980	300	0.6	~32	830	6,230	300	1	~44	660	4,950
		350	0.5	~32	830	4,650	350	0.5	~32	830	5,810	350	0.5	~44	660	4,620
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.5★	~32	1,020	7,340	~150	1.5★	~32	1,020	9,180	~150	1.5★	~44	810	7,290
		200	1.2★	~32	1,020	7,340	200	1.2★	~32	1,020	9,180	200	1.5★	~44	810	7,290
		250	0.8	~32	890	5,340	250	0.8	~32	890	6,680	250	1.2★	~44	710	5,330
		300	0.6	~32	830	4,980	300	0.6	~32	830	6,230	300	1	~44	660	4,950
		350	0.5	~32	830	4,650	350	0.5	~32	830	5,810	350	0.5	~44	660	4,620
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.5★	~32	1,020	7,340	~150	1.5★	~32	1,020	9,180	~150	1.5★	~44	810	7,290
		200	1.2★	~32	1,020	7,340	200	1.2★	~32	1,020	9,180	200	1.5★	~44	810	7,290
		250	0.8	~32	890	5,340	250	0.8	~32	890	6,680	250	1.2★	~44	710	5,330
		300	0.6	~32	830	4,980	300	0.6	~32	830	6,230	300	1	~44	660	4,950
		350	0.5	~32	830	4,650	350	0.5	~32	830	5,810	350	0.5	~44	660	4,620
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.2★	~32	700	4,200	~150	1.2★	~32	700	5,250	~150	1.2★	~44	560	4,200
		200	1	~32	700	4,200	200	1	~32	700	5,250	200	1.2★	~44	560	4,200
		250	0.7	~32	640	3,840	250	0.7	~32	640	4,800	250	1	~44	510	3,830
		300	0.6	~32	510	2,860	300	0.6	~32	510	3,570	300	0.5	~44	400	2,800
		350	-	-	-	-	350	-	-	-	-	350	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 SPNW type	~150	1	~32	640	3,580	~150	1	~32	640	4,480	~150	1	~44	510	3,570
		200	0.8	~32	640	3,330	200	0.8	~32	640	4,160	200	0.8	~44	510	3,320
		250	0.6	~32	640	3,070	250	0.6	~32	640	3,840	250	0.6	~44	510	3,060
		300	-	-	-	-	300	-	-	-	-	300	-	-	-	-
		350	-	-	-	-	350	-	-	-	-	350	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 SPNW type SPMT-PM type	~150	1.5★	~32	1,150	8,280	~150	1.5★	~32	1,150	10,350	~150	1.5★	~44	910	8,190
		200	1.5★	~32	1,150	8,280	200	1.5★	~32	1,150	10,350	200	1.5★	~44	910	8,190
		250	1.2★	~32	1,150	6,900	250	1.2★	~32	1,150	8,630	250	1.2★	~44	910	6,830
		300	0.8	~32	1,020	6,120	300	0.8	~32	1,020	7,650	300	0.8	~44	810	6,080
		350	0.5	~32	1,020	6,120	350	0.5	~32	1,020	7,650	350	0.5	~44	810	6,080
Stainless steel SUS304 Below 250HB	JC7550 SPMT-SM type SPET-SM type	~150	1	~32	950	4,940	~150	1	~32	950	6,180	~150	1	~44	760	5,320
		200	1	~32	950	4,940	200	1	~32	950	6,180	200	1	~44	760	4,940
		250	0.8	~32	830	3,980	250	0.8	~32	830	4,980	250	0.8	~44	660	3,960
		300	0.6	~32	760	3,040	300	0.6	~32	760	3,800	300	0.6	~44	610	3,050
		350	0.4	~32	640	2,560	350	0.4	~32	640	3,200	350	0.5	~44	510	2,550
Titanium alloy (Ti-6Al-4V)	JC7550 SPMT-SM type SPET-SM type	~150	1	~32	380	910	~150	1	~32	380	1,140	~150	1	~44	300	900
		200	0.8	~32	380	910	200	0.8	~32	380	1,140	200	0.8	~44	300	900
		250	0.6	~32	380	760	250	0.6	~32	380	950	250	0.6	~44	300	750
		300	0.4	~32	380	610	300	0.4	~32	380	760	300	0.4	~44	300	600
		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 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.

★ : When using an insert with a breaker (SPMT / SPET type), use with ap ≤ 1.0.

High feed
For profile machining

SKS-GII

SKG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Facemill type milling cutter (SKG-10 type)

Work Materials	Insert Grades	Tool dia. (mm)									
		63/66					80				
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.5★	~44	810	8,750	~150	1.5★	~60	640	6,910
		200	1.5★	~44	810	8,750	200	1.5★	~60	640	6,910
		250	1.2★	~42	710	6,390	250	1.2★	~55	560	5,040
		300	1	~42	660	5,940	300	1	~55	520	4,680
		350	0.5	~42	660	5,540	350	0.5	~55	520	4,370
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.5★	~44	810	8,750	~150	1.5★	~60	640	6,910
		200	1.5★	~44	810	8,750	200	1.5★	~60	640	6,910
		250	1.2★	~42	710	6,390	250	1.2★	~55	560	5,040
		300	1	~42	660	5,940	300	1	~55	520	4,680
		350	0.5	~42	660	5,540	350	0.5	~55	520	4,370
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.5★	~44	810	8,750	~150	1.5★	~60	640	6,910
		200	1.5★	~44	810	8,750	200	1.5★	~60	640	6,910
		250	1.2★	~42	710	6,390	250	1.2★	~55	560	5,040
		300	1	~42	660	5,940	300	1	~55	520	4,680
		350	0.5	~42	660	5,540	350	0.5	~55	520	4,370
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.2★	~44	560	5,040	~150	1.2★	~60	440	3,960
		200	1.2★	~44	560	5,040	200	1.2★	~60	440	3,960
		250	1	~42	510	4,590	250	1	~55	400	3,600
		300	0.5	~42	400	3,360	300	0.5	~55	320	2,690
		350	-	-	-	-	350	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 SPNW type	~150	1	~44	510	4,280	~150	1	~60	400	3,360
		200	0.8	~44	510	3,980	200	0.8	~60	400	3,120
		250	0.6	~42	510	3,670	250	0.6	~55	400	2,880
		300	-	-	-	-	300	-	-	-	-
		350	-	-	-	-	350	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 SPNW type SPMT-PM type	~150	1.5★	~44	910	9,830	~150	1.5★	~60	720	7,780
		200	1.5★	~44	910	9,830	200	1.5★	~60	720	7,780
		250	1.2★	~42	910	8,190	250	1.2★	~55	720	6,480
		300	0.8	~42	810	7,290	300	0.8	~55	640	5,760
		350	0.5	~42	810	7,290	350	0.5	~55	640	5,760
Stainless steel SUS304 Below 250HB	JC7550 SPMT-SM type SPET-SM type	~150	1	~44	760	6,380	~150	1	~60	600	5,040
		200	1	~44	760	5,930	200	1	~60	600	4,680
		250	0.8	~42	660	4,750	250	0.8	~55	520	3,740
		300	0.6	~42	610	3,660	300	0.6	~55	480	2,880
		350	0.5	~42	510	3,060	350	0.5	~55	400	2,400
Titanium alloy (Ti-6Al-4V)	JC7550 SPMT-SM type SPET-SM type	~150	1	~44	300	1,080	~150	1	~60	240	860
		200	0.8	~44	300	1,080	200	0.8	~60	240	860
		250	0.6	~42	300	900	250	0.6	~55	240	720
		300	0.4	~42	300	720	300	0.4	~55	240	580
		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.

★ : When using an insert with a breaker (SPMT / SPET type), use with ap ≤ 1.0.

High feed
For profile machining

SKS-GII

SKG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Facemill type milling cutter (SKG-14 type)

Work Materials	Insert Grades	Tool dia. (mm)														
		50/52					63					66				
		No. of teeth 4N					No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	2★	~28	890	6,410	~150	2★	~40	710	5,110	~150	2★	~44	680	6,120
		200	1.8	~28	890	6,410	200	1.8	~40	710	5,110	200	1.8	~44	680	6,120
		250	1.5	~28	830	4,980	250	1.5	~40	660	3,960	250	1.5	~44	630	4,730
		300	0.8	~28	760	4,560	300	0.8	~40	610	3,660	300	0.8	~44	580	4,350
		350	0.6	~28	640	3,580	350	0.6	~40	510	2,860	350	0.6	~44	480	3,360
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	2★	~28	890	6,410	~150	2★	~40	710	5,110	~150	2★	~44	680	6,120
		200	1.8	~28	890	6,410	200	1.8	~40	710	5,110	200	1.8	~44	680	6,120
		250	1.5	~28	830	4,980	250	1.5	~40	660	3,960	250	1.5	~44	630	4,730
		300	0.8	~28	760	4,560	300	0.8	~40	610	3,660	300	0.8	~44	580	4,350
		350	0.6	~28	640	3,580	350	0.6	~40	510	2,860	350	0.6	~44	480	3,360
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	2★	~28	890	6,410	~150	2★	~40	710	5,110	~150	2★	~44	680	6,120
		200	1.8	~28	890	6,410	200	1.8	~40	710	5,110	200	1.8	~44	680	6,120
		250	1.5	~28	830	4,980	250	1.5	~40	660	3,960	250	1.5	~44	630	4,730
		300	0.8	~28	760	4,560	300	0.8	~40	610	3,660	300	0.8	~44	580	4,350
		350	0.6	~28	640	3,580	350	0.6	~40	510	2,860	350	0.6	~44	480	3,360
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.6	~28	640	3,840	~150	1.6	~40	510	3,060	~150	1.6	~44	480	3,600
		200	1.4	~28	640	3,840	200	1.4	~40	510	3,060	200	1.4	~44	480	3,600
		250	1.2	~28	640	3,840	250	1.2	~40	510	3,060	250	1.2	~40	480	3,600
		300	0.7	~28	510	2,860	300	0.7	~40	400	2,240	300	0.7	~40	390	2,730
		350	-	-	-	-	350	-	-	-	-	350	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 SPNW type	~150	1	~28	570	2,740	~150	1	~40	450	2,160	~150	1	~44	430	2,580
		200	1	~28	570	2,280	200	1	~40	450	1,800	200	1	~44	430	2,150
		250	0.8	~28	570	1,820	250	0.8	~40	450	1,440	250	0.8	~40	430	1,720
		300	0.5	~28	450	1,260	300	0.5	~40	350	980	300	0.5	~40	340	1,190
		350	-	-	-	-	350	-	-	-	-	350	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 SPNW type SPMT-PM type	~150	2★	~28	1,150	8,280	~150	2★	~40	910	6,550	~150	2★	~44	870	7,830
		200	1.8	~28	1,150	8,280	200	1.8	~40	910	6,550	200	1.8	~44	870	7,830
		250	1.5	~28	1,150	6,900	250	1.5	~40	910	5,460	250	1.5	~44	870	6,530
		300	0.8	~28	1,020	6,120	300	0.8	~40	810	4,860	300	0.8	~44	770	5,780
		350	0.6	~28	1,020	5,710	350	0.6	~40	810	4,540	350	0.6	~44	770	5,390
Stainless steel SUS304 Below 250HB	JC7550 SPMT-SM type SPET-SM type	~150	1.3	~28	950	4,940	~150	1.3	~40	760	4,260	~150	1.3	~44	760	5,320
		200	1.3	~28	950	4,940	200	1.3	~40	760	3,950	200	1.3	~44	760	4,940
		250	1.1	~28	830	3,980	250	1.1	~40	660	3,170	250	1.1	~40	660	3,960
		300	0.9	~28	760	3,040	300	0.9	~40	610	2,440	300	0.9	~40	610	3,050
		350	0.7	~28	640	2,560	350	0.7	~40	510	2,040	350	0.7	~40	510	2,550
Titanium alloy (Ti-6Al-4V)	JC7550 SPMT-SM type SPET-SM type	~150	1.3	~28	380	910	~150	1.3	~40	300	720	~150	1.3	~44	300	900
		200	1.1	~28	380	910	200	1.1	~40	300	720	200	1.1	~44	300	900
		250	0.9	~28	380	760	250	0.9	~40	300	600	250	0.9	~40	300	750
		300	0.7	~28	380	610	300	0.7	~40	300	480	300	0.7	~40	300	600
		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 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.

★ : When using an insert with a breaker (SPMT / SPET type), use with ap ≤ 1.8.

High feed
For profile machining

SKS-GII Modular Head MSG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Facemill type milling cutter (SKG-14 type)

Work Materials	Insert Grades	Tool dia. (mm)														
		80					100					125				
		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 S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	2★	~56	600	5,400	~150	2★	~70	480	5,180	~150	2★	~87	380	4,100
		200	1.8	~56	600	5,400	200	1.8	~70	480	5,180	200	1.8	~87	380	4,100
		250	1.5	~56	560	4,200	250	1.5	~70	450	4,050	250	1.5	~87	360	3,240
		300	0.8	~56	520	3,900	300	0.8	~70	410	3,690	300	0.8	~87	330	2,970
		350	0.6	~56	440	3,080	350	0.6	~70	350	2,940	350	0.6	~87	280	2,350
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118) SPNW type SPMT-PM type	~150	2★	~56	600	5,400	~150	2★	~70	480	5,180	~150	2★	~87	380	4,100
		200	1.8	~56	600	5,400	200	1.8	~70	480	5,180	200	1.8	~87	380	4,100
		250	1.5	~56	560	4,200	250	1.5	~70	450	4,050	250	1.5	~87	360	3,240
		300	0.8	~56	520	3,900	300	0.8	~70	410	3,690	300	0.8	~87	330	2,970
		350	0.6	~56	440	3,080	350	0.6	~70	350	2,940	350	0.6	~87	280	2,350
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	2★	~56	600	5,400	~150	2★	~70	480	5,180	~150	2★	~87	380	4,100
		200	1.8	~56	600	5,400	200	1.8	~70	480	5,180	200	1.8	~87	380	4,100
		250	1.5	~56	560	4,200	250	1.5	~70	450	4,050	250	1.5	~87	360	3,240
		300	0.8	~56	520	3,900	300	0.8	~70	410	3,690	300	0.8	~87	330	2,970
		350	0.6	~56	440	3,080	350	0.6	~70	350	2,940	350	0.6	~87	280	2,350
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~150	1.6	~56	400	3,000	~150	1.6	~70	320	2,880	~150	1.6	~87	250	2,250
		200	1.4	~56	400	3,000	200	1.4	~70	320	2,880	200	1.4	~87	250	2,250
		250	1.2	~56	400	3,000	250	1.2	~70	320	2,880	250	1.2	~87	250	2,250
		300	0.7	~56	320	2,240	300	0.7	~70	250	2,100	300	0.7	~87	200	1,680
		350	-	-	-	-	350	-	-	-	-	350	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 SPNW type	~150	1	~56	360	2,160	~150	1	~70	290	2,090	~150	1	~87	230	1,660
		200	1	~56	360	1,800	200	1	~70	290	1,740	200	1	~87	230	1,380
		250	0.8	~52	360	1,440	250	0.8	~60	290	1,390	250	0.8	~75	230	1,100
		300	0.5	~52	280	980	300	0.5	~60	220	920	300	0.5	~75	180	760
		350	-	-	-	-	350	-	-	-	-	350	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 SPNW type SPMT-PM type	~150	2★	~56	720	6,480	~150	2★	~70	570	6,160	~150	2★	~87	460	4,970
		200	1.8	~56	720	6,480	200	1.8	~70	570	6,160	200	1.8	~87	460	4,970
		250	1.5	~56	720	5,400	250	1.5	~70	570	5,130	250	1.5	~87	460	4,140
		300	0.8	~56	640	4,800	300	0.8	~70	510	4,590	300	0.8	~87	410	3,690
		350	0.6	~56	640	4,480	350	0.6	~70	510	4,280	350	0.6	~87	410	3,440
Stainless steel SUS304 Below 250HB	JC7550 SPMT-SM type SPET-SM type	~150	1.5	~56	600	4,200	~150	1.5	~70	480	4,030	~150	1.5	~87	380	3,190
		200	1.5	~56	600	3,900	200	1.5	~70	480	3,740	200	1.5	~87	380	2,960
		250	1.3	~52	520	3,120	250	1.3	~60	410	2,950	250	1.3	~75	330	2,380
		300	1.1	~52	480	2,400	300	1.1	~60	380	2,280	300	1.1	~75	310	1,860
		350	0.9	~52	400	2,000	350	0.9	~60	320	1,920	350	0.9	~75	250	1,500
Titanium alloy (Ti-6Al-4V)	JC7550 SPMT-SM type SPET-SM type	~150	1.3	~56	240	720	~150	1.3	~70	190	680	~150	1.3	~87	150	540
		200	1.1	~56	240	720	200	1.1	~70	190	680	200	1.1	~87	150	540
		250	0.9	~52	240	600	250	0.9	~60	190	570	250	0.9	~75	150	450
		300	0.7	~52	240	480	300	0.7	~60	190	460	300	0.7	~75	150	360
		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 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.

★ : When using an insert with a breaker (SPMT / SPET type), use with ap ≤ 1.8.

High feed
For shape machining

SKS-GII

SKG TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Facemill type milling cutter (SKG-14 type)

Work Materials	Insert Grades	Tool dia. (mm) 160 No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118) SPNW type SPMT-PM type	~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 SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118) SPNW type SPMT-PM type	~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 HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~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 NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8050 (JC8118) SPNW type SPMT-PM type	~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 SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118 SPNW type	~150	1	~112	180	1,510
		200	1	~112	180	1,260
		250	0.8	~100	180	1,010
		300	0.5	~100	140	690
		350	-	-	-	-
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118 SPNW type SPMT-PM type	~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
Stainless steel SUS304 Below 250HB	JC7550 SPMT-SM type SPET-SM type	~150	1.5	~112	300	2,940
		200	1.5	~112	300	2,730
		250	1.3	~100	260	2,180
		300	1.1	~100	240	1,680
		350	0.9	~100	200	1,400
Titanium alloy (Ti-6Al-4V)	JC7550 SPMT-SM type SPET-SM type	~150	1.3	~112	120	500
		200	1.1	~112	120	500
		250	0.9	~100	120	420
		300	0.7	~100	120	340
		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.

★ : When using an insert with a breaker (SPMT / SPET type), use with ap ≤ 1.8.

High feed
For proflie machining

SKS Extreme Extreme series EXSKS-09 TYPE

SKS EXTREME

For High Feed Machining

Next Generation High Feed Milling Cutters

- High Feed Machining with High Depth of Cut (ap=3mm) and Feed per Tooth 2 mm possible to Achieve very high Metal Removal rates.
- 6 Cutting Edges -double Sided Inserts

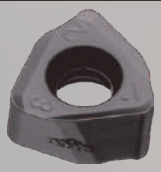
- Insert Thickness 7.5 mm, improved strength by 150% compared with all other High Feed conventional Inserts.

- Smooth and stable high feed machining even at high over hang lengths above L/D=6
- Excellent ramping angle while machining with helical interpolation for pockets or hole enlarging operations.
- Due to Dovetel pocket geometry and Inserts resting on the face, single Screw clamping prevents inserts movement while machining, and easy to relocate new edge again.

High feed
For proflie machining

SKS Extreme Extreme series EXSKS-09 TYPE

● Inserts with 3 PVD coating grades JC8118, JC8050, JC7560 available for various applications as follows.

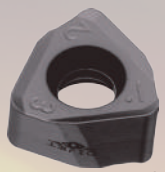


For mold steel more than 38HRC & high hardened steel less than 50HRC.

JC8118

For general, mold steel less than 36HRC & stainless steel.

JC7560



From general steel to pre-hardened steel, For stainless steel

JC8050

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		JC8118	JC8050	JC7560				JC8050	JC7560				JC8118			JC8118	

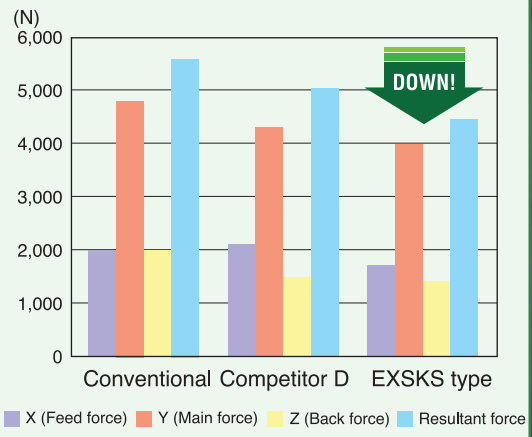
Adopted PVD Coated grade “JC7560” improved fracture toughness & heat impact resistance and new PVD Coated grade “JC8118” for mold steel & high hardened die steel less than 50HRC. Both grades achieved longer tool life.
2 insert grades “JC7560” & “JC8118” can be widely applied from general & mold steel to high hardened die steel & stainless steel. PVD Coated grade “JC8050” can be widely applied for carbon steel, mold steel and stainless steel.

■ CUTTING PERFORMANCE

Cutting Force Comparison

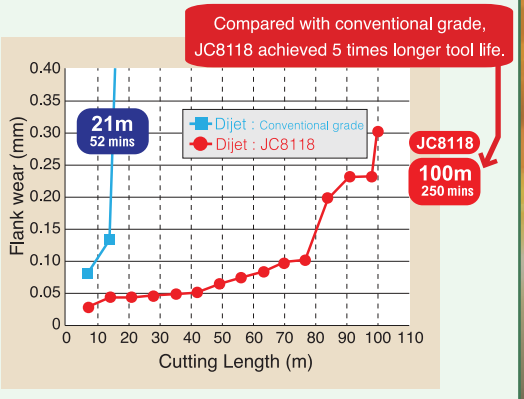
18% reduction from conventional tool
10% reduction from competitor D

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



Tool Life Comparison

Compared with conventional grade, JC8118 achieved 5 times longer tool life.



Material : SKD61 1.2344 (45HRC)
Tool dia. : ϕ63mm Insert No. : WNMU090720ZER-PM (JC8118)
Vc=80m/min, fz=1.0mm/t ap=1.0mm ae=45mm
Test by one insert Cross cutting Dry

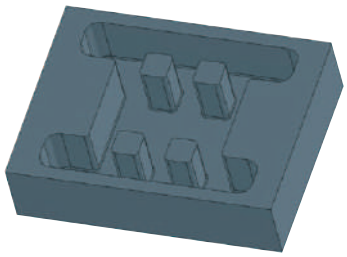
High feed
For proflie machining

SKS Extreme Extreme series EXSKS-09 TYPE

CASE STUDIES

1.High feed machining on mold steel

Surface roughing



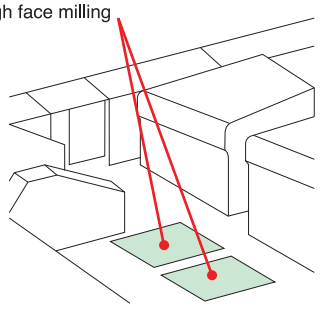
Work	Part name		Cavity mold
	Material		Mold steel (heat-treated)
	Hardness		30-34HRC
Tool	Tool No.		EXSKS-7100R
	Insert No.		WNMU090720ZER-PM (JC7560)
Cutting conditions	Cutting speed	n	325min^{-1}
		Vc	102m/min
	Feed speed	Vf	3,980mm/min
		fz	1.75mm/t
	ap(mm)		2.5mm
	ae(mm)		76mm
	Coolant		Dry
	Machine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

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 with 1 cutting edge.

2.High feed machining on die structure part

Rough face milling



Overhung length : 220mm

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}
		Vc	125m/min
	Feed speed	Vf	5,000mm/min
		fz	1.66mm/t
	ap(mm)		3mm
	ae(mm)		47mm
	Coolant		Dry
	Machine		Double column MC

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 per edge

High feed
For proflie machining

SKS Extreme Extreme series EXSKS-09 TYPE

G-Body

■ BODY / BORE TYPE MILLING CUTTER

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm)							
				φDc	Lf	φDb	φd	φd1	a	b	ℓ
Metric Bore	EXSKS-3050R-22	●	3	50	55	40	22	9.6	10.4	6.3	19
	EXSKS-4050R-22	●	4	50	55	40	22	9.6	10.4	6.3	19
	EXSKS-4052R-22	☆	4	52	50	40	22	17	10.4	6.3	20
	EXSKS-4063R-22	●	4	63	50	48	22	17	10.4	6.3	20
	EXSKS-5063R-22	●	5	63	50	48	22	17	10.4	6.3	20
	EXSKS-5063R-27	●	5	63	50	48	27	20	12.4	7	22
	EXSKS-5066R-27	☆	5	66	50	48	27	20	12.4	7	22
	EXSKS-6080R-27	●	6	80	55	65	27	37	12.4	7	22
	EXSKS-7100R-32	●	7	100	70	85	32	26	14.4	8	32
	EXSKS-8125R-40	●	8	125	70	100	40	32	16.4	9	35
	EXSKS-9160R-40	●	9	160	55	100	40	85	16.4	9	35

Note) 1. All cutters are supplied without inserts.
2. Please refer page E036 - E038 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. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

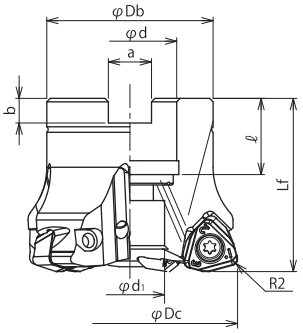
Small number of inserts type: Reduces cutting resistance by reducing the number of inserts by one, By ensuring the size of the chip pocket, chip evacuation is also improved.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

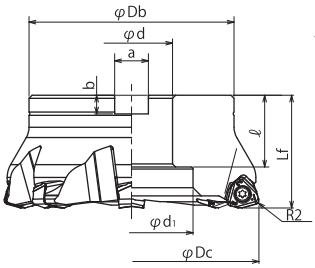
High feed
For profile machining

SKS Extreme Extreme series EXSKS-09 TYPE

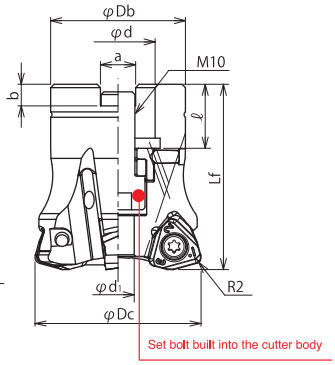
● Fig. 1 : Through coolant hole



● Fig. 2 : Without coolant hole



● Fig. 3 : Through coolant hole



■ BODY / BORE TYPE MILLING CUTTER

Type	Cat. No.	Set Bolt		Weight (kg)	Fig.	Insert	Parts: Clamp screw	Parts: Wrench
								(Not included)
Metric Bore	**EXSKS-3050R-22**	M10×1.5×25★	Head cap screw (JIS Standard)	0.4	3	WNMU090720 ZER-PM	CSW-513H	A-20
	EXSKS-4050R-22	M10×1.5×25★		0.3	3			
	EXSKS-4052R-22	M10		0.4	1			
	EXSKS-4063R-22	M10		0.5	1			
	EXSKS-5063R-22	M10		0.5	1			
	EXSKS-5063R-27	M12×1.75×30★		0.5	1			
	EXSKS-5066R-27	M12×1.75×30★		0.5	1			
	EXSKS-6080R-27	M12×1.75×40★		0.9	1			
	EXSKS-7100R-32	M16×2×45★		1.9	1			
	EXSKS-8125R-40	M20×2.5×45★		3.9	1			
	EXSKS-9160R-40	M20	Clamp bolt	3.9	2			

Note) 1. All cutters are supplied without inserts.
2. Please refer page E036 - E038 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. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

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

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

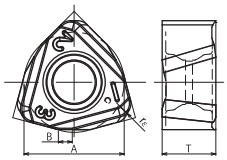
High feed
For profile machining

SKS Extreme Extreme series EXSKS-09 TYPE

INSERTS

JC8050, JC8118

JC7560



● About insert identification

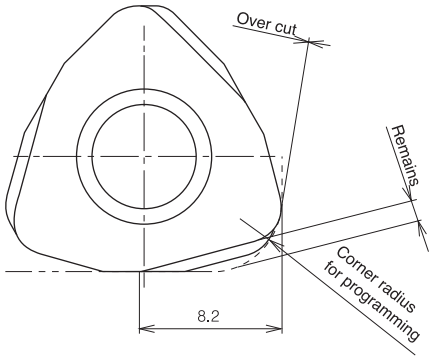
Around the insert hole for each grade
The mark is different.

JC8050 JC8118 JC7560

Cat. No.	Tole-rance	Dimensions (mm)				PVD coated			Insert	Parts	
		A	T	B	rε	JC8118	JC7560	JC8050		Clamp screw	Wrench
WNMU090720ZER-PM	M	14	7.66	1.94	2	●	●	●	WNMU090720ZER-PM	CSW-513H	A-20

10 inserts per case

Definition of corner for programming

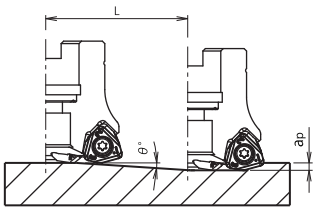


(mm)

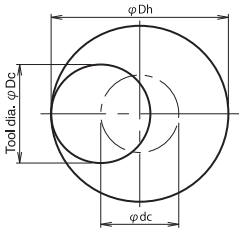
Corner radius for programming	Over cut	Remains
R3.0	0	1.41
R3.5	0	1.30
R4.0	0.025	1.19

Instructions for profile milling

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

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

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 counter-clockwise.

Note :
- 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.

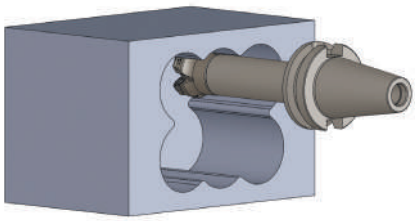
Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Max. drilling depth (mm)
				Max. ramping angle θ°	Total cutting length L (m) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
EXSKS-*050	50	33.7	3	2°24'	71.6	68	96	2
EXSKS-*052	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

High feed
For proflie machining

SKS Extreme Extreme series EXSKS-09 TYPE

CASE STUDIES

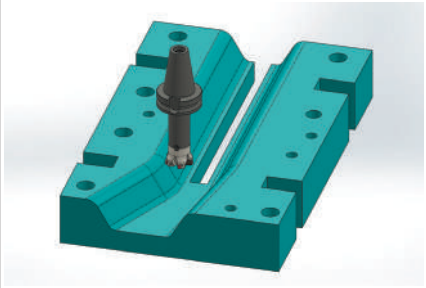
Overhung length: 210mm



Work	Part name	Test piece
	Material	NAK80
	Hardness	40HRC
Tool	Tool No.	EXSKS-5063R
	Insert No.	WNMU090720ZER-PM (JC8118)
Cutting conditions	Cutting speed	600min-1 (120m / min)
	Feed speed	5,000mm / min (0.6mm / t)
	ap(mm)	1.4mm
	ae(mm)	45mm (some 63mm)
	Coolant	External air
	Machine	Horizontal MC (BT50 specification) 45 / 37kW

Result The current product has ap = 1mm and stable machining is possible with ap = 1.4mm against insert damage.

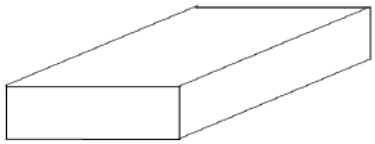
Overhung length: 150mm



Work	Part name	Press die
	Material	SKD11
	Hardness	Raw
Tool	Tool No.	EXSKS-4063R
	Insert No.	WNMU090720ZER-PM (JC8118)
Cutting conditions	Cutting speed	750min-1 (150m / min)
	Feed speed	3,500mm / min (1.2mm / t)
	ap(mm)	2mm
	ae(mm)	44
	Coolant	DRY
	Machine	Gate MC (BT50 specification) 22kW

Result Achieved 1.3 times the efficiency and 1.7 times the tool life of the current product.

Gauge length: 170mm



150x300x500mm

Work	Part name	plate
	Material	DAC-H
	Hardness	40HRC
Tool	Tool No.	EXSKS-7100R
	Insert No.	WNMU090720ZER-PM (JC8118)
Cutting conditions	Cutting speed	250min-1 (80m / min)
	Feed speed	1,400mm / min (0.8mm / t)
	ap(mm)	0.7mm
	ae(mm)	70mm
	Coolant	External air
	Machine	Gate MC (BT50 specification) 22kw

Result Achieved 2.4 times the efficiency of current tools.

High feed
For profile machining

SKS Extreme Extreme series EXSKS-09 TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Face mill type milling cutter

Work Materials	Insert Grades	Tool dia (mm)														
		50					50/52					63				
		No. of teeth 3N					No. of teeth 4N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 JC8050 (JC8118)	~150	2	950	5,700	9.3	~150	2	950	7,600	12.4	~150	2	750	6,000	12.3
		200	1.5	800	4,800	5.9	200	1.5	800	6,400	7.8	200	1.8	680	5,440	10.0
		250	1	650	2,925	2.4	250	1	650	3,900	3.2	250	1.5	600	4,800	7.4
		300	0.6	650	1,950	1.0	300	0.6	650	2,600	1.3	300	1	550	4,400	4.5
		350	—	—	—	—	350	—	—	—	—	350	0.6	550	3,300	2.0
		400	—	—	—	—	400	—	—	—	—	400	0.4	550	2,200	0.9
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 JC8050 (JC8118)	~150	2	950	5,700	9.3	~150	2	950	7,600	12.4	~150	2	750	6,000	12.3
		200	1.5	800	4,800	5.9	200	1.5	800	6,400	7.8	200	1.8	680	5,440	10.0
		250	1	650	2,925	2.4	250	1	650	3,900	3.2	250	1.5	600	4,800	7.4
		300	0.6	650	1,950	1.0	300	0.6	650	2,600	1.3	300	1	550	4,400	4.5
		350	—	—	—	—	350	—	—	—	—	350	0.6	550	3,300	2.0
		400	—	—	—	—	400	—	—	—	—	400	0.4	550	2,200	0.9
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 JC8050 (JC8118)	~150	2	830	4,980	9.2	~150	2	830	6,640	12.3	~150	2	650	5,200	12.2
		200	1.5	700	4,200	5.9	200	1.5	700	5,600	7.8	200	1.8	580	4,640	9.8
		250	1	570	2,565	2.4	250	1	570	3,420	3.2	250	1.5	520	4,160	7.3
		300	0.6	570	1,710	1.0	300	0.6	570	2,280	1.3	300	1	460	3,680	4.3
		350	—	—	—	—	350	—	—	—	—	350	0.6	460	2,760	1.9
		400	—	—	—	—	400	—	—	—	—	400	0.4	460	1,840	0.9
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~150	1.5	700	2,100	5.1	~150	1.5	700	2,800	6.8	~150	1.5	550	2,200	6.8
		200	1	600	1,800	2.9	200	1	600	2,400	3.9	200	1.2	500	2,000	4.9
		250	0.7	490	1,470	1.7	250	0.7	490	1,960	2.2	250	1	440	1,760	3.6
		300	0.4	490	735	0.5	300	0.4	490	980	0.6	300	0.7	380	1,520	2.2
		350	—	—	—	—	350	—	—	—	—	350	0.5	380	1,520	1.6
		400	—	—	—	—	400	—	—	—	—	400	—	—	—	—
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	510	1,530	5.0	~150	1.5	510	2,040	6.6	~150	1.5	400	1,600	6.6
		200	1	460	1,380	3.0	200	1	460	1,840	4.0	200	1.2	360	1,440	4.7
		250	0.7	420	1,260	1.9	250	0.7	420	1,680	2.5	250	1	320	1,280	3.5
		300	0.4	420	630	0.5	300	0.4	420	840	0.7	300	0.7	280	1,120	2.1
		350	—	—	—	—	350	—	—	—	—	350	0.5	280	1,120	1.5
		400	—	—	—	—	400	—	—	—	—	400	—	—	—	—
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	JC8118	~150	2.5	950	5,700	9.3	~150	2.5	950	7,600	12.4	~150	2.5	750	6,000	12.3
		200	2	800	4,800	6.2	200	2	800	6,400	8.3	200	2	680	5,440	8.9
		250	1.5	650	2,925	2.9	250	1.5	650	3,900	3.8	250	1.5	600	4,800	5.9
		300	1	650	1,950	1.3	300	1	650	2,600	1.7	300	1	550	4,400	3.6
		350	—	—	—	—	350	—	—	—	—	350	0.6	550	3,300	1.6
		400	—	—	—	—	400	—	—	—	—	400	0.4	550	2,200	0.7
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	950	5,700	9.3	~150	2.5	950	7,600	12.4	~150	2.5	750	6,000	12.3
		200	2	800	4,800	6.2	200	2	800	6,400	8.3	200	2	680	5,440	8.9
		250	1.5	650	2,925	2.9	250	1.5	650	3,900	3.8	250	1.5	600	4,800	5.9
		300	1	650	1,950	1.3	300	1	650	2,600	1.7	300	1	550	4,400	3.6
		350	—	—	—	—	350	—	—	—	—	350	0.6	550	3,300	1.6
		400	—	—	—	—	400	—	—	—	—	400	0.4	550	2,200	0.7
Stainless steel SUS304 Below 250HB	JC8050 (JC7560)	~150	2	950	4,275	11.1	~150	2	950	5,700	14.8	~150	2	750	4,500	14.7
		200	1.5	800	3,600	7.0	200	1.5	800	4,800	9.4	200	1.8	680	4,080	12.0
		250	1	650	1,950	2.5	250	1	650	2,600	3.4	250	1.5	600	3,600	8.8
		300	0.6	650	1,950	1.5	300	0.6	650	2,600	2.0	300	1	550	2,640	4.3
		350	—	—	—	—	350	—	—	—	—	350	0.6	550	2,200	2.2
		400	—	—	—	—	400	—	—	—	—	400	0.4	550	2,200	1.4

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed
For profile machining

SKS Extreme Extreme series EXSKS-09 TYPE

RECOMMENDED CUTTING CONDITIONS

Face mill type milling cutter

Work Materials	Insert Grades	Tool dia (mm)														
		63/66					80					100				
		No. of teeth 5N					No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 JC8050 (JC8118)	~150	2	750	7,500	15.4	~150	2	600	7,200	18.7	~150	2	480	6,720	21.8
		200	1.8	680	6,800	12.5	200	1.8	540	6,480	15.2	200	2	430	6,020	19.6
		250	1.5	600	6,000	9.2	250	1.8	480	5,760	13.5	250	2	380	5,320	17.3
		300	1	550	5,500	5.6	300	1.5	440	5,280	10.3	300	1.5	350	4,900	11.9
		350	0.6	550	4,125	2.5	350	1	440	5,280	6.9	350	1.5	350	4,900	11.9
		400	0.4	550	2,750	1.1	400	0.6	440	3,960	3.1	400	1	350	4,900	8.0
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 JC8050 (JC8118)	~150	2	750	7,500	15.4	~150	2	600	7,200	18.7	~150	2	480	6,720	21.8
		200	1.8	680	6,800	12.5	200	1.8	540	6,480	15.2	200	2	430	6,020	19.6
		250	1.5	600	6,000	9.2	250	1.8	480	5,760	13.5	250	2	380	5,320	17.3
		300	1	550	5,500	5.6	300	1.5	440	5,280	10.3	300	1.5	350	4,900	11.9
		350	0.6	550	4,125	2.5	350	1	440	5,280	6.9	350	1.5	350	4,900	11.9
		400	0.4	550	2,750	1.1	400	0.6	440	3,960	3.1	400	1	350	4,900	8.0
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 JC8050 (JC8118)	~150	2	650	6,500	15.2	~150	2	520	6,240	18.5	~150	2	410	5,740	21.3
		200	1.8	580	5,800	12.2	200	1.8	470	5,640	15.1	200	2	370	5,180	19.2
		250	1.5	520	5,200	9.1	250	1.8	420	5,040	13.5	250	2	330	4,620	17.2
		300	1	460	4,600	5.4	300	1.5	360	4,320	9.6	300	1.5	280	3,920	10.9
		350	0.6	460	3,450	2.4	350	1	360	4,320	6.4	350	1.5	280	3,920	10.9
		400	0.4	460	2,300	1.1	400	0.6	360	3,240	2.9	400	1	280	3,920	7.3
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~150	1.5	550	2,750	8.4	~150	1.5	430	2,580	10.1	~150	1.5	350	2,450	11.9
		200	1.2	500	2,500	6.1	200	1.2	390	2,340	7.3	200	1.5	310	2,170	10.6
		250	1	440	2,200	4.5	250	1.2	340	2,040	6.4	250	1.2	280	1,960	7.6
		300	0.7	380	1,900	2.7	300	1	300	1,800	4.7	300	1	250	1,750	5.7
		350	0.5	380	1,900	1.9	350	0.7	300	1,800	3.3	350	1	250	1,750	5.7
		400	—	—	—	—	400	0.4	300	1,800	1.9	400	0.7	250	1,750	4.0
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	400	2,000	8.2	~150	1.5	320	1,920	10.0	~150	1.5	250	1,750	11.4
		200	1.2	360	1,800	5.9	200	1.2	290	1,740	7.2	200	1.5	230	1,610	10.5
		250	1	320	1,600	4.4	250	1.2	260	1,560	6.5	250	1.2	200	1,400	7.3
		300	0.7	280	1,400	2.7	300	1	220	1,320	4.6	300	1	180	1,260	5.5
		350	0.5	280	1,400	1.9	350	0.7	220	1,320	3.2	350	1	180	1,260	5.5
		400	—	—	—	—	400	0.4	220	1,320	1.8	400	0.7	180	1,260	3.8
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	JC8118	~150	2.5	750	7,500	15.4	~150	2.5	600	7,200	18.7	~150	2.5	480	6,720	21.8
		200	2	680	6,800	11.1	200	2	540	6,480	13.5	200	2.5	430	6,020	19.6
		250	1.5	600	6,000	7.4	250	2	480	5,760	12.0	250	2	380	5,320	13.8
		300	1	550	5,500	4.5	300	1.5	440	5,280	8.2	300	2	350	4,900	12.7
		350	0.6	550	4,125	2.0	350	1	440	5,280	5.5	350	1.5	350	4,900	9.6
		400	0.4	550	2,750	0.9	400	0.6	440	3,960	2.5	400	1	350	4,900	6.4
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	750	7,500	15.4	~150	2.5	600	7,200	18.7	~150	2.5	480	6,720	21.8
		200	2	680	6,800	11.1	200	2	540	6,480	13.5	200	2.5	430	6,020	19.6
		250	1.5	600	6,000	7.4	250	2	480	5,760	12.0	250	2	380	5,320	13.8
		300	1	550	5,500	4.5	300	1.5	440	5,280	8.2	300	2	350	4,900	12.7
		350	0.6	550	4,125	2.0	350	1	440	5,280	5.5	350	1.5	350	4,900	9.6
		400	0.4	550	2,750	0.9	400	0.6	440	3,960	2.5	400	1	350	4,900	6.4
Stainless steel SUS304 Below 250HB	JC8050 (JC7560)	~150	2	750	5,625	18.4	~150	2	600	5,400	22.5	~150	2	480	5,040	26.2
		200	1.8	680	5,100	15.0	200	1.8	540	4,860	18.2	200	2	430	4,515	23.5
		250	1.5	600	4,500	11.1	250	1.8	480	4,320	16.2	250	2	380	3,990	20.7
		300	1	550	3,300	5.4	300	1.5	440	3,960	12.4	300	1.5	350	3,675	14.3
		350	0.6	550	2,750	2.7	350	1	440	3,168	6.6	350	1.5	350	3,675	14.3
		400	0.4	550	2,750	1.8	400	0.6	440	2,640	3.3	400	1	350	3,675	9.6

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High feed
For proflie machining

SKS Extreme Extreme series EXSKS-09 TYPE

RECOMMENDED CUTTING CONDITIONS

● Face mill type milling cutter

Work Materials	Insert Grades	Tool dia (mm)									
		125					160				
		No. of teeth 8N					No. of teeth 9N				
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	Pc (kW)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 JC8050 (JC8118)	~150	2	380	6,080	24.7	~150	2	300	5,400	28.1
		200	2	340	5,440	22.1	200	2	270	4,860	25.3
		250	2	300	4,800	19.5	250	2	240	4,320	22.5
		300	2	280	4,480	18.2	300	2	220	3,960	20.6
		350	1.5	280	4,480	13.7	350	2	220	3,960	20.6
		400	1.5	280	4,480	13.7	400	1.5	220	3,960	15.4
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC7560 JC8050 (JC8118)	~150	2	380	6,080	24.7	~150	2	300	5,400	28.1
		200	2	340	5,440	22.1	200	2	270	4,860	25.3
		250	2	300	4,800	19.5	250	2	240	4,320	22.5
		300	2	280	4,480	18.2	300	2	220	3,960	20.6
		350	1.5	280	4,480	13.7	350	2	220	3,960	20.6
		400	1.5	280	4,480	13.7	400	1.5	220	3,960	15.4
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC7560 JC8050 (JC8118)	~150	2	330	5,280	24.5	~150	2	260	4,680	27.8
		200	2	300	4,800	22.3	200	2	230	4,140	24.6
		250	2	260	4,160	19.3	250	2	210	3,780	22.5
		300	2	230	3,680	17.1	300	2	180	3,240	19.3
		350	1.5	230	3,680	12.8	350	2	180	3,240	19.3
		400	1.5	230	3,680	12.8	400	1.5	180	3,240	14.4
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~150	1.5	280	2,240	13.7	~150	1.5	220	1,980	15.4
		200	1.5	250	2,000	12.2	200	1.5	200	1,800	14.0
		250	1.5	220	1,760	10.7	250	1.5	180	1,620	12.6
		300	1.5	200	1,600	9.8	300	1.5	150	1,350	10.5
		350	1	200	1,600	6.5	350	1.5	150	1,350	10.5
		400	1	200	1,600	6.5	400	1	150	1,350	7.0
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1.5	200	1,600	13.0	~150	1.5	160	1,440	15.0
		200	1.5	180	1,440	11.7	200	1.5	150	1,350	14.0
		250	1.5	160	1,280	10.4	250	1.5	130	1,170	12.2
		300	1.5	140	1,120	9.1	300	1.5	110	990	10.3
		350	1	140	1,120	6.1	350	1.5	110	990	10.3
		400	1	140	1,120	6.1	400	1	110	990	6.9
Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	JC8118	~150	2.5	380	6,080	24.7	~150	2.5	300	5,400	28.1
		200	2.5	340	5,440	22.1	200	2.5	270	4,860	25.3
		250	2.5	300	4,800	19.5	250	2.5	240	4,320	22.5
		300	2	280	4,480	14.6	300	2.5	220	3,960	20.6
		350	1.5	280	4,480	10.9	350	2	220	3,960	16.5
		400	1.5	280	4,480	10.9	400	1.5	220	3,960	12.4
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	JC8118	~150	2.5	380	6,080	24.7	~150	2.5	300	5,400	28.1
		200	2.5	340	5,440	22.1	200	2.5	270	4,860	25.3
		250	2.5	300	4,800	19.5	250	2.5	240	4,320	22.5
		300	2	280	4,480	14.6	300	2.5	220	3,960	20.6
		350	1.5	280	4,480	10.9	350	2	220	3,960	16.5
		400	1.5	280	4,480	10.9	400	1.5	220	3,960	12.4
Stainless steel SUS304 Below 250HB	JC8050 (JC7560)	~150	2	380	4,560	29.6	~150	2	300	4,050	33.7
		200	2	340	4,080	26.5	200	2	270	3,645	30.3
		250	2	300	3,600	23.4	250	2	240	3,240	27.0
		300	2	280	3,360	21.8	300	2	220	2,970	24.7
		350	1.5	280	3,360	16.4	350	2	220	2,970	24.7
		400	1.5	280	3,360	16.4	400	1.5	220	2,970	18.5

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

NOTE

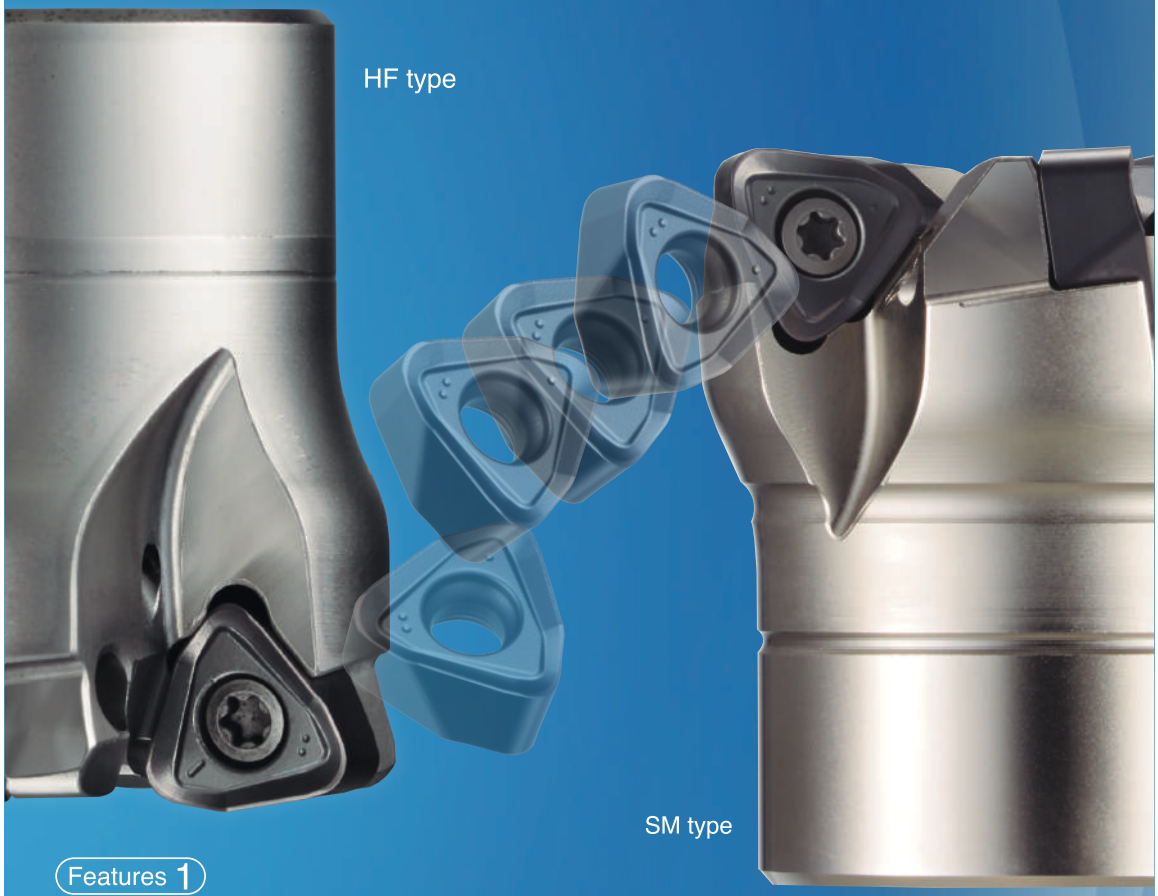
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle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

High feed / shoulder milling
For proflie machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

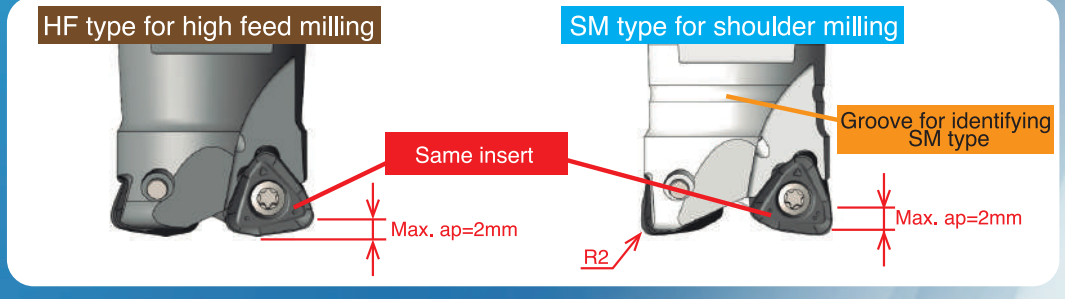
Multi Extreme

Next Generation Milling, 1 type of insert for High Feed Milling as well as for Shoulder Milling



Features 1

Same insert fits into 2 type of cutters, high feed cutter as well as shoulder milling cutter,
In case of Face milling of vertical walls and Corner milling, used inserts in High Feed milling can be reused for shoulder milling provided depth of cut ap should be less than 0.8mm



High feed / shoulder milling
For profile machining

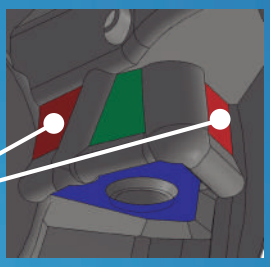
Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

Features 2

Economical double sided Inserts with 6 cutting edges, and higher number of cutting tooth per cutter, higher metal removal rate can be achieved.

Features 3

Due to dovetail pocket geometry and Inserts resting on the face, single Screw clamping prevents inserts movement while machining, and easy to relocate new edge again.



Feature 4

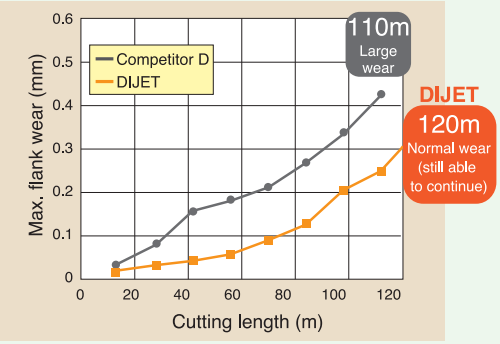
Inserts with 2 PVD coating grades JC8118, JC8050, available for various applications as follows.

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		JC8118		JC8050				JC8118	JC8050			JC8118				JC8118	

Cutting performance

Tool life comparison (For high feed machining)



Material : Mold steel (P20)

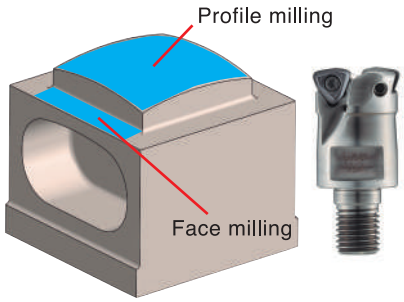
- Tool dia .: ϕ32mm high feed type (MEX-2032-HF-M16))
- Cutting conditions: Vc = 200m / min, fz = 1.5mm / t, ap = 1.5mm, ae = 22mm
Air blow

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

■ CASE STUDIES

1. Profile milling of surface (by HF type)



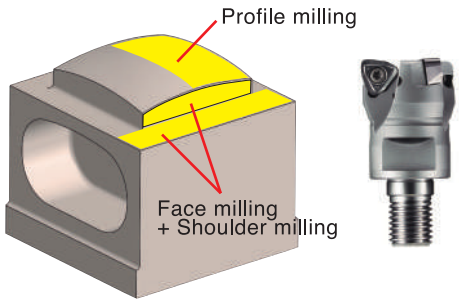
Overhung lenght : 98mm

Work	Part name		Test piece
	Material		Mold steel (p20)
	Hardness		30-36HRC
Tool	Tool No.		MEX-2032-HF-M16
	Insert No.		WNMU070620ZER-PM (JC8118)
Cutting conditions	Cutting speed	n	1,500 (min^{-1})
		Vc	150 (m/min)
	Feed speed	Vf	3,600 (mm/min)
		fz	1.2 (mm/t)
	ap(mm)		0.8 (mm)
	ae(mm)		14 (mm)
	Coolant		External
	Machine		Vertical MC

Result

Possible to removing the machining steps by using HF/SM type separately, therefore achieved high-accuracy in final finishing. And, due to using the same insert, reduce the type & the running cost of the tools.

2. Copy milling of surface (by SM type)



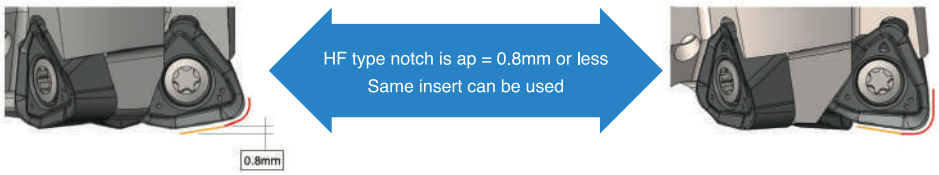
Overhung lenght : 98mm

Work	Part name		Test piece
	Material		Mold steel (p20)
	Hardness		30-36HRC
Tool	Tool No.		MEX-2032-SM-M16
	Insert No.		WNMU070620ZER-PM (JC8118)
Cutting conditions	Cutting speed	n	2,000 (min^{-1})
		Vc	201 (m/min)
	Feed speed	Vf	1,000 (mm/min)
		fz	0.25 (mm/t)
	ap(mm)		0.3 (mm)
	ae(mm)		1 (mm)
	Coolant		Air blow (Internal)
	Machine		Vertical MC

Result

Possible to removing the machining steps by using HF/SM type separately, therefore achieved high-accuracy in final finishing. And, due to using the same insert, reduce the type & the running cost of the tools.

Important note : HF type SM type



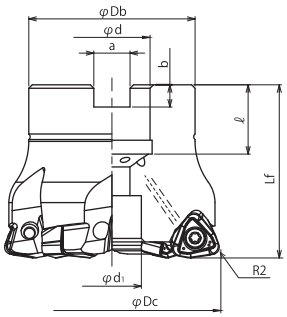
Yellow line: Used cutting edge when HF type is installed (ap = 0.8 mm or less) Red line: Used cutting edge when SM type is installed

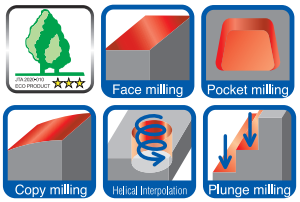
High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

G-Body

Through coolant hole





■ Body (HF type for high feed milling)

Type	Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ
Metric bore	EXM-5050R-HF-22	●	5	50	50	40	22	16.5	10.4	6.3	20
	EXM-5052R-HF-22	☆	5	52	50	40	22	16.5	10.4	6.3	20
	EXM-6063R-HF-22	●	6	63	50	48	22	17	10.4	6.3	20
	EXM-7080R-HF-27	●	7	80	55	65	27	20	12.4	7	22

■ Body (HF type for high feed milling)

Type	Cat No.	Set bolt		Weight (kg)	Insert	Parts: Clamp screw	Parts: Wrench
Metric bore	EXM-5050R-HF-22	M10	Head cap screw (JIS Standard)	0.38	WNMU070620 ZER-PM	TSW-410H	A-15T
	EXM-5052R-HF-22	M10		0.40			
	EXM-6063R-HF-22	M10		0.64			
	EXM-7080R-HF-27	M12×1.75×35★		1.23			

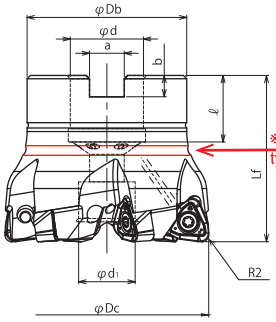
Clamp screw	Recommended torque (N•m)
TSW-410H	3.5

Note) 1. All cutters are supplied without inserts.
2. Please refer page E052 to E053 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. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

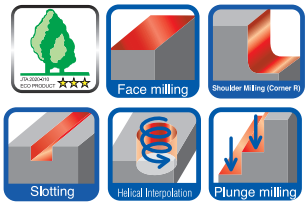
High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE



※ Difference of looking in HF type and SM type for tool proof.

Through coolant hole



■ Body (SM type for shoulder milling)

Type	Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ
Metric bore	**EXM-5050R-SM-22**	●	5	50	50	40	22	16.5	10.4	6.3	20
	EXM-5052R-SM-22	☆	5	52	50	40	22	16.5	10.4	6.3	20
	EXM-6063R-SM-22	●	6	63	50	48	22	17	10.4	6.3	20

■ Body (SM type for shoulder milling)

Type	Cat No.	Set bolt		Weight (kg)	Insert	Parts: Clamp screw	Parts: Wrench
							(not included)
Metric bore	**EXM-5050R-SM-22**	M10	Head cap screw (JIS Standard)	0.38	WNMU070620 ZER-PM	TSW-410H	A-15T
	EXM-5052R-SM-22	M10		0.41			
	EXM-6063R-SM-22	M10		0.63			

Note) 1. All cutters are supplied without inserts.
2. Please refer page E059 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Clamp screw	Recommended torque (N·m)
TSW-410H	3.5

●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

Through coolant hole

Fig.1 ● When the tool diameter φDc = φ32

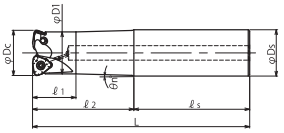
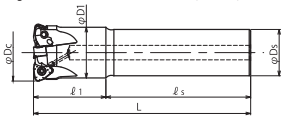


Fig.2 ● When the tool diameter is φDc = φ35, 40



■ Body (HF type for high feed milling)

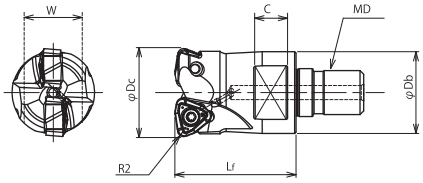
Cat No.	Stock	No. of insert	Dimensions (mm) φDc	ℓ1	ℓ2	ℓs	L	φD1	φDs	θ n° Taper angle	Fig	Insert	Parts: Clamp screw	Parts: Wrench
EXM-2032-HF-70-S32	●	2	**32**	30	70	80	150	29	32	1.5°	1	WNMU070620ZER-PM	TSW-410H	A-15
EXM-2032-HF-120-S32	●	2	**32**	30	120	80	200	29	32	0.6°	1			
EXM-3035-HF-40-S32	●	3	**35**	40	-	110	150	31	32	-	2			
EXM-3035-HF-40L-S32	●	3	**35**	40	-	160	200	31	32	-	2			
EXM-4040-HF-50-S32	●	4	**40**	50	-	100	150	35	32	-	2			
EXM-4040-HF-50L-S32	●	4	**40**	50	-	150	200	35	32	-	2			

Note) 1. All cutters are supplied without inserts.
2. Please refer page E050 - E051 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Clamp screw	Recommended torque (N·m)
TSW-410H	3.5

G-Body

Through coolant hole



■ Body (HF type for high feed milling)

Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Insert	Parts: Clamp screw	Parts: Wrench
MEX-2032-HF-M16	●	2	**32**	43	29	M16	12	22	WNMU070620ZER-PM	TSW-410H	A-15
MEX-3035-HF-M16	●	3	**35**	43	29	M16	12	22			
MEX-4040-HF-M16	●	4	**40**	43	32	M16	14	26			
MEX-4042-HF-M16	☆	4	**42**	43	32	M16	14	26			

Note) 1. All cutters are supplied without inserts.
2. Please refer page E048 - E049 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
4. See page H018 for the recommended tightening torque for the modular head.

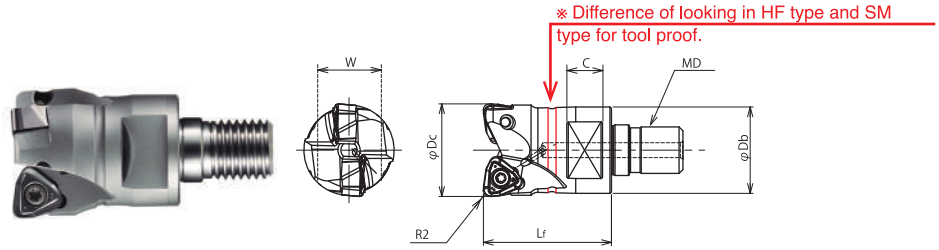
Clamp screw	Recommended torque (N·m)
TSW-410H	3.5

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

Through coolant hole



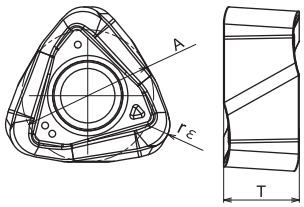
■ Body (SM type for shoulder milling)

Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	MD	C (not included)	W	Insert	Parts: Clamp screw	Parts: Wrench
											(not included)
MEX-2032-SM-M16	●	2	**32**	43	29	M16	12	22	WNMU070620ZER-PM	TSW-410H	A-15
MEX-3035-SM-M16	●	3	**35**	43	29	M16	12	22			
MEX-4040-SM-M16	●	4	**40**	43	32	M16	14	26			
MEX-4042-SM-M16	☆	4	**42**	43	32	M16	14	26			

Note) 1. All cutters are supplied without inserts.
2. Please refer page E054 - E055 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
4. See page H018 for the recommended tightening torque for the modular head.

Clamp screw	Recommended torque (N•m)
TSW-410H	3.5

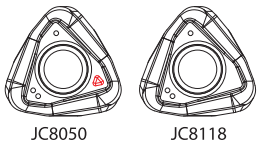
■ Insert



Cat No.	Tolerance	PVD Coated JC8050	PVD Coated JC8118	Dimensions (mm) A	T	rε
WNMU070620ZER-PM	M	●	●	**11.2**	6.4	2

10 inserts per case.

● About insert identification
Around the insert hole for each grade
The mark is different.



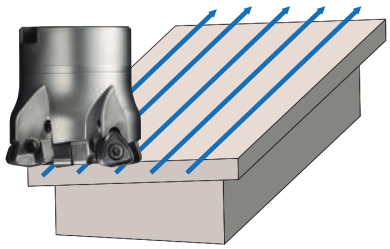
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

CASE STUDIES

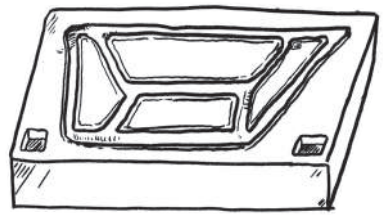
1. Contouring milling of slope surface (by HF type)



Work	Part name	Big welding jig
	Material	SS400
	Hardness	-
Tool	Tool No.	EXM-5050R-HF-22
	Insert No.	WNMU070620ZER-PM (JC8050)
Cutting conditions	Cutting speed	800 (min-1)
		125 (m / min)
	Feed speed	6,000 (mm / min)
		1.5 (mm / t)
	ap(mm)	1.5 (mm)
	ae(mm)	35 (mm)
	Coolant	External refueling
	Machine	Vertical MC

Result: It can be continued even after 427m machining and has a long life. Tool costs are reduced by 1.5 times the number of insert corners (4 corners on both sides → 6 corners on both sides) compared to the cutter of competitor F.

2. Heavy roughing

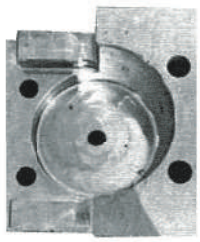


Overhung length: 150mm

Work	Part name	Automotive parts press dies
	Material	Tool steel
	Hardness	30HRC
Tool	Tool No.	EXM-5050R-HF-22
	Insert No.	WNMU070620ZER-PM (JC8118)
Cutting conditions	Cutting speed	850 (min-1)
		133 (m / min)
	Feed speed	2,400 (mm / min)
		0.56 (mm / t)
	ap(mm)	1.0 (mm)
	ae(mm)	72 (mm)
	Coolant	External air
	Machine	Gate MC

Result: EXM type wears normally even after 1.5 hours of machining (continuous machining is possible). It was possible to machine without chattering even with twice the feed of competitor F's products.

3. Heavy roughing



Work	Part name	Die casting mold
	Material	Pre-hardened steel (P20)
	Hardness	30HRC
Tool	Tool No.	EXM-5050R-HF-22
	Insert No.	WNMU070620ZER-PM (JC8118)
Cutting conditions	Cutting speed	850 (min-1)
		133 (m / min)
	Feed speed	4,000 (mm / min)
		0.94 (mm / t)
	ap(mm)	1.0 (mm)
	ae(mm)	30 (mm)
	Coolant	External air
	Machine	Vertical MC

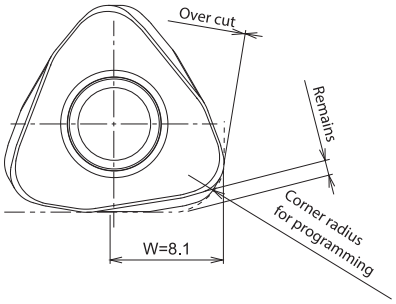
Result: EXM type wears normally even after 5 hours of machining (continuous machining is possible). The EXM type has 5 hours / 1 corner and 2.5 times the life, while competitor A's product has 2 hours / 1 corner.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 / MEX-07 TYPE

Definition of corner for programming

In case of using HF type

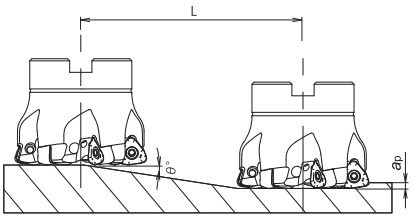


Corner radius for programming	Over cut	Remains
R3.0 (basic)	0	0.8
R3.5	0.06	0.73
R4.0	0.21	0.66

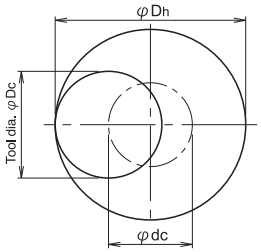
(mm)

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 counter-clockwise.

Note :
- 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)	
EXM / MEX-2032-HF…	32	15	2	2.5°	46	47	58	0.6
EXM / MEX-3035-HF…	35	18	2	2.5°	46	53	64	0.6
EXM / MEX-4040-HF…	40	23	2	2.0°	57	63	74	0.6
MEX-4042-HF-M16	42	25	2	1.8°	64	63	78	0.6
EXM-5050R-HF-22	50	33	2	1.5°	76	83	94	0.6
EXM-5052R-HF-22	52	35	2	1.2°	95	87	98	0.6
EXM-6063R-HF-22	63	46	2	1.0°	115	109	120	0.6
EXM-7080R-HF…	80	63	2	0.8°	143	147	158	0.6
MEX-2032-SM-M16	32	28	2.5	0.8°	179	48	60	0.6
MEX-3035-SM-M16	35	31	2.5	0.8°	179	54	66	0.6
MEX-4040-SM-M16	40	36	2.5	0.8°	179	64	76	0.6
MEX-4042-SM-M16	42	38	2.5	0.8°	179	68	80	0.6
EXM-5050R-SM-22	50	46	2.5	0.8°	179	84	96	0.6
EXM-5052R-SM-22	52	48	2.5	0.8°	179	88	100	0.6
EXM-6063R-SM-22	63	59	2.5	0.8°	179	110	122	0.6

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR HIGH FEED MACHINING

● MEX-HF and MSN type

Work Materials	Insert Grades	Tool dia (mm)									
		32					35				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	1	~14	1,990	5,970	~100	1	~18	1,820	8,190
		150	0.8	~14	1,990	5,570	150	0.8	~18	1,820	7,640
		210	0.6	~14	1,790	4,650	210	0.6	~18	1,640	6,400
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	1	~14	1,790	5,370	~100	1	~18	1,640	7,380
		150	0.8	~14	1,790	5,010	150	0.8	~18	1,640	6,890
		210	0.6	~14	1,590	4,130	210	0.6	~18	1,460	5,690
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	1	~14	1,790	5,370	~100	1	~18	1,640	7,380
		150	0.8	~14	1,790	5,010	150	0.8	~18	1,640	6,890
		210	0.6	~14	1,590	4,130	210	0.6	~18	1,460	5,690
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	0.8	~14	1,290	3,100	~100	0.8	~18	1,180	4,250
		150	0.6	~14	1,290	2,840	150	0.6	~18	1,180	3,890
		210	0.4	~14	1,090	2,180	210	0.4	~18	1,000	3,000
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.8	~14	990	1,980	~100	0.8	~18	910	2,730
		150	0.6	~14	990	1,780	150	0.6	~18	910	2,460
		210	0.4	~14	800	1,280	210	0.4	~18	730	1,750
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	1.5	~14	1,990	5,970	~100	1.5	~18	1,820	8,190
		150	1.2	~14	1,990	5,970	150	1.2	~18	1,820	8,190
		210	0.8	~14	1,790	5,010	210	0.8	~18	1,640	6,890
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	1	~14	1,690	5,070	~100	1	~18	1,550	6,980
		150	0.8	~14	1,690	4,730	150	0.8	~18	1,550	6,510
		210	0.6	~14	1,490	3,870	210	0.6	~18	1,360	5,300
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	0.8	~14	1,490	3,580	~100	0.8	~18	1,360	4,900
		150	0.6	~14	1,490	3,280	150	0.6	~18	1,360	4,490
		210	0.4	~14	1,290	2,580	210	0.4	~18	1,180	3,540
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	1	~14	1,690	4,060	~100	1	~18	1,550	5,580
		150	0.8	~14	1,690	3,720	150	0.8	~18	1,550	5,120
		210	0.6	~14	1,490	2,980	210	0.6	~18	1,360	4,080

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR HIGH FEED MACHINING

● MEX-HF and MSN type

Work Materials	Insert Grades	Tool dia (mm) 40/42 No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	1	~23	1,430	8,580
		150	0.8	~23	1,430	8,010
		210	0.6	~23	1,270	6,600
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	1	~23	1,270	7,620
		150	0.8	~23	1,270	7,110
		210	0.6	~23	1,110	5,770
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	1	~23	1,270	7,620
		150	0.8	~23	1,270	7,110
		210	0.6	~23	1,110	5,770
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	0.8	~23	880	4,220
		150	0.6	~23	880	3,870
		210	0.4	~23	720	2,880
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.8	~23	720	2,880
		150	0.6	~23	720	2,590
		210	0.4	~23	560	1,790
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	1.5	~23	1,430	8,580
		150	1.2	~23	1,430	8,580
		210	0.8	~23	1,270	7,110
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	1	~23	1,190	7,140
		150	0.8	~23	1,190	6,660
		210	0.6	~23	1,030	5,360
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	0.8	~23	1,030	4,940
		150	0.6	~23	1,030	4,530
		210	0.4	~23	880	3,520
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	1	~23	1,190	5,710
		150	0.8	~23	1,190	5,240
		210	0.6	~23	1,030	4,120

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR HIGH FEED MACHINING

● End mill type (EXM-HF-S32 type)

Work Materials	Insert Grades	Tool dia (mm)									
		32					35				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~70	0.8	~14	1,990	4,780	~90	0.8	~18	1,820	6,550
		~120	0.7	~14	1,790	3,940	~140	0.7	~18	1,640	5,410
		-	-	-	-	-	-	-	-	-	-
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~70	0.8	~14	1,790	4,300	~90	0.8	~18	1,640	5,900
		~120	0.7	~14	1,590	3,500	~140	0.7	~18	1,460	4,820
		-	-	-	-	-	-	-	-	-	-
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~70	0.8	~14	1,790	4,300	~90	0.8	~18	1,640	5,900
		~120	0.7	~14	1,590	3,500	~140	0.7	~18	1,460	4,820
		-	-	-	-	-	-	-	-	-	-
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~70	0.6	~14	1,290	2,580	~90	0.6	~18	1,180	3,540
		~120	0.5	~14	1,090	1,960	~140	0.5	~18	1,000	2,700
		-	-	-	-	-	-	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	0.6	~14	990	1,780	~90	0.6	~18	910	2,460
		~120	0.5	~14	800	1,280	~140	0.5	~18	730	1,750
		-	-	-	-	-	-	-	-	-	-
Cast iron FC250 (GG25) 160-260HB	JC8118	~70	1.2	~14	1,990	4,780	~90	1.2	~18	1,820	6,550
		~120	1	~14	1,790	4,300	~140	1	~18	1,640	5,900
		-	-	-	-	-	-	-	-	-	-
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~70	0.8	~14	1,690	4,060	~90	0.8	~18	1,550	5,580
		~120	0.6	~14	1,490	3,280	~140	0.6	~18	1,360	4,490
		-	-	-	-	-	-	-	-	-	-
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~70	0.6	~14	1,490	2,980	~90	0.6	~18	1,360	4,080
		~120	0.5	~14	1,290	2,320	~140	0.5	~18	1,180	3,190
		-	-	-	-	-	-	-	-	-	-
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~70	0.8	~14	1,690	3,380	~90	0.8	~18	1,550	4,650
		~120	0.7	~14	1,490	2,680	~140	0.7	~18	1,360	3,670
		-	-	-	-	-	-	-	-	-	-

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR HIGH FEED MACHINING

● End mill type (EXM-HF-S32 type)

Work Materials	Insert Grades	Tool dia (mm) 40 No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~90	0.8	~23	1,430	6,860
		~140	0.7	~23	1,350	5,940
		-	-	-	-	-
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~90	0.8	~23	1,270	6,100
		~140	0.7	~23	1,190	5,240
		-	-	-	-	-
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~90	0.8	~23	1,270	6,100
		~140	0.7	~23	1,190	5,240
		-	-	-	-	-
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~90	0.6	~23	880	3,520
		~140	0.5	~23	800	2,880
		-	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~90	0.6	~23	720	2,590
		~140	0.5	~23	640	2,050
		-	-	-	-	-
Cast iron FC250 (GG25) 160-260HB	JC8118	~90	1.2	~23	1,430	6,860
		~140	1	~23	1,350	6,480
		-	-	-	-	-
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~90	0.8	~23	1,190	5,710
		~140	0.6	~23	1,110	4,880
		-	-	-	-	-
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~90	0.6	~23	1,030	4,120
		~140	0.5	~23	950	3,420
		-	-	-	-	-
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~90	0.8	~23	1,190	4,760
		~140	0.7	~23	1,110	4,000
		-	-	-	-	-

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR HIGH FEED MACHINING

● Facemill type (EXM-HF type)

Work Materials	Insert Grades	Tool dia (mm)									
		50/52					63				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	1.5	~33	950	7,130	~150	1.5	~46	760	6,840
		200	1.2	~33	950	6,180	200	1.2	~46	760	5,930
		250	1	~33	830	5,400	250	1	~46	660	5,150
		300	0.7	~33	760	4,180	300	0.7	~46	610	4,030
		350	-	-	-	-	350	0.5	~46	610	4,030
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	1.5	~33	830	6,230	~150	1.5	~46	660	5,940
		200	1.2	~33	830	5,400	200	1.2	~46	660	5,150
		250	1	~33	700	4,550	250	1	~46	560	4,370
		300	0.7	~33	640	3,520	300	0.7	~46	510	3,370
		350	-	-	-	-	350	0.5	~46	510	3,370
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	1.5	~33	830	6,230	~150	1.5	~46	660	5,940
		200	1.2	~33	830	5,400	200	1.2	~46	660	5,150
		250	1	~33	700	4,550	250	1	~46	560	4,370
		300	0.7	~33	640	3,520	300	0.7	~46	510	3,370
		350	-	-	-	-	350	0.5	~46	510	3,370
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	1.2	~33	700	4,550	~150	1.2	~46	560	4,370
		200	1	~33	700	3,850	200	1	~46	560	3,700
		250	0.7	~33	570	3,140	250	0.7	~46	450	2,970
		300	0.5	~33	510	2,550	300	0.5	~46	400	2,400
		350	-	-	-	-	350	-	-	-	-
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1	~33	570	2,850	~150	1	~46	450	2,700
		200	0.8	~33	570	2,570	200	0.8	~46	450	2,430
		250	0.6	~33	510	2,300	250	0.6	~46	400	2,160
		300	0.4	~33	450	1,800	300	0.4	~46	350	1,680
		350	-	-	-	-	350	-	-	-	-
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	2	~33	950	7,130	~150	2	~46	760	6,840
		200	1.5	~33	950	6,180	200	1.5	~46	760	5,930
		250	1	~33	830	5,400	250	1	~46	660	5,150
		300	0.7	~33	760	4,180	300	0.7	~46	610	4,030
		350	-	-	-	-	350	0.5	~46	610	4,030
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	1.5	~33	830	6,230	~150	1.5	~46	660	5,940
		200	1.2	~33	830	5,400	200	1.2	~46	660	5,150
		250	1	~33	700	4,550	250	1	~46	560	4,370
		300	0.7	~33	640	3,520	300	0.7	~46	510	3,370
		350	-	-	-	-	350	0.5	~46	510	3,370
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	1.2	~33	700	4,550	~150	1.2	~46	560	4,370
		200	1	~33	700	3,850	200	1	~46	560	3,700
		250	0.7	~33	570	3,140	250	0.7	~46	450	2,970
		300	0.5	~33	510	2,550	300	0.5	~46	400	2,400
		350	-	-	-	-	350	0.4	~46	400	2,400
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	1.5	~33	830	5,400	~150	1.5	~46	660	5,150
		200	1.2	~33	830	4,570	200	1.2	~46	660	4,360
		250	1	~33	700	3,850	250	1	~46	560	3,700
		300	0.7	~33	640	3,200	300	0.7	~46	510	3,060
		350	-	-	-	-	350	0.5	~46	510	3,060

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR HIGH FEED MACHINING

● Facemill type (EXM-HF type)

Work Materials	Insert Grades	Tool dia (mm)				
		80				
		No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	1.5	~63	600	6,300
		200	1.2	~63	600	5,460
		250	1	~63	520	4,730
		300	0.7	~63	480	3,700
		350	0.5	~63	480	3,700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	1.5	~63	520	5,460
		200	1.2	~63	520	4,730
		250	1	~63	440	4,000
		300	0.7	~63	400	3,080
		350	0.5	~63	400	3,080
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	1.5	~63	520	5,460
		200	1.2	~63	520	4,730
		250	1	~63	440	4,000
		300	0.7	~63	400	3,080
		350	0.5	~63	400	3,080
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	1.2	~63	440	4,000
		200	1	~63	440	3,390
		250	0.7	~63	360	2,770
		300	0.5	~63	320	2,240
		350	-	-	320	2,240
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1	~63	360	2,520
		200	0.8	~63	360	2,270
		250	0.6	~63	320	2,020
		300	0.4	~63	280	1,570
		350	-	-	-	-
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	2	~63	600	6,300
		200	1.5	~63	600	5,460
		250	1	~63	520	4,730
		300	0.7	~63	480	3,700
		350	0.5	~63	480	3,700
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	1.5	~63	520	5,460
		200	1.2	~63	520	4,730
		250	1	~63	440	4,000
		300	0.7	~63	400	3,080
		350	0.5	~63	400	3,080
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	1.2	~63	440	4,000
		200	1	~63	440	3,390
		250	0.7	~63	360	2,770
		300	0.5	~63	320	2,240
		350	0.4	~63	320	2,240
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	1.5	~63	520	4,730
		200	1.2	~63	520	4,000
		250	1	~63	440	3,390
		300	0.7	~63	400	2,800
		350	0.5	~63	400	2,800

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

MEX-SM and MSN type

Work Materials	Insert Grades	Tool dia (mm)									
		32					35				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	3	~10	1,990	1,000	~100	3	~10	1,820	1,370
		150	2	~8	1,990	800	150	2	~8	1,820	1,090
		210	1	~6	1,790	540	210	1	~6	1,640	740
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	3	~10	1,790	900	~100	3	~10	1,640	1,230
		150	2	~8	1,790	720	150	2	~8	1,640	980
		210	1	~6	1,590	480	210	1	~6	1,460	660
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	3	~10	1,790	900	~100	3	~10	1,640	1,230
		150	2	~8	1,790	720	150	2	~8	1,640	980
		210	1	~6	1,590	480	210	1	~6	1,460	660
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	2	~10	1,290	520	~100	2	~10	1,180	710
		150	1.5	~8	1,290	390	150	1.5	~8	1,180	530
		210	1	~6	1,090	220	210	1	~6	1,000	300
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	1.5	~10	990	240	~100	1.5	~10	910	330
		150	1	~8	990	200	150	1	~8	910	270
		210	-	-	-	-	210	-	-	-	-
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	3	~10	1,990	1,000	~100	3	~10	1,820	1,370
		150	2.5	~8	1,990	800	150	2.5	~8	1,820	1,090
		210	2	~6	1,790	720	210	2	~6	1,640	980
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	3	~10	1,690	850	~100	3	~10	1,550	1,160
		150	2	~8	1,690	680	150	2	~8	1,550	930
		210	1	~6	1,490	450	210	1	~6	1,360	610
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	2	~10	1,490	600	~100	2	~10	1,360	820
		150	1.5	~8	1,490	450	150	1.5	~8	1,360	610
		210	1	~6	1,290	260	210	1	~6	1,180	350
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	3	~10	1,690	850	~100	3	~10	1,550	1,160
		150	2	~8	1,690	680	150	2	~8	1,550	930
		210	1	~6	1,490	450	210	1	~6	1,360	610

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

● MEX-SM and MSN type

Work Materials	Insert Grades	Tool dia (mm) 40/42 No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	3	~12	1,590	1,590
		150	2	~10	1,590	1,270
		210	1	~8	1,430	860
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	3	~12	1,430	1,430
		150	2	~10	1,430	1,140
		210	1	~8	1,270	760
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	3	~12	1,430	1,430
		150	2	~10	1,430	1,140
		210	1	~8	1,270	760
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	2	~12	1,030	820
		150	1.5	~10	1,030	620
		210	1	~8	880	350
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	1.5	~12	800	380
		150	1	~10	800	320
		210	-	~8	-	-
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	3	~12	1,590	1,590
		150	2.5	~10	1,590	1,270
		210	2	~8	1,430	1,140
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	3	~12	1,350	1,350
		150	2	~10	1,350	1,080
		210	1	~8	1,190	710
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	2	~12	1,190	950
		150	1.5	~10	1,190	710
		210	1	~8	1,030	410
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	3	~12	1,350	1,350
		150	2	~10	1,350	1,080
		210	1	~8	1,190	710

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

● Facemill type (EXM-SM type)

Work Materials	Insert Grades	Tool dia (mm)									
		50/52					63				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	3	~15	1,150	1,730	~150	3	~15	910	1,640
		200	2.5	~12	1,150	1,440	200	2.5	~12	910	1,370
		250	1.5	~10	1,020	1,020	250	1.5	~10	810	970
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	3	~15	1,020	1,530	~150	3	~15	810	1,460
		200	2.5	~12	1,020	1,280	200	2.5	~12	810	1,220
		250	1.5	~10	890	890	250	1.5	~10	710	850
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	3	~15	1,020	1,530	~150	3	~15	810	1,460
		200	2.5	~12	1,020	1,280	200	2.5	~12	810	1,220
		250	1.5	~10	890	890	250	1.5	~10	710	850
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	3	~12	700	880	~150	3	~12	560	840
		200	2	~10	700	700	200	2	~10	560	670
		250	1	~8	640	480	250	1	~8	510	460
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	3	~10	570	430	~150	3	~10	450	410
		200	2	~8	570	340	200	2	~8	450	320
		250	1	~6	510	260	250	1	~6	400	240
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	3	~18	1,150	1,730	~150	3	~18	910	1,640
		200	2.5	~15	1,150	1,440	200	2.5	~15	910	1,370
		250	2	~10	1,020	1,280	250	2	~10	810	1,220
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	3	~15	950	1,430	~150	3	~15	760	1,370
		200	2.5	~12	950	1,190	200	2.5	~12	760	1,140
		250	1	~10	830	420	250	1	~10	660	400
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	3	~15	830	1,040	~150	3	~15	660	990
		200	2	~12	830	830	200	2	~12	660	790
		250	1	~10	700	530	250	1	~10	560	500
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	3	~15	950	1,430	~150	3	~15	760	1,370
		200	2.5	~12	950	1,190	200	2.5	~12	760	1,140
		250	1.5	~10	830	830	250	1.5	~10	660	790

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

● MEX-SM and MSN type

Work Materials	Insert Grades	Tool dia (mm)									
		32					35				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	1	~28	1,990	1,190	~100	1	~31	1,820	1,640
		150	0.8	~28	1,990	1,000	150	0.8	~31	1,820	1,370
		210	0.6	~28	1,790	720	210	0.6	~31	1,640	980
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	1	~28	1,790	1,070	~100	1	~31	1,640	1,480
		150	0.8	~28	1,790	900	150	0.8	~31	1,640	1,230
		210	0.6	~28	1,590	640	210	0.6	~31	1,460	880
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	1	~28	1,790	1,070	~100	1	~31	1,640	1,480
		150	0.8	~28	1,790	900	150	0.8	~31	1,640	1,230
		210	0.6	~28	1,590	640	210	0.6	~31	1,460	880
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	0.8	~28	1,290	650	~100	0.8	~31	1,180	890
		150	0.6	~28	1,290	520	150	0.6	~31	1,180	710
		210	0.4	~28	1,090	330	210	0.4	~31	1,000	450
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.8	~28	990	300	~100	0.8	~31	910	410
		150	0.6	~28	990	240	150	0.6	~31	910	330
		210	0.4	~28	800	160	210	0.4	~31	730	220
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	1.5	~28	1,990	1,190	~100	1.5	~31	1,820	1,640
		150	1.2	~28	1,990	1,000	150	1.2	~31	1,820	1,370
		210	0.8	~28	1,790	900	210	0.8	~31	1,640	1,230
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	1	~28	1,690	1,010	~100	1	~31	1,550	1,400
		150	0.8	~28	1,690	850	150	0.8	~31	1,550	1,160
		210	0.6	~28	1,490	300	210	0.6	~31	1,360	410
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	0.8	~28	1,490	750	~100	0.8	~31	1,360	1,020
		150	0.6	~28	1,490	600	150	0.6	~31	1,360	820
		210	0.4	~28	1,290	390	210	0.4	~31	1,180	530
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	1	~28	1,690	1,010	~100	1	~31	1,550	1,400
		150	0.8	~28	1,690	850	150	0.8	~31	1,550	1,160
		210	0.6	~28	1,490	600	210	0.6	~31	1,360	820

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series MEX-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

● MEX-SM and MSN type

Work Materials	Insert Grades	Tool dia (mm) 40/42 No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	1	~36	1,430	1,720
		150	0.8	~36	1,430	1,430
		210	0.6	~36	1,270	1,020
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	1	~36	1,270	1,520
		150	0.8	~36	1,270	1,270
		210	0.6	~36	1,110	890
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	1	~36	1,270	1,520
		150	0.8	~36	1,270	1,270
		210	0.6	~36	1,110	890
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	0.8	~36	880	880
		150	0.6	~36	880	700
		210	0.4	~36	720	430
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.8	~36	720	430
		150	0.6	~36	720	350
		210	0.4	~36	560	220
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	1.5	~36	1,430	1,720
		150	1.2	~36	1,430	1,430
		210	0.8	~36	1,270	1,270
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	1	~36	1,190	1,430
		150	0.8	~36	1,190	1,190
		210	0.6	~36	1,030	410
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	0.8	~36	1,030	1,030
		150	0.6	~36	1,030	820
		210	0.4	~36	880	530
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	1	~36	1,190	1,430
		150	0.8	~36	1,190	1,190
		210	0.6	~36	1,030	820

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed / shoulder milling
For profile machining

Multi Extreme Extreme series EXM-07 TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

● Facemill type (EXM-SM type)

Work Materials	Insert Grades	Tool dia (mm)									
		50/52					63				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	1.5	~46	950	1,430	~150	1.5	~59	760	1,370
		200	1.2	~46	950	1,190	200	1.2	~59	760	1,140
		250	1	~46	830	830	250	1	~59	660	790
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	1.5	~46	830	1,250	~150	1.5	~59	660	1,190
		200	1.2	~46	830	1,040	200	1.2	~59	660	990
		250	1	~46	700	700	250	1	~59	560	670
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	1.5	~46	830	1,250	~150	1.5	~59	660	1,190
		200	1.2	~46	830	1,040	200	1.2	~59	660	990
		250	1	~46	700	700	250	1	~59	560	670
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	1.2	~46	700	880	~150	1.2	~59	560	840
		200	1	~46	700	700	200	1	~59	560	670
		250	0.7	~46	570	430	250	0.7	~59	450	410
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	1	~46	570	430	~150	1	~59	450	410
		200	0.8	~46	570	340	200	0.8	~59	450	320
		250	0.6	~46	510	260	250	0.6	~59	400	240
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	2	~46	950	1,430	~150	2	~59	760	1,370
		200	1.5	~46	950	1,190	200	1.5	~59	760	1,140
		250	1	~46	830	1,040	250	1	~59	660	990
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	1.5	~46	830	1,250	~150	1.5	~59	660	1,190
		200	1.2	~46	830	1,040	200	1.2	~59	660	990
		250	1	~46	700	350	250	1	~59	560	340
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	1.2	~46	700	880	~150	1.2	~59	560	840
		200	1	~46	700	700	200	1	~59	560	670
		250	0.7	~46	570	430	250	0.7	~59	450	410
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	1.5	~46	830	1,250	~150	1.5	~59	660	1,190
		200	1.2	~46	830	1,040	200	1.2	~59	660	990
		250	1	~46	700	700	250	1	~59	560	670

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill

QM Series

"QM MILL & QM MAX"

New generation high feed mill

QM Max
(Small diameter multi-blade)

Modular type φ10～φ32
End mill type φ10～φ14

MPM / PME type

QM Mill

Modular type φ16～φ42
Shell mill type φ40～φ66

MQX / QXP type

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill

QM Series **MPM / PME** TYPE

Low cutting force

Adopted unique 3D geometry insert with low cutting force and multi blades, even if small insert, QM MILL achieved high speed and high efficient machining. Possible to use on low power and compact machines such as BT30.

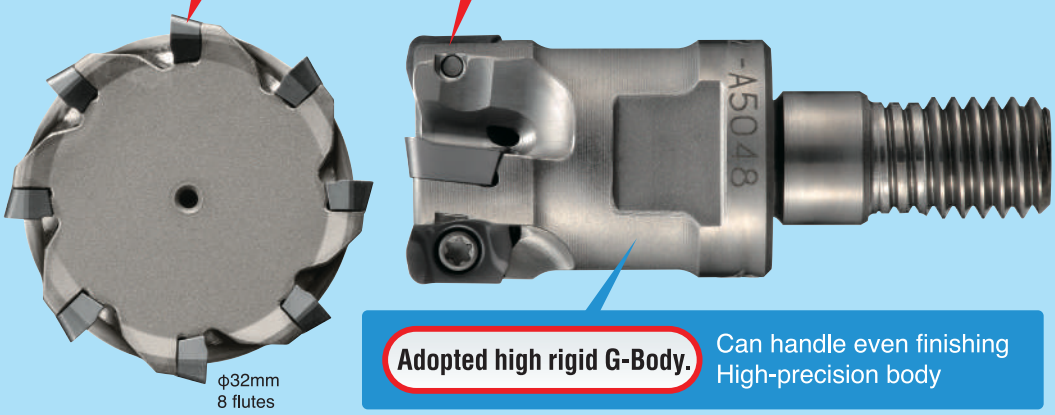
G-Body

Multi blades

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

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

High feed insert

EOMT0602..ZER (R1.0, 2.0)

High feed insert
for unfavorable condition

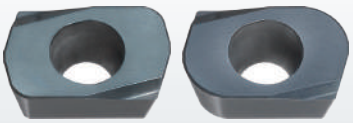
EOMW060210ZER

For steel shoulder cutting

ZOMT0602 ... ZER-PL (Corner R0.2, 0.4, 0.8)

For high hardened steel insert

Addition of Corner Radius R2



EOHW060210ZTR

Bottom Surface
Shoulder Surface finishing

YOHW0602...ZER-12

Insert grades includes PVD Coating grades

1) JC8118 which is highly versatile grade and can be used for general steels to high hardness materials upto 55 HRC. Also works on difficult-to-cut materials like Titanium, Inconel and Heat resistant alloys
2) JC8050 and JC7560 are recommended for interrupted cutting which are fracture resistant and impact resistant.
3) PVD Coating grade DH102 for high hardness materials and high speed machining.
4) We have Y0HW0602...-12 inserts with very close 'H' tolerance for finishing applications.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill

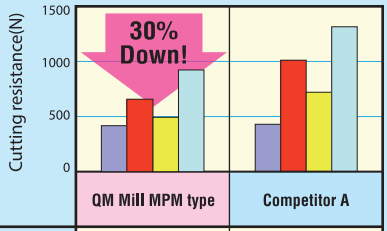
QM Series MPM / PME TYPE

■ Cutting performance of QM MILL against competitor

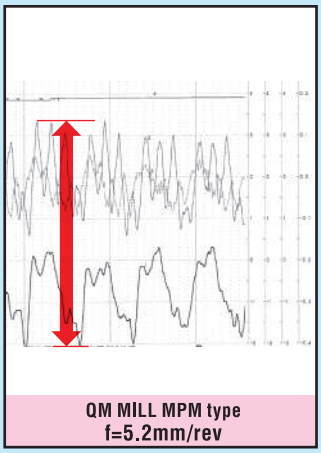
Cutting force comparison (f=5.2mm/rev)

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

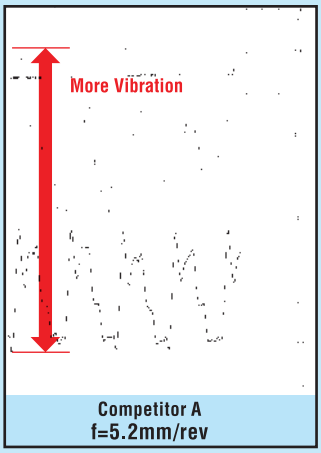
Low Cutting Force



	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

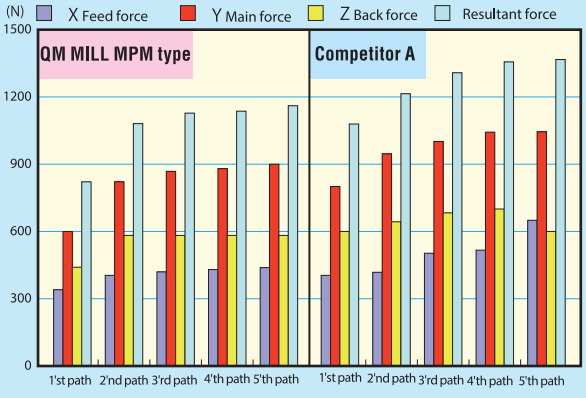


Competitor A
f=5.2mm/rev

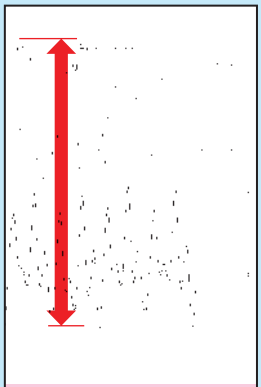
Cutting force comparison (f=4.0mm/rev)

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

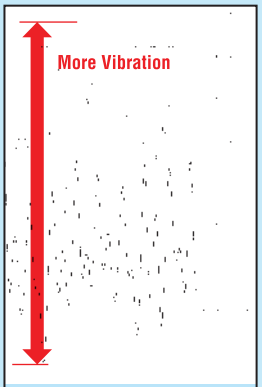
Vibration Free



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

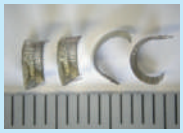
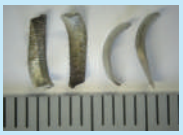
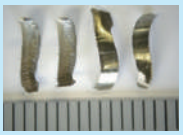
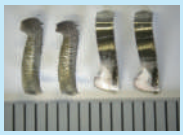


QM MILL MPM type:
5th path



Competitor A: 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.

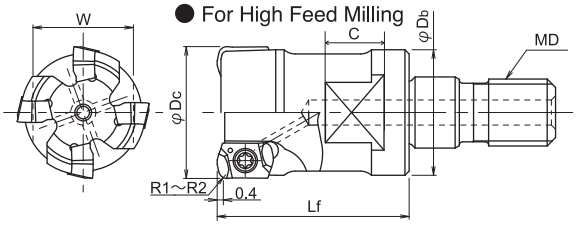
For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

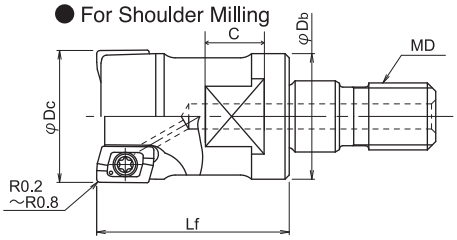
G-Body

Through Coolant Hole

● For High Feed Milling



● For Shoulder Milling



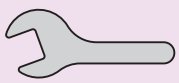
■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MPM-2010-M6	●	2	10	18	9.5	M6	6.5	8	EO＊＊0602＊＊Z＊R ZOMT0602PL＊＊ZER YOHW0602＊＊ZER-12	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-3015-M8	●	3	15	23	14	M8	8	12			
MPM-4016-M8	●	4	16	23	15	M8	8	12			
MPM-4017-M8	●	4	17	23	15	M8	8	12			
MPM-4018-M8	●	4	18	23	15	M8	8	12			
MPM-5020-M10	●	5	20	30	19	M10	9	14			
MPM-5021-M10	●	5	21	30	19	M10	9	14			
MPM-6025-M12	●	6	25	35	23.6	M12	10	17			
MPM-7030-M16	●	7	30	43	29	M16	12	22			
MPM-8032-M16	●	8	32	43	29	M16	12	22			

Note: 1. Please refer page E069 - E081 for recommended cutting conditions.
2. All cutters are supplied without inserts
3. Please refer page D16 for recommended tightening torque.
(It is recommended to use a dedicated spanner <DS type> for M6 and M8 sizes.)
4. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

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

◆ Dedicated spanner (for M6 and M8) Spanner model number



Spanner model number	Screw size	Tightening torque	Width across flats W	Thickness	Length
DS-08	M6	8.0 N·m	8	4	85
DS-12	M8	16 N·m	12	4	93

* Short handle specifications prevent overtightening.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

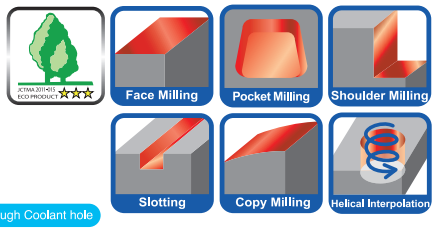
For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill

QM series

PME TYPE

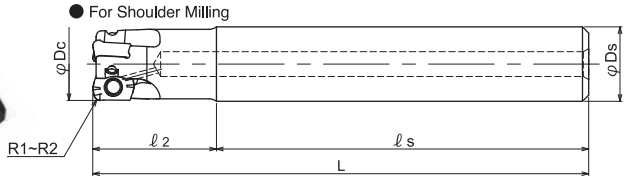
- End mill type holder for "QM Mill", a small-diameter, multi-blade, high-efficiency cutting edge replacement tool.
- High-speed, high-efficiency machining is possible with a unique 3D-shaped low-resistance insert. (In general steel machining, machining with a table feed of 6 m is possible).
- High-precision body that can handle finishing.
- Supports a wide range of machining of high hardness materials, heat resistant alloys, and titanium alloys.
- Regular type (PME type) has a coolant hole.



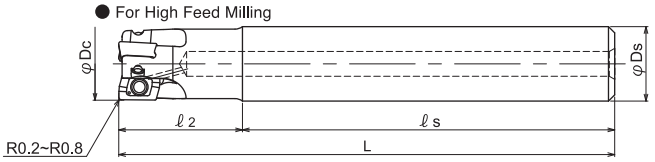
■ PME type

Through Coolant hole

● For Shoulder Milling

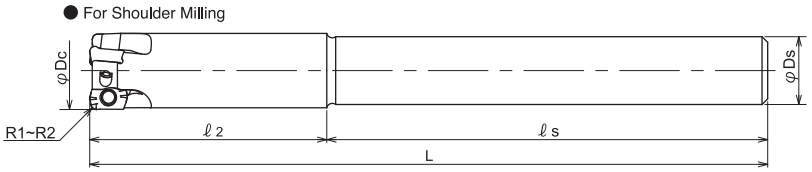


● For High Feed Milling

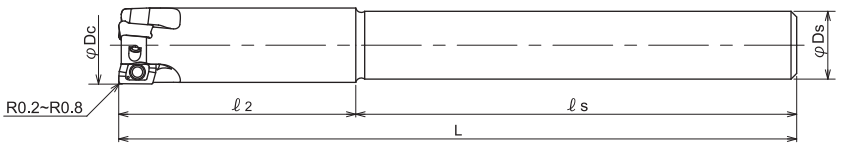


■ PME-LS type

● For Shoulder Milling



● For High Feed Milling

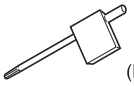


■ BODY

Type	Cat. No.	Stock	No. of inserts	Coolant hole	Dimensions (mm) φDc	ℓ2	ℓs	L	φDs	Applicable inserts
Metric standard shank	**PME2010S10**	●	2	With	**10**	20	60	80	10	EO＊＊0602＊＊Z＊R ZOMT0602＊＊ZER YOHW0602＊＊ZER-12
	PME3012S12	●	3	With	**12**	20	60	80	12	
	PME3014S12	●	3	With	**14**	20	60	80	12	
Metric long shank	**PME2011S10-LS**	●	2	Without	**11**	33	87	120	10	
	PME3013S12-LS	●	3	Without	**13**	39	81	120	12	
	PME3014S12-LS	●	3	Without	**14**	42	78	120	12	

Note: 1. Please refer page E069 - E081 for recommended cutting conditions. (In case of steel shank cutting parameters to be considered 50% less)
2. All cutters are supplied without inserts
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

■ PARTS

Clamp screw	Wrench
	 (Not included)
DSW-1840H	A-06

Clamp Screw	Recommended Torque (N·m)
DSW-1840H	0.4

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For high feed / shape / shoulder Milling
For bottom / side finishing

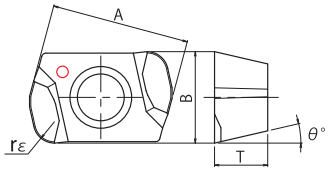
QM Mill

QM Series **MPM / PME** TYPE

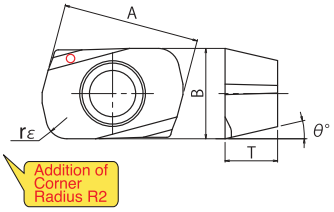
INSERTS

High feed insert

〈JC7560〉Adapted



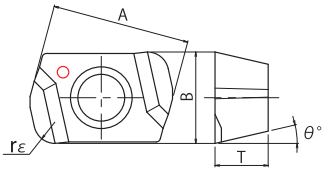
For high hardened steel insert



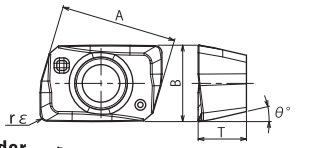
Addition of Corner Radius R2

High feed insert for unfavorable condition

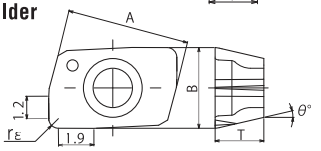
〈JC7560〉Adapted



Shoulder milling insert



Bottom and Side Shoulder Finishing

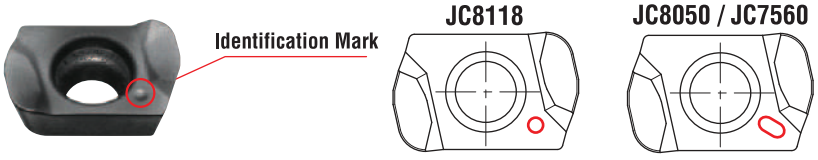


Type	Cat. No.	Tole-rance	PVD coated					Dimensions (mm)				
			JC8118	DH102	JC7560	JC8015	JC8050	A	T	B	rε	θ°
High feed insert	EOMT060210ZER	M	●		●		●	6.5	2.5	4.3	1.0	13°
	EOMT060220ZER	M	●				●	6.5	2.5	4.3	2.0	13°
High feed insert for unfavorable condition	EOMW060210ZER	M	●		●		●	6.5	2.5	4.3	1.0	13°
For high hardened steel insert	EOHW060210ZTR	H	●	●				6.5	2.5	4.3	1.0	13°
	EOHW060220ZTR	H	●	●				6.5	2.5	4.3	2.0	13°
Shoulder milling insert	ZOMT060202ZER-PL	M	●				●	6.62	2.7	4.3	0.2	13°
	ZOMT060204ZER-PL	M	●				●	6.62	2.7	4.3	0.4	13°
	ZOMT060208ZER-PL	M	●				●	6.62	2.7	4.3	0.8	13°
Bottom and Side Shoulder Finishing	YOHW060203ZER-12	H		●		●		6.5	2.6	4.3	0.3	13°
	YOHW060205ZER-12	H		●		●		6.5	2.6	4.3	0.5	13°
	YOHW060208ZER-12	H		●		●		6.5	2.6	4.3	0.8	13°

10 inserts per case. Note) JC5118 will be replaced with JC8118.

Identification of grade for QM MILL insert

Identification for the grades has been defined by different mark.



MAGNETISER

・Magnetizing and demagnetizing can be easily done only by inserting the tip of wrench into the Magnetizer + and rubbing lightly.
・The work efficiency improves when insert is set by magnetizing the tip of wrench.
※Please do not use it in the vicinity of the equipment which is to be influenced with magnetism.

Cat. No.	Stock
MAGNETISER	●

1 piece per case.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For high feed / shape / shoulder Milling
For bottom / side finishing

QM Mill

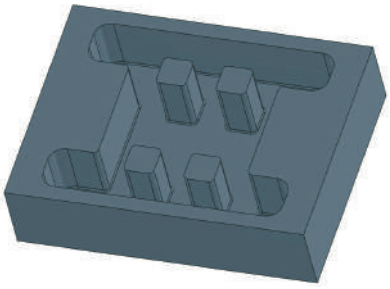
QM Series

PME TYPE

■ CASE STUDIES

1. Tool application conversion (rough machining) from solid tools

Overhung length: 70mm



Work	Part name		Mold
	Material		NAK80
	Hardness		40HRC
Tool	Tool No.		MPM-3012-M6 MSN-M6-50-S12C
	Insert No.		EOMT060210ZER JC8118
Cutting conditions	Cutting speed	n	3,000 (min^{-1})
		Vc	110 (m/min)
	Feed speed	Vf	4,500 (mm/min)
		f	1.5 (mm/rev)
	ap (mm)		0.3mm
	ae (mm)		6mm
	Coolant		Air blow
	Machine		Vertical MC

Result

Tool cost reduction by switching from solid tools.
Achieves a machining life of 90 (min) and an actual machining length of 200 (m) with less machining vibration.

2. Improvement of processing accuracy of SKD61 (finishing)

Overhung length: 50mm

Work	Part name		Mold
	Material		SKD61
	Hardness		50-52 HRC
Tool	Tool No.		MPM-2010-M6 MSN-M6-30-S10C
	Insert No.		YOHW060208ZER-12 DH102
Cutting conditions	Cutting speed	n	2,550 (min^{-1})
		Vc	80 (m/min)
	Feed speed	Vf	1,000 (mm/min)
		f	0.4 (mm/rev)
	ap (mm)		0.05mm
	ae (mm)		5mm
	Coolant		Emulsion oil
	Machine		Vertical MC

Result

Compared to the conventional M-class insert cutter, the machined surface accuracy is improved and the grinding time in the post-process is shortened.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill

QM Series **MPM / PME** TYPE

Guidelines for selection of the QM Mill

Work Materials	Carbon steel S50C, S55C (C50, C55) Below 250HB				Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB			
Grades / Cat.No.	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EOMT0602*0ZER	☆	☆	☆		☆	☆	☆	
EOMW060210ZER	○	○	◎		○	○	◎	
EOHW0602*0ZTR								

Work Materials	Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC				Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC			
Grades / Cat.No.	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EOMT0602*0ZER	☆	☆	☆		☆	☆		
EOMW060210ZER	○	○	◎		◎	○		
EOHW0602*0ZTR								

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			
Grades / Cat.No.	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EOMT0602*0ZER	☆				×	×		
EOMW060210ZER	○	●			○			
EOHW0602*0ZTR	◎				●			◎

Work Materials	Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB				Stainless steel SUS304 Below 250HB			
Grades / Cat.No.	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EOMT0602*0ZER	○					◎	○	
EOMW060210ZER	◎		●			●		
EOHW0602*0ZTR								

Work Materials	Titanium alloy Ti-6Al-4V				Inconel INCO718			
Grades / Cat.No.	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EOMT0602*0ZER	○	○	◎		◎	○	○	
EOMW060210ZER			●			●		
EOHW0602*0ZTR								

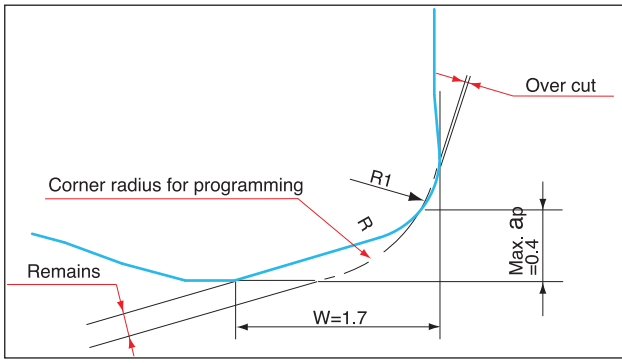
◎: First Choice, Good Condition ○: Moderate Condition

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill QM Series MPM / PME / PME-LS TYPE

Definition of corner radius for programming



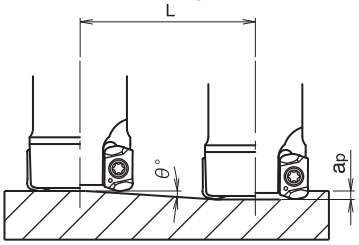
(mm)

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

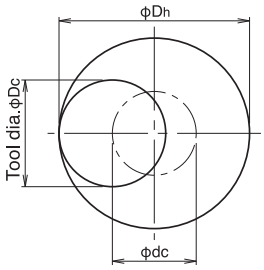
Note) In case of setting corner radius for programming to R2, recommend to use EOMT060220ZER

Instructions for profile milling with EO※※ type insert

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

$$\phi dc = \phi Dh - \phi Dc$$

Tool pass dia. Bore dia. Tool dia.

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

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

Note :
- 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)
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-3015-M8	15	11.5	0.4	1°12'	19.1	25	28
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-4018-M8	18	14.5	0.4	0°51'	27.0	31	34
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
PME2010S10	10	6.6	0.3	2°18'	7.5	15	18
PME2011S10-LS	11	7.6	0.3	1°54'	9	17	20
PME3012S12	12	8.5	0.3	1°36'	10.7	19	22
PME3013S12-LS	13	9.5	0.3	1°24'	12.3	21	24
PME3014S12(-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).

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

■ RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (EOMT / W type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder ❶

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13/14/15					16/17/18				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (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) (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	JC8118 (JC7560) (JC8050)	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	JC8118 (JC8050)	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 (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 EOMW type	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 (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	JC8050 (JC7560)	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 (JC8118) (JC8050)	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
Heat resistant alloy (INCO718)	JC8118 (JC7560) (JC8050)	50	0.3	~6	950	760	60	0.3	~8	800	960	70	0.3	~12	600	960
		75	0.2	~6	850	760	80	0.2	~8	720	780	120	0.25	~12	540	780
		100	0.15	~5	760	610	110	0.15	~7	640	610	160	0.2	~12	480	610

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

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the QM mill shank type milling cutter PME / PME-LS type, shorten the out stick length ℓ to about 60% of the above catalog conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (EOMT / W type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder ❶

Work Materials	Insert Grades	Tool dia. (mm)									
		20/21					25				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (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) (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	JC8118 (JC7560) (JC8050)	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	JC8118 (JC8050)	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 (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 EOMW type	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 (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	JC8050 (JC7560)	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 (JC8118) (JC8050)	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
Heat resistant alloy (INCO718)	JC8118 (JC7560) (JC8050)	70	0.3	~14	480	960	90	0.3	~18	380	910
		120	0.25	~14	430	860	140	0.25	~18	340	730
		190	0.2	~14	380	610	210	0.2	~18	300	580

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (EOMT / W type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder ❶

Work Materials	Insert Grades	Tool dia. (mm)									
		30					32				
		No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (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) (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	JC8118 (JC7560) (JC8050)	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	JC8118 (JC8050)	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 (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 EOMW type	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 (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	JC8050 (JC7560)	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 (JC8118) (JC8050)	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
Heat resistant alloy (INCO718)	JC8118 (JC7560) (JC8050)	100	0.3	~22	320	900	100	0.3	~24	300	960
		150	0.25	~22	290	730	150	0.25	~24	270	780
		210	0.2	~22	260	580	210	0.2	~24	240	610

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (EOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		10/11					12/13/14/15					16/17/18				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	40	0.20	~6	2,860	2,860	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	2,060
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	–	–	–	–

Work Materials	Insert Grades	Tool dia. (mm)									
		20/21					25				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
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	0.2	~14	1,290	3,100	150	0.2	~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	0.1	~14	1,140	1,540	150	0.1	~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)	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	120	0.25	~22	950	3,990	120	0.25	~24	900	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, 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 same 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) When using the QM mill shank type milling cutter PME / PME-LS type, shorten the out stick length ℓ to about 60% of the above catalog conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (ZOMT*-PL type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)														
			10/11					12/13/15					16/17/18				
			No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
			ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118)	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	3,400	610	160	~0.7	~1.3	2,550	610
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	50	~4.0	~6.0	4,770	570	60	~4.0	~8.0	3,980	720	70	~5.0	~10.0	2,980	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, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	50	~4.0	~6.0	4,770	480	60	~4.0	~8.0	3,980	600	70	~5.0	~10.0	2,980	600
			75	~1.2	~1.8	4,300	340	80	~1.7	~2.6	3,580	430	120	~2.0	~3.0	2,690	430
			100	~0.5	~0.8	3,820	230	110	~0.6	~1.2	3,180	290	160	~0.7	~1.3	2,390	290
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	50	~3.0	~4.0	3,820	380	60	~3.0	~4.5	3,180	480	70	~4.0	~6.0	2,390	480
			75	~1.2	~1.6	3,440	280	80	~1.3	~1.8	2,860	340	120	~1.7	~2.2	2,150	340
			100	~0.5	~0.8	3,060	180	110	~0.6	~1.0	2,550	230	160	~0.6	~1.1	1,910	230
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118	50	~2.5	~3.0	3,180	320	60	~2.5	~3.5	2,650	400	70	~3.5	~5.5	1,990	400
			75	~1.0	~1.4	2,860	230	80	~1.0	~1.5	2,390	290	120	~1.4	~2.0	1,790	290
			100	~0.5	~0.6	2,550	150	110	~0.5	~0.8	2,120	190	160	~0.5	~1.0	1,590	190
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118	50	~4.0	~6.0	4,770	760	60	~4.0	~8.0	3,980	960	70	~5.0	~10.0	2,980	950
			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	3,820	460	110	~0.6	~1.2	3,180	570	160	~0.7	~1.3	2,390	570
Stainless steel SUS304 Below 250HB	PL type	JC8050	50	~4.0	~6.0	4,770	570	60	~4.0	~8.0	3,980	720	70	~5.0	~10.0	2,980	720
			75	~1.2	~1.8	4,300	430	80	~1.7	~2.6	3,580	540	120	~2.0	~3.0	2,690	540
			100	~0.5	~0.8	3,820	310	110	~0.6	~1.2	3,180	380	160	~0.7	~1.3	2,390	380

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the QM mill shank type milling cutter PME / PME-LS type, shorten the out stick length ℓ to about 60% of the above catalog conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (ZOMT*-PL type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)									
			20/21					25				
			No. of teeth 5N					No. of teeth 6N				
			ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118)	70	~5.0	~16.0	2,550	1,020	90	~5.0	~20.0	2,040	980
			120	~4.0	~8.0	2,290	800	140	~4.0	~10.0	1,830	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	PL type	JC8050 (JC8118)	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, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	70	~5.0	~16.0	2,390	600	90	~5.0	~20.0	1,910	570
			120	~4.0	~8.0	2,150	430	140	~4.0	~10.0	1,720	410
			190	~3.0	~4.0	1,910	290	210	~3.0	~8.0	1,530	280
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	70	~4.0	~16.0	1,910	480	90	~4.0	~20.0	1,530	460
			120	~3.0	~8.0	1,720	340	140	~3.0	~10.0	1,380	330
			190	~2.0	~4.0	1,530	230	210	~2.0	~8.0	1,220	220
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118	70	~3.5	~10.0	1,590	400	90	~3.5	~12.5	1,270	380
			120	~2.5	~5.0	1,430	290	140	~2.5	~6.2	1,150	280
			190	~1.2	~2.5	1,270	190	210	~1.2	~3.2	1,020	180
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118	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	PL type	JC8050	70	~5.0	~16.0	2,390	720	90	~5.0	~20.0	1,910	690
			120	~4.0	~8.0	2,150	540	140	~4.0	~10.0	1,720	520
			190	~3.0	~4.0	1,910	380	210	~3.0	~8.0	1,530	370

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (ZOMT*-PL type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)									
			30					32				
			No. of teeth 7N					No. of teeth 8N				
			ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118)	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	PL type	JC8050 (JC8118)	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, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	100	~5.0	~22.0	1,590	560	100	~5.0	~22.0	1,490	600
			150	~4.0	~15.0	1,430	400	150	~4.0	~15.0	1,340	430
			210	~3.0	~8.0	1,270	270	210	~3.0	~8.0	1,190	290
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	100	~5.0	~22.0	1,270	440	100	~5.0	~22.0	1,190	480
			150	~4.0	~15.0	1,150	320	150	~4.0	~15.0	1,070	340
			210	~3.0	~8.0	1,020	210	210	~3.0	~8.0	950	230
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118	100	~4.0	~15.0	1,060	370	100	~4.0	~15.0	990	400
			150	~3.0	~7.5	950	270	150	~3.0	~7.5	900	290
			210	~2.0	~3.8	850	180	210	~2.0	~3.8	800	190
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118	100	~5.0	~24.0	1,590	890	100	~5.0	~24.0	1,490	950
			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	PL type	JC8050	100	~5.0	~22.0	1,590	670	100	~5.0	~22.0	1,490	720
			150	~4.0	~15.0	1,430	500	150	~4.0	~15.0	1,340	540
			210	~3.0	~8.0	1,270	360	210	~3.0	~8.0	1,190	380

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (YOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		10/11					12/13/14/15				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~50	≦1.2	≦0.10	12,600	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 SKD61, SKD11 (1.2344, 1.2379) Below 255HB	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 HPM7, PX5, P20 (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 NAK80, HPM1, P21 (1.2311, P21) 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 SKD61, DAC, DHA (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 SKD11, SLD, DC11 (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 FC, FCD (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 SUS304 Below 250HB	JC8015 (DH102)	~50	≦1.0	≦0.10	11,400	3,420	~60	≦1.0	≦0.10	9,550	4,300
		75	≦0.7	≦0.08	7,980	1,920	80	≦0.7	≦0.08	6,690	2,400
		100	≦0.5	≦0.08	7,980	1,600	110	≦0.5	≦0.08	6,690	2,000
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~50	≦1.0	≦0.10	2,520	600	~60	≦1.0	≦0.10	2,120	760
		75	≦0.7	≦0.08	1,740	350	80	≦0.7	≦0.08	1,480	450
		100	≦0.5	≦0.08	1,740	280	110	≦0.5	≦0.08	1,480	360

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the QM mill shank type milling cutter PME / PME-LS type, shorten the out stick length ℓ to about 60% of the above catalog conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (YOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		16/17/18					20/21				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	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 SKD61, SKD11 (1.2344, 1.2379) Below 255HB	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 HPM7, PX5, P20 (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 NAK80, HPM1, P21 (1.2311, P21) 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	1,560	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 SKD61, DAC, DHA (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 SKD11, SLD, DC11 (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 FC, FCD (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 SUS304 Below 250HB	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	1,600	760	~100	≦1.0	≦0.10	1,260	760
		120	≦0.7	≦0.08	1,120	450	150	≦0.7	≦0.08	870	450
		160	≦0.5	≦0.08	1,120	360	190	≦0.5	≦0.08	870	360

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the QM mill shank type milling cutter PME / PME-LS type, shorten the out stick length ℓ to about 60% of the above catalog conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (YOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		25					30					32				
		No. of teeth 6N					No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (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 SKD61, SKD11 (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 HPM7, PX5, P20 (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	2,230	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 NAK80, HPM1, P21 (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 SKD61, DAC, DHA (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 SKD11, SLD, DC11 (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 FC, FCD (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 SUS304 Below 250HB	JC8015 (DH102)	~120	≦1.0	≦0.10	4,580	4,120	~160	≦1.0	≦0.10	3,800	3,990	~160	≦1.0	≦0.10	3,580	4,300
		190	≦0.7	≦0.08	3,200	2,300	240	≦0.7	≦0.08	2,660	2,230	240	≦0.7	≦0.08	2,500	2,400
		235	≦0.5	≦0.08	3,200	1,920	290	≦0.5	≦0.08	2,660	1,860	290	≦0.5	≦0.08	2,500	2,000
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~120	≦1.0	≦0.10	1,020	730	~160	≦1.0	≦0.10	840	710	~160	≦1.0	≦0.10	800	760
		190	≦0.7	≦0.08	710	430	240	≦0.7	≦0.08	580	410	240	≦0.7	≦0.08	560	450
		235	≦0.5	≦0.08	710	340	290	≦0.5	≦0.08	580	320	290	≦0.5	≦0.08	560	360

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (YOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		10/11					12/13/14/15				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (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 SKD61, SKD11 (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 HPM7, PX5, P20 (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 NAK80, HPM1, P21 (1.2311, P21) 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 SKD61, DAC, DHA (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 SKD11, SLD, DC11 (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 FC, FCD (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 SUS304 Below 250HB	JC8015 (DH102)	~50	≦0.12	5~10	7,320	2,640	~60	≦0.12	6~12	6,100	3,290
		75	≦0.10	5~10	5,460	1,580	80	≦0.10	6~12	4,580	1,980
		100	≦0.10	5~8	4,740	1,190	110	≦0.10	6~10	3,960	1,500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~50	≦0.12	5~10	1,560	370	~60	≦0.12	6~12	1,330	480
		75	≦0.10	5~10	1,200	230	80	≦0.10	6~12	1,000	290
		100	≦0.10	5~8	1,020	170	110	≦0.10	6~10	860	220

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the QM mill shank type milling cutter PME / PME-LS type, shorten the protrusion length ℓ to about 60% of the above catalog conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (YOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		16/17/18					20/21				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (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 SKD61, SKD11 (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	2,980	1,500	190	≦0.10	10~16	2,370	1,500
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	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
Mold steel NAK80, HPM1, P21 (1.2311, P21) 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 SKD61, DAC, DHA (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 SKD11, SLD, DC11 (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 FC, FCD (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 SUS304 Below 250HB	JC8015 (DH102)	~80	≦0.12	8~16	4,580	3,290	~100	≦0.12	10~20	3,660	3,290
		120	≦0.10	8~16	3,440	1,980	150	≦0.10	10~20	2,730	1,980
		160	≦0.10	8~13	2,980	1,500	190	≦0.10	10~16	2,370	1,500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~80	≦0.12	8~16	1,000	480	~100	≦0.12	10~20	780	480
		120	≦0.10	8~16	740	290	150	≦0.10	10~20	600	290
		160	≦0.10	8~13	640	220	190	≦0.10	10~16	510	220

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Mill Modular Head QM Series MPM TYPE

RECOMMENDED CUTTING CONDITIONS

QM Mill MPM type (YOHW type insert for high feed)
+ Anti Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		25					30					32				
		No. of teeth 6N					No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (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 SKD61, SKD11 (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 HPM7, PX5, P20 (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 NAK80, HPM1, P21 (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 SKD61, DAC, DHA (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 SKD11, SLD, DC11 (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 FC, FCD (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 SUS304 Below 250HB	JC8015 (DH102)	~120	≦0.12	12~25	2,930	3,160	~160	≦0.12	15~30	2,440	3,070	~160	≦0.12	16~32	2,290	3,290
		190	≦0.12	12~25	2,200	1,900	240	≦0.12	15~30	1,820	1,830	240	≦0.12	16~32	1,720	1,980
		235	≦0.10	12~20	1,900	1,440	290	≦0.10	15~24	1,590	1,390	290	≦0.10	16~26	1,490	1,500
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~120	≦0.12	12~25	640	460	~160	≦0.12	15~30	520	440	~160	≦0.12	16~32	500	480
		190	≦0.10	12~25	480	280	240	≦0.10	15~30	400	270	240	≦0.10	16~32	370	290
		235	≦0.06	12~20	420	210	290	≦0.06	15~24	340	200	290	≦0.06	16~26	320	220

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

Quick & Mini
QM MAX

New generation high feed mill “QM MAX”

Modular type
ϕ16 ~ ϕ42

Bore type
ϕ40 ~ ϕ66

G-Body

Low resistance

A high-efficiency machining tool that can be machined at ap = 1.0 mm with a low-resistance insert (cutting resistance reduced by 25% compared to conventional products) that has a unique three-dimensional shape. In addition, the cutting resistance and power value do not change even at a machining depth of 1.7 mm or more, and there is no problem in vertical wall machining.

Multi-blade

High feed machining is possible due to the multi-blade specifications, and a metal removal rate of 144cc / min (when using the ϕ32 modular type) is achieved.

Vibration free

When using the modular head MQX type, by combining the all-carbide shank arbor "Anti Vibration" with excellent anti-vibration effect, high efficiency machining and long insert life is expected without chattering.

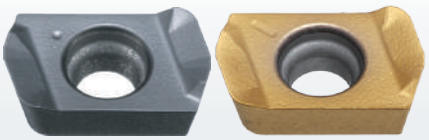
For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

QM Quick & Mini MAX Insert specification

High feed insert

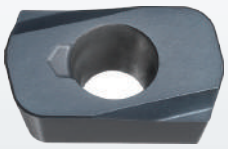


EPMT100312ZER EPMT100312ZER

High feed insert for unfavorable condition

EPMW100312ZER EPMW100312ZTR EPMW100312ZTR

For high hardness materials Hard insert



EPHW100316ZTR

Shoulder milling insert for aluminum alloy

ZPMT1003 ... ZER-NL
(Corner R0.2, 0.4, 0.8, 2.0)

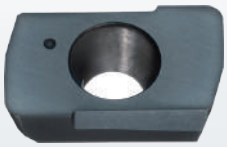
For steel shoulder milling

ZPMT1003...ZER-PL
(Corner R0.4, 0.8, 2.0)

For titanium shoulder milling

ZPMT1003...ZER-SL
(Corner R0.4, 0.8, 2.0)

"MIRROR INSERT" for finishing side & bottom face



YPHW1003...ZER-...

CBN Insert

YPHW100308ZTR-F1

High feed and shoulder milling can be machined with same body. Moreover, adopted "Mirror Insert" achieved high efficient finishing on side & bottom face.

1) Adopted PVD Multilayer Coated grade "JC8118" possible to cut general steel, hardened material, titanium alloy and heat-resistant alloy.
2) Tough grade "JC8050" for interrupted cutting.
3) New PVD Coated grade "JC7560" improved heat-fracture resistance & impact strength and tool life.
4) Available now uncoated grade "FZ15" for shoulder milling of aluminum alloy.
5) "Mirror Insert" YPHW type and shoulder milling insert ZPMT-PL type adopted regular PVD coated grade "JC8015" that have a wide application.
6) Cermet "CX75" and new PVD coated grade "DH102" for high speed machining in hardened material.
7) Available now CBN grade for "Mirror Insert" YPHW type.

For high feed / profile / shoulder Milling
For bottom / side finishing

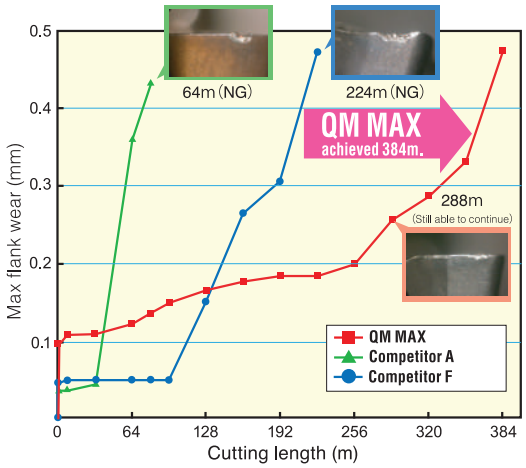
QM Max

QM Series MQX / QXP TYPE

■ Cutting performance of QM MAX against competitor

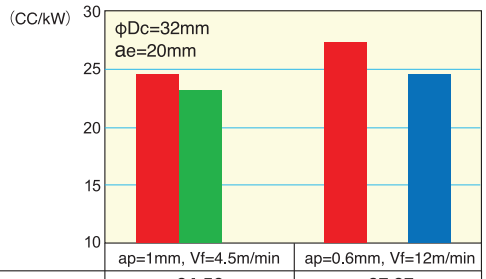
Tool life comparison

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.

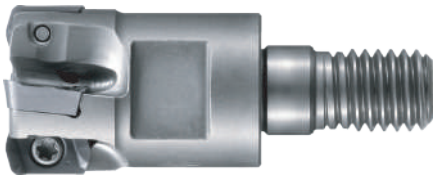
Power Saving Features

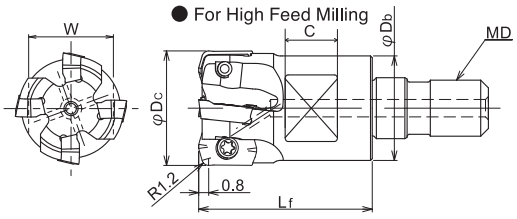
For high feed / profile / shoulder Milling
For bottom / side finishing

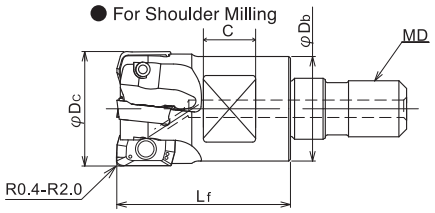
QM Max Modular Head QM Series MQX TYPE

G-Body

Through Coolant Hole







BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp screw	Parts: Wrench (Not included)
MQX-2016-M8	●	2	16	23	14	M8	8	12			
MQX-2017-M8	●	2	17	23	14	M8	8	12			
MQX-3020-M10	●	3	20	30	18	M10	9	14		TSW-2556H	
MQX-4020-M10	●	4	20	30	18	M10	9	14			
MQX-4021-M10	●	4	21	30	18	M10	9	14			
MQX-4025-M12	●	4	25	35	22.5	M12	10	17			
MQX-5025-M12	●	5	25	35	22.5	M12	10	17			
MQX-4026-M12	●	4	26	35	22.5	M12	10	17	EP**1003**Z*R		
MQX-5026-M12	●	5	26	35	22.5	M12	10	17	ZPMT1003**ZER		A-08
MQX-5030-M16	●	5	30	43	27	M16	12	22	YPHW1003**ZER-**		
MQX-5032-M16	●	5	32	43	29	M16	12	22		DSW-2563H	
MQX-6032-M16	●	6	32	43	29	M16	12	22			
MQX-5035-M16	●	5	35	43	29	M16	12	22			
MQX-6035-M16	●	6	35	43	29	M16	12	22			
MQX-6040-M16	●	6	40	43	32	M16	14	26			
MQX-7040-M16	●	7	40	43	32	M16	14	26			
MQX-6042-M16	●	6	42	43	32	M16	14	26			

Note) 1. All cutters are supplied without wrench & MOLY.
2. Please refer to pages E098 - E144 for recommended cutting conditions.
3. Refer to page D16 for the recommended tightening torque for modular heads.
(It is recommended to use a dedicated spanner <DS type> for M8 size.)

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

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

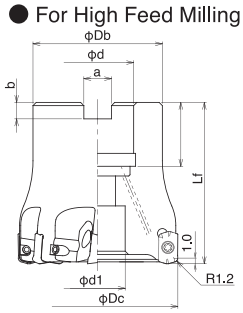
For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

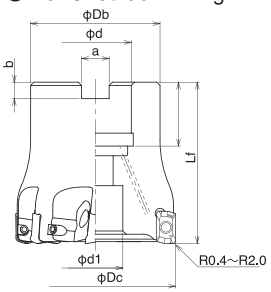
QM Series QXP TYPE

G-Body Through Coolant Hole

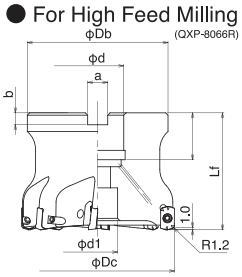
● For High Feed Milling



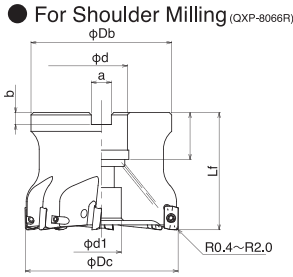
● For Shoulder Milling



● For High Feed Milling (QXP-8066R)



● For Shoulder Milling (QXP-8066R)

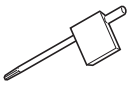


■ BODY / FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Inserts
Metric Bore	QXP-6040R-16	●	6	40	45	35	16	14	8.4	5.6	18	EP**1003**Z*R
	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	ZPMT1003**ZER
	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	YPHW1003**ZER-**
	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 wrench & MOLY.
2. Please refer to pages E098 - E144 for recommended cutting conditions.
3. Refer to page D16 for the recommended tightening torque for modular heads.
(It is recommended to use a dedicated spanner <DS type> for M8 size.)

■ PARTS

Clamp Screw	Wrench
	
DSW-2563H	A-08

Clamp Screw	Recommended Torque (N·m)
DSW-2563H	1.1

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

INSERTS

ZPMT-PL / NL / SL type insert: An insert for shoulder cutting that can be used for semi finishing to finishing on the side and bottom. A lineup for steel, aluminum, and titanium for each application.

High feed insert
(EPMT1003**ZER)

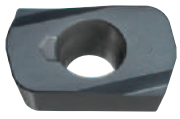
〈JC7560〉 Adapted

High feed insert for unfavorable condition
(EPMW100312ZER)

High feed insert for unfavorable condition
(EPMW100312ZTR)

〈JC7560〉 Adapted

High hardened steel
(EPHW100316ZTR)



Shoulder milling insert
(EPMT1003**ZER)

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

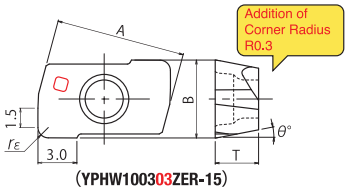
Polished

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

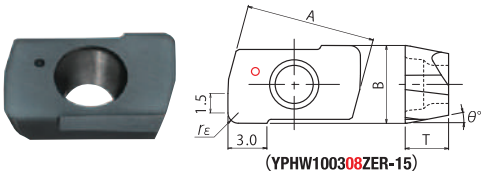
Shoulder milling insert for Ti-alloy
(ZPMT1003**ZER-SL)

"Mirror Insert" for finishing side & bottom face
(YPHW1003**ZER-15) (YPHW100308ZTR-F1) (YPHW100308ZER-F)

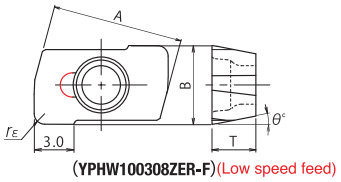
Addition of Corner Radius R0.3



(YPHW100303ZER-15)



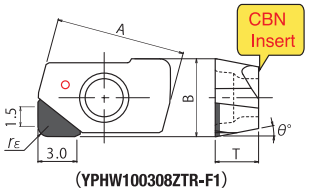
(YPHW100308ZER-15)



(YPHW100308ZER-F)(Low speed feed)

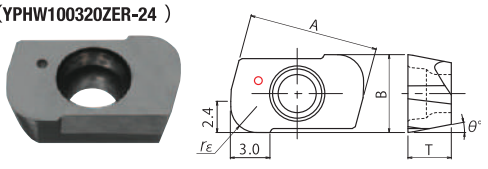
CBN Insert

CBN Insert



(YPHW100308ZTR-F1)

"Mirror insert" for finishing side & bottom face / contouring milling
(YPHW100320ZER-24)



For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series **MQX / QXP** TYPE

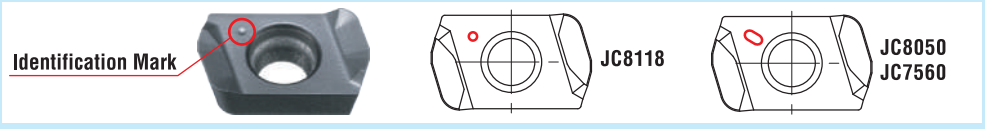
INSERTS

Type	Cat. No.	Tole-rance	PVD coated						Un-coated	Cermet	CBN	Dimensions (mm)				
			JC8118	DH102	JC7518	JC7560	JC8015	JC8050	FC18	CX75	JBN795	A	T	B	$r\varepsilon$	$\theta°$
High feed insert	EPMT100312ZER	M	●			●		●				10	3.2	6	1.2	11°
	EPMT100320ZER	M	●												2.0	
High feed insert for unfavorable condition	EPMW100312ZER	M	●					●				10	3.2	6	1.2	11°
	EPMW100312ZTR	M	●			●		●								
High hardened steel	EPHW100316ZTR	H	●	●								10	3.2	6	1.6	11°
Shoulder milling insert for aluminum alloy	ZPMT100304ZER-NL	M							●			10.08	3.4	6	0.4	11°
	ZPMT100308ZER-NL	M							●			10.08	3.4	6	0.8	11°
	ZPMT100320ZER-NL	M							●			10.08	3.4	6	2.0	11°
Shoulder milling insert for steel	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°
Shoulder milling insert for Ti-alloy	ZPMT100304ZER-SL	M			●							10.08	3.4	6	0.4	11°
	ZPMT100308ZER-SL	M			●							10.08	3.4	6	0.8	11°
	ZPMT100320ZER-SL	M			●							10.08	3.4	6	2.0	11°
"MIRROR INSERT" for finishing side & bottom face / contouring milling	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°
	YPHW100308ZTR-F1	H									●	10.06	3.35	6	0.8	11°
	YPHW100320ZER-24	H		●			●					10.06	3.35	6	2.0	11°

10 inserts per case, but JBN795 insert is packed in 1 piece per case.
Note) JC5118 has been replaced by JC8118.

Identification of grade for QM MILL insert

Identification for the grades has been defined by different mark.



● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX / QXP TYPE

■ CUTTING DATA

1. Improvement of SKD61 machining life (rough machining)

Overhung length: 60mm

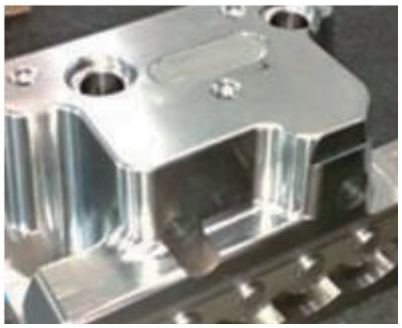
Work	Part name	Mold	
	Material	SKD61	
	Hardness	50～52HRC	
Tool	Tool No.	MQX-2017-M8 MSN-M8-40-S16C	
	Insert No.	EPHW100316ZTR DH102	
Cutting conditions	Cutting speed	n	3,000 (min^{-1})
		Vc	160 (m/min)
	Feed speed	Vf	2,500 (mm/min)
		f	0.84 (mm/rev)
	ap (mm)	0.5mm	
	ae (mm)	10mm	
	Coolant	Water-soluble cutting oil	
	Machine	Vertical MC	

Result

Even after 90 minutes of machining, continuous machining is possible with normal wear of the insert.
A machining life of about 1.5 times that of the conventional product was achieved.

2. Improvement of machining accuracy and efficiency of SKD61 (finishing)

Overhung length: 100mm



Work	Part name	Mold	
	Material	SKD61	
	Hardness	50～52HRC	
Tool	Tool No.	MQX-4021-M10 MSN-M10-70-S20C	
	Insert No.	YPHW100308ZER-15 DH102	
Cutting conditions	Cutting speed	n	3,000 (min^{-1})
		Vc	200 (m/min)
	Feed speed	Vf	1,000 (mm/min)
		f	0.33 (mm/rev)
	ap (mm)	0.15～0.18mm	
	ae (mm)	0.05mm	
	Coolant	Water-soluble cutting oil	
	Machine	Vertical MC	

Result

Improved machining accuracy of inclined surfaces. The machining efficiency is 1.25 times that of conventional ball end mills, and the long machining life is about 3 hours.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / 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) Below 255HB			
Cat.No. \ Grades	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EPMT1003＊＊ZER	☆	☆	☆		☆	☆	☆	
EPMW100312ZER								
EPMW100312ZTR	○	○	◎		○	○	◎	
EPHW100316ZTR								

Work Materials	Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC				Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC			
Cat.No. \ Grades	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EPMT1003＊＊ZER	☆	☆	☆		☆	☆		
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			
Cat.No. \ Grades	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EPMT1003＊＊ZER	☆				×	×		
EPMW100312ZER	○				○			
EPMW100312ZTR	●				●			
EPHW100316ZTR	◎							◎

Work Materials	Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB				Stainless steel SUS304 Below 250HB			
Cat.No. \ Grades	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EPMT1003＊＊ZER	○					◎	○	
EPMW100312ZER	◎					●		
EPMW100312ZTR	●		○					
EPHW100316ZTR								

Work Materials	Titanium alloy Ti-6Al-4V				Inconel INCO718			
Cat.No. \ Grades	JC8118	JC8050	JC7560	DH102	JC8118	JC8050	JC7560	DH102
EPMT1003＊＊ZER	○	○	◎		◎	○	○	
EPMW100312ZER		●				●		
EPMW100312ZTR								
EPHW100316ZTR								

・EPMW type : Without chipbreaker ・EPMT type : With chipbreaker

・EPHW type : Without chipbreaker

◎: First Choice, Good Condition ○: Moderate Condition

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

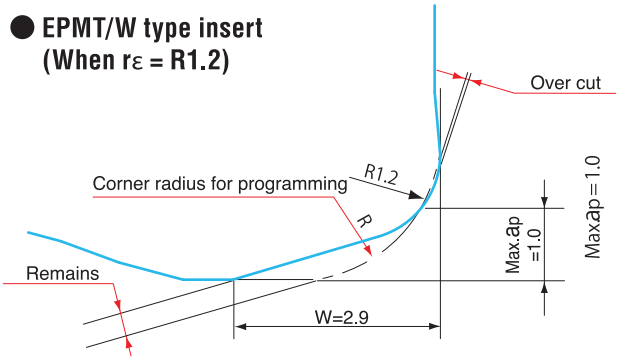
For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

Definition of corner radius for programming

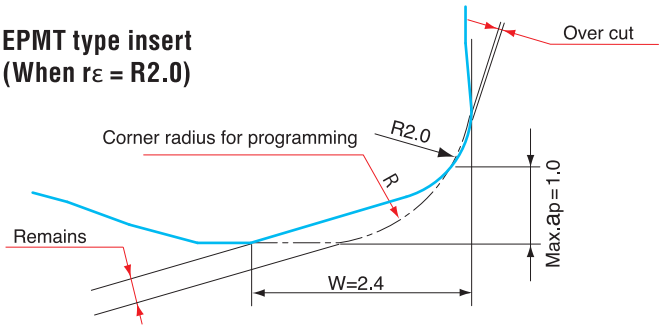
EPMT/W type insert (When rε = R1.2)



(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

EPMT type insert (When rε = R2.0)

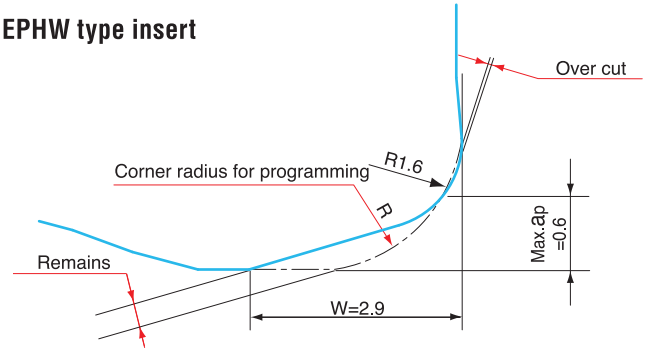


(mm)

Corner radius for programming	Over cut	Remains
R1.0	0	0.51
R1.5	0	0.31
R2.0(Recommended)	0	0.13
R2.5	0.12	0.04
R3.0	0.32	0

EPMT100320ZER reduces uncut parts
It is possible to reduce the burden on the next process.

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

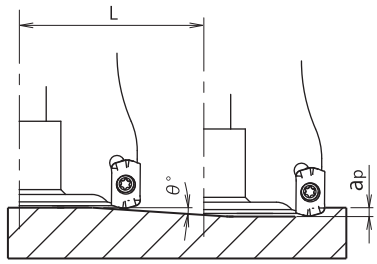
For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

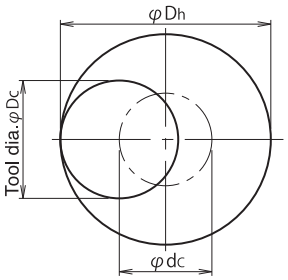
QM Series **MQX / QXP** TYPE

Instructions for profile milling with EMPT/W type insert

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

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

Tool pass dia. Bore dia. Tool dia.

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

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

Note :
- 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.

For ZPMT 100312ZER insert

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at 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	1.8	25.5	22	30	0.6
MQX-＊017-M8	17	11.2	0.8	1.6	28.6	24	32	0.6
MQX-＊020-M10	20	14.1	0.8	1.4	32.7	30	38	0.6
MQX-＊021-M10	21	15.1	0.8	1.3	35.3	32	40	0.6
MQX-＊025-M12	25	19.1	0.8	1	45.8	40	48	0.6
MQX-＊026-M12	26	20.1	0.8	0.95	48.2	42	50	0.6
MQX-＊028-M12	28	22.1	0.8	0.85	53.9	46	54	0.6
MQX-＊030-M16	30	24.1	0.8	0.8	57.3	50	58	0.5
MQX-＊032-M16	32	26.1	0.8	0.7	65.5	54	62	0.5
MQX-＊035-M16	35	29.1	0.8	0.6	76.4	60	68	0.5
MQX-＊040-M16	40	34.1	0.8	0.5	91.7	70	78	0.6
MQX-＊042-M16	42	36.2	0.8	0.45	101.9	74	82	0.6
QXP-＊040R-16	40	34.1	1	0.5	114.6	70	78	0.6
QXP-＊050R-＊＊	50	44.1	1	0.4	143.2	90	98	0.6
QXP-8052R-22	52	46.1	1	0.35	163.7	94	102	0.6
QXP-8063R-＊＊	63	57.1	1	0.3	191	116	124	0.6
QXP-8066R-＊＊	66	60.1	1	0.3	191	122	130	0.6

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

For EPMT100320ZER insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	11.2	0.8	2.3	19.9	24	30	0.7
MQX-＊017-M8	17	12.2	0.8	2	22.9	26	32	0.7
MQX-＊020-M10	20	15.1	0.8	1.5	30.6	32	38	0.7
MQX-＊021-M10	21	16.1	0.8	1.4	32.7	34	40	0.7
MQX-＊025-M12	25	20.1	0.8	1.1	41.7	42	48	0.6
MQX-＊026-M12	26	21.1	0.8	1	45.8	44	50	0.6
MQX-＊028-M12	28	23.1	0.8	0.9	50.9	48	54	0.6
MQX-＊030-M16	30	25.1	0.8	0.85	53.9	52	58	0.6
MQX-＊032-M16	32	27.1	0.8	0.75	61.1	56	62	0.6
MQX-＊035-M16	35	30.1	0.8	0.65	70.5	62	68	0.6
MQX-＊040-M16	40	35.1	0.8	0.55	83.3	72	78	0.7
MQX-＊042-M16	42	37.1	0.8	0.55	83.3	76	82	0.7
QXP-＊040R-16	40	35.1	1	0.55	104.2	72	78	0.7
QXP-＊050R-＊＊	50	45.1	1	0.4	143.2	92	98	0.7
QXP-8052R-22	52	47.2	1	0.4	143.2	96	102	0.7
QXP-8063R-＊＊	63	58.2	1	0.3	191	118	124	0.7
QXP-8066R-＊＊	66	61.2	1	0.3	191	124	130	0.7

For EPMW100312ZTR insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at 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	1.7	27	22	30	0.6
MQX-＊017-M8	17	11.2	0.8	1.5	30.6	24	32	0.6
MQX-＊020-M10	20	14.1	0.8	1.3	35.3	30	38	0.6
MQX-＊021-M10	21	15.1	0.8	1.2	38.2	32	40	0.6
MQX-＊025-M12	25	19.1	0.8	0.9	50.9	40	48	0.6
MQX-＊026-M12	26	20.1	0.8	0.85	53.9	42	50	0.6
MQX-＊028-M12	28	22.1	0.8	0.75	61.1	46	54	0.6
MQX-＊030-M16	30	24.1	0.8	0.7	65.5	50	58	0.5
MQX-＊032-M16	32	26.1	0.8	0.6	76.4	54	62	0.5
MQX-＊035-M16	35	29.1	0.8	0.5	91.7	60	68	0.5
MQX-＊040-M16	40	34.1	0.8	0.4	114.6	70	78	0.6
MQX-＊042-M16	42	36.2	0.8	0.35	131	74	82	0.6
QXP-＊040R-16	40	34.1	1	0.4	143.2	70	78	0.6
QXP-＊050R-＊＊	50	44.1	1	0.3	191	90	98	0.6
QXP-8052R-22	52	46.1	1	0.25	229.2	94	102	0.6
QXP-8063R-＊＊	63	57.1	1	0.2	286.5	116	124	0.6
QXP-8066R-＊＊	66	60.1	1	0.2	286.5	122	130	0.6

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

For EPHW100316ZTR insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	10.2	0.6	1.1	31.2	22	30	0.6
MQX-＊017-M8	17	11.2	0.6	1	34.4	24	32	0.6
MQX-＊020-M10	20	14.1	0.6	0.8	43	30	38	0.6
MQX-＊021-M10	21	15.1	0.6	0.7	49.1	32	40	0.6
MQX-＊025-M12	25	19.1	0.6	0.55	62.5	40	48	0.6
MQX-＊026-M12	26	20.1	0.6	0.5	68.8	42	50	0.6
MQX-＊028-M12	28	22.1	0.6	0.45	76.4	46	54	0.6
MQX-＊030-M16	30	24.1	0.6	0.4	85.9	50	58	0.5
MQX-＊032-M16	32	26.1	0.6	0.4	85.9	54	62	0.5
MQX-＊035-M16	35	29.1	0.6	0.35	98.2	60	68	0.5
MQX-＊040-M16	40	34.1	0.6	0.3	114.6	70	78	0.6
MQX-＊042-M16	42	36.2	0.6	0.25	137.5	74	82	0.6
QXP-＊040R-16	40	34.1	0.6	0.3	114.6	70	78	0.6
QXP-＊050R-＊＊	50	44.1	0.6	0.2	171.9	90	98	0.6
QXP-8052R-22	52	46.1	0.6	0.2	171.9	94	102	0.6
QXP-8063R-＊＊	63	57.1	0.6	0.15	229.2	116	124	0.6
QXP-8066R-＊＊	66	60.1	0.6	0.15	229.2	122	130	0.6

ZPMT100304ZER-## For insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	15	0.8	3	15.3	27.6	30.4	0.6
MQX-＊017-M8	17	16	0.8	3.2	14.3	29.6	32.4	0.6
MQX-＊020-M10	20	19	0.8	2.4	19.1	35.6	38.4	0.6
MQX-＊021-M10	21	20	0.8	2.2	20.8	37.6	40.4	0.6
MQX-＊025-M12	25	24	0.8	1.7	27	45.6	48.4	0.6
MQX-＊026-M12	26	25	0.8	1.6	28.6	47.6	50.4	0.6
MQX-＊028-M12	28	27	0.8	1.5	30.6	51.6	54.4	0.6
MQX-＊030-M16	30	29	0.8	1.3	35.3	55.6	58.4	0.5
MQX-＊032-M16	32	31	0.8	1.2	38.2	59.6	62.4	0.5
MQX-＊035-M16	35	34	0.8	1.1	41.7	65.6	68.4	0.5
MQX-＊040-M16	40	39	0.8	0.95	48.2	75.6	78.4	0.6
MQX-＊042-M16	42	41	0.8	0.85	53.9	79.6	82.4	0.6
QXP-＊040R-16	40	39	1	0.95	60.3	75.6	78.4	0.6
QXP-＊050R-＊＊	50	49	1	0.7	81.8	95.6	98.4	0.6
QXP-8052R-22	52	51	1	0.65	88.1	99.6	102.4	0.6
QXP-8063R-＊＊	63	62	1	0.55	104.2	121.6	124.4	0.6
QXP-8066R-＊＊	66	65	1	0.5	114.6	127.6	130.4	0.6

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

For ZPMT100308ZER-## insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	14.2	0.8	3	15.3	26.8	29.6	0.6
MQX-＊017-M8	17	15.2	0.8	3.2	14.3	28.8	31.6	0.6
MQX-＊020-M10	20	18.2	0.8	2.4	19.1	34.8	37.6	0.6
MQX-＊021-M10	21	19.2	0.8	2.2	20.8	36.8	39.6	0.6
MQX-＊025-M12	25	23.2	0.8	1.7	27	44.8	47.6	0.6
MQX-＊026-M12	26	24.2	0.8	1.6	28.6	46.8	49.6	0.6
MQX-＊028-M12	28	26.2	0.8	1.5	30.6	50.8	53.6	0.6
MQX-＊030-M16	30	28.2	0.8	1.3	35.3	54.8	57.6	0.5
MQX-＊032-M16	32	30.2	0.8	1.2	38.2	58.8	61.6	0.5
MQX-＊035-M16	35	33.2	0.8	1.1	41.7	64.8	67.6	0.5
MQX-＊040-M16	40	38.2	0.8	0.95	48.2	74.8	77.6	0.6
MQX-＊042-M16	42	40.2	0.8	0.85	53.9	78.8	81.6	0.6
QXP-＊040R-16	40	38.2	1	0.95	60.3	74.8	77.6	0.6
QXP-＊050R-＊＊	50	48.2	1	0.7	81.8	94.8	97.6	0.6
QXP-8052R-22	52	50.2	1	0.65	88.1	98.8	101.6	0.6
QXP-8063R-＊＊	63	61.2	1	0.55	104.2	120.8	123.6	0.6
QXP-8066R-＊＊	66	64.2	1	0.5	114.6	126.8	129.6	0.6

For ZPMT100320ZER-## insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	11.8	0.8	3	15.3	22	27.2	0.6
MQX-＊017-M8	17	12.8	0.8	3.2	14.3	24	29.2	0.6
MQX-＊020-M10	20	15.8	0.8	2.4	19.1	30	35.2	0.6
MQX-＊021-M10	21	16.8	0.8	2.2	20.8	32	37.2	0.6
MQX-＊025-M12	25	20.8	0.8	1.7	27.0	40	45.2	0.6
MQX-＊026-M12	26	21.8	0.8	1.6	28.6	42	47.2	0.6
MQX-＊028-M12	28	23.8	0.8	1.5	30.6	46	51.2	0.6
MQX-＊030-M16	30	25.8	0.8	1.3	35.3	50	55.2	0.5
MQX-＊032-M16	32	27.8	0.8	1.2	38.2	54	59.2	0.5
MQX-＊035-M16	35	30.8	0.8	1.1	41.7	60	65.2	0.5
MQX-＊040-M16	40	35.8	0.8	0.95	48.2	70	75.2	0.6
MQX-＊042-M16	42	37.8	0.8	0.85	53.9	74	79.2	0.6
QXP-＊040R-16	40	35.8	1	0.95	60.3	70	75.2	0.6
QXP-＊050R-＊＊	50	45.8	1	0.7	81.8	90	95.2	0.6
QXP-8052R-22	52	47.8	1	0.65	88.1	94	99.2	0.6
QXP-8063R-＊＊	63	58.8	1	0.55	104.2	116	121.2	0.6
QXP-8066R-＊＊	66	61.8	1	0.5	114.6	122	127.2	0.6

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series **MQX / QXP** TYPE

For YPHW100303 ZER-15 insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	15.3	0.3	1.3	13.2	29	30.7	0.2
MQX-＊017-M8	17	16.3	0.3	1.7	10.1	31	32.7	0.3
MQX-＊020-M10	20	19.3	0.3	2.1	8.2	37	38.7	0.3
MQX-＊021-M10	21	20.3	0.3	2.4	7.2	39	40.7	0.3
MQX-＊025-M12	25	24.3	0.3	1.8	9.5	47	48.7	0.3
MQX-＊026-M12	26	25.3	0.3	1.7	10.1	49	50.7	0.3
MQX-＊028-M12	28	27.3	0.3	1.6	10.7	53	54.7	0.3
MQX-＊030-M16	30	29.3	0.3	1.4	12.3	57	58.7	0.3
MQX-＊032-M16	32	31.3	0.3	1.3	13.2	61	62.7	0.3
MQX-＊035-M16	35	34.3	0.3	1.2	14.3	67	68.7	0.3
MQX-＊040-M16	40	39.3	0.3	1	17.2	77	78.7	0.3
MQX-＊042-M16	42	41.3	0.3	0.9	19.1	81	82.7	0.3
QXP-＊040R-16	40	39.3	0.3	1	17.2	77	78.7	0.3
QXP-＊050R-＊＊	50	49.3	0.3	0.75	22.9	97	98.7	0.3
QXP-8052R-22	52	51.3	0.3	0.7	24.6	101	102.7	0.3
QXP-8063R-＊＊	63	62.3	0.3	0.6	28.6	123	124.7	0.3
QXP-8066R-＊＊	66	65.3	0.3	0.55	31.3	129	130.7	0.3

For YPHW100308ZER-15 insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	14.3	0.3	1.4	12.3	27	29.7	0.2
MQX-＊017-M8	17	15.3	0.3	1.8	9.5	29	31.7	0.3
MQX-＊020-M10	20	18.3	0.3	2.2	7.8	35	37.7	0.3
MQX-＊021-M10	21	19.3	0.3	2.5	6.9	37	39.7	0.3
MQX-＊025-M12	25	23.3	0.3	1.9	9	45	47.7	0.3
MQX-＊026-M12	26	24.3	0.3	1.8	9.5	47	49.7	0.3
MQX-＊028-M12	28	26.3	0.3	1.7	10.1	51	53.7	0.3
MQX-＊030-M16	30	28.3	0.3	1.5	11.5	55	57.7	0.3
MQX-＊032-M16	32	30.3	0.3	1.4	12.3	59	61.7	0.3
MQX-＊035-M16	35	33.3	0.3	1.2	14.3	65	67.7	0.3
MQX-＊040-M16	40	38.3	0.3	1	17.2	75	77.7	0.3
MQX-＊042-M16	42	40.3	0.3	0.9	19.1	79	81.7	0.3
QXP-＊040R-16	40	38.3	0.3	1	17.2	75	77.7	0.3
QXP-＊050R-＊＊	50	48.3	0.3	0.75	22.9	95	97.7	0.3
QXP-8052R-22	52	50.3	0.3	0.7	24.6	99	101.7	0.3
QXP-8063R-＊＊	63	61.3	0.3	0.6	28.6	121	123.7	0.3
QXP-8066R-＊＊	66	64.3	0.3	0.55	31.3	127	129.7	0.3

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series MQX / QXP TYPE

For YPHW100320ZER-24 insert

Cat. No.	Tool dia. ϕDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
MQX-＊016-M8	16	11.9	0.3	1.9	9.0	22.2	27.3	0.3
MQX-＊017-M8	17	12.9	0.3	2.2	7.8	24.2	29.3	0.3
MQX-＊020-M10	20	15.9	0.3	2.5	6.9	30.2	35.3	0.3
MQX-＊021-M10	21	16.9	0.3	2.8	6.1	32.2	37.3	0.3
MQX-＊025-M12	25	20.9	0.3	2.2	7.8	40.2	45.3	0.3
MQX-＊026-M12	26	21.9	0.3	2	8.6	42.2	47.3	0.3
MQX-＊028-M12	28	23.9	0.3	1.8	9.5	46.2	51.3	0.3
MQX-＊030-M16	30	25.9	0.3	1.6	10.7	50.2	55.3	0.3
MQX-＊032-M16	32	27.9	0.3	1.5	11.5	54.2	59.3	0.3
MQX-＊035-M16	35	30.9	0.3	1.4	12.3	60.2	65.3	0.3
MQX-＊040-M16	40	35.9	0.3	1.1	15.6	70.2	75.3	0.3
MQX-＊042-M16	42	37.9	0.3	1.1	15.6	74.2	79.3	0.3
QXP-＊040R-16	40	35.9	0.3	1.1	15.6	70.2	75.3	0.3
QXP-＊050R-＊＊	50	45.9	0.3	0.9	19.1	90.2	95.3	0.3
QXP-8052R-22	52	47.9	0.3	0.85	20.2	94.2	99.3	0.3
QXP-8063R-＊＊	63	58.9	0.3	0.65	26.4	116.2	121.3	0.3
QXP-8066R-＊＊	66	61.9	0.3	0.65	26.4	122.2	127.3	0.3

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (EPMT/W type insert for high feed) + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560	~70	0.6	~10	3,600	4,900	~70	0.6	~14	2,850	5,800	~70	0.6	~14	2,850	7,700
	(JC8050)	120	0.5	~10	3,600	4,500	120	0.5	~14	2,850	5,300	120	0.5	~14	2,850	7,000
	(JC8118)	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	~70	0.6	~10	3,600	4,900	~70	0.6	~14	2,850	5,800	~70	0.6	~14	2,850	7,700
	(JC8050)	120	0.5	~10	3,600	4,500	120	0.5	~14	2,850	5,300	120	0.5	~14	2,850	7,000
	(JC8118)	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) 30-36HRC	JC7560	~70	0.6	~10	3,600	4,900	~70	0.6	~14	2,850	5,800	~70	0.6	~14	2,850	7,700
	(JC8050)	120	0.5	~10	3,600	4,500	120	0.5	~14	2,850	5,300	120	0.5	~14	2,850	7,000
	(JC8118)	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	~70	0.5	~10	1,900	2,600	~70	0.5	~14	1,500	3,050	~70	0.5	~14	1,500	4,050
	(JC8118)	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	~70	0.4	~10	1,400	1,400	~70	0.4	~14	1,100	1,650	~70	0.4	~14	1,100	2,200
	(JC8050)	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 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	~70	0.8	~10	3,000	5,000	~70	0.8	~14	2,400	6,000	~70	0.8	~14	2,400	8,000
	(JC7560)	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	~70	0.6	~10	3,100	4,200	~70	0.6	~14	2,500	5,100	~70	0.6	~14	2,500	6,800
	(JC8050)	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	~70	0.5	~10	1,200	960	~70	0.5	~14	950	1,140	~70	0.5	~14	950	1,500
	(JC8118)	120	0.3	~10	1,200	960	120	0.3	~14	950	1,140	120	0.3	~14	950	1,500
	(JC8050)	160	0.2	~10	1,200	960	190	0.2	~14	950	1,140	190	0.2	~14	950	1,500
Inconel (INCO718)	JC8118	~70	0.5	~10	630	380	~70	0.5	~14	500	450	~70	0.5	~14	500	600
	(JC8050)	120	0.3	~10	630	380	120	0.3	~14	500	450	120	0.3	~14	500	600
	(JC7560)	160	0.2	~10	630	380	190	0.2	~14	500	450	190	0.2	~14	500	600

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the ZPMT100320ZER-PL type insert for shoulder cutting in high feed machining, refer the above catalog and please use 10% to 30% lower cutting conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (EPMT/W type insert for high feed) + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		25/26					25/26/28				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (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) (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) (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 (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 (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 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 (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 (JC8118) (JC8050)	~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)	JC8118 (JC8050) (JC7560)	~90	0.5	~19	400	480	~90	0.5	~19	400	600
		140	0.3	~19	400	480	140	0.3	~19	400	600
		210	0.2	~19	400	480	210	0.2	~19	400	600

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the ZPMT100320ZER-PL type insert for shoulder cutting in high feed machining, refer the above catalog and please use 10% to 30% lower cutting conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (EPMT/W type insert for high feed) + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 30/32/35 No. of teeth 5N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	32/35 No. of teeth 6N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (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) (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 (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 (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 (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 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 (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 (JC8118) (JC8050)	~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)	JC8118 (JC8050) (JC7560)	~100	0.5	~25	300	500	~100	0.5	~25	300	580
		150	0.3	~25	300	500	150	0.3	~25	300	580
		210	0.2	~25	300	500	210	0.2	~25	300	580

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

NOTE

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 same 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) When using the ZPMT100320ZER-PL type insert for shoulder cutting in high feed machining, refer the above catalog and please use 10% to 30% lower cutting conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (EPMT/W type insert for high feed) + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40/42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (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) (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) (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 (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 (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 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 (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 (JC8118) (JC8050)	~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)	JC8118 (JC8050) (JC7560)	~100	0.5	~32	250	450	~100	0.5	~32	250	520
		150	0.3	~32	250	450	150	0.3	~32	250	520
		210	0.2	~32	250	450	210	0.2	~32	250	520

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

■ NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) When using the ZPMT100320ZER-PL type insert for shoulder cutting in high feed machining, refer the above catalog and please use 10% to 30% lower cutting conditions.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

EPMT/W type insert for high feed + QM Max Shell type milling cutter

Work Materials	Insert Grades	Over-hung Length (mm)	Tool dia. (mm) 40							
			No. of teeth 6N				No. of teeth 7N			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC8118)	~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) (JC8118)	~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) (JC8118)	~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 (JC8118)	~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	JC8118 (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	JC8118 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	JC8118 (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	—	—	—	—	—	—	—	—
Stainless 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 (JC8118) (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)	JC8118 (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, ap : Axial depth of cut, ae : Radial depth of cut, n : Spindle speed, Vf : Feed speed

NOTE

Please refer page E105

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS

● EPMT/W type insert for high feed + QM Max Shell type milling cutter

Work Materials	Insert Grades	Over-hung Length (mm)	Tool dia. (mm) 50 No. of teeth 7N ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	50/52 No. of teeth 8N ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC8118)	~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) (JC8118)	~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) (JC8118)	~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 (JC8118)	~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	JC8118 (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	JC8118 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	JC8118 (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 (JC8118) (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)	JC8118 (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, ap : Axial depth of cut, ae : Radial depth of cut, n : Spindle speed, Vf : Feed speed

■ NOTE

Please refer page E105

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

EPMT/W type insert for high feed + QM Max Shell type milling cutter

Work Materials	Insert Grades	Over-hung Length ℓ (mm)	Tool dia. (mm) 63/66 No. of teeth 8N ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC7560 (JC8050) (JC8118)	~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) (JC8118)	~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) (JC8118)	~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 (JC8118)	~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	JC8118 (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	JC8118 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	JC8118 (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 (JC8118) (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)	JC8118 (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, ap : Axial depth of cut, ae : Radial depth of cut, n : Spindle speed, Vf : Feed speed

NOTE

Please refer page E105

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● QM Max MQX type (EPHW type insert for high hardened material) + Anti-Vibration 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				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	0.30	~10	1,790	2,860	~80	0.30	~14	1,430	3,430	~80	0.30	~14	1,430	4,570
		100	0.25	~10	1,610	2,060	120	0.25	~14	1,290	2,480	120	0.25	~14	1,290	3,300
		130	0.20	~10	1,430	1,370	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	~70	0.20	~10	1,590	950	~80	0.20	~14	1,270	1,140	~80	0.20	~14	1,270	1,520
		100	0.15	~10	1,430	770	120	0.15	~14	1,140	920	120	0.15	~14	1,140	1,230
		130	0.10	~10	1,270	610	160	0.10	~14	1,020	730	160	0.10	~14	1,020	980

Work Materials	Insert Grades	Tool dia. (mm)									
		25 / 26					25 / 26 / 28				
		No. of teeth 4N					No. of teeth 5N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.30	~18	1,150	3,680	~100	0.30	~18	1,150	4,600
		150	0.25	~18	1,040	2,660	150	0.25	~18	1,040	3,330
		200	0.20	~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

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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

QM Max MQX type (EPHW type insert for high hardened material) +
Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30 / 32 / 35					32 / 35				
		No. of teeth 5N					No. of teeth 6N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~130	0.30	~24	900	3,600	~130	0.30	~24	900	4,320
		190	0.25	~24	810	2,590	190	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

Work Materials	Insert Grades	Tool dia. (mm)									
		40 / 42					40				
		No. of teeth 6N					No. of teeth 7N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~130	0.30	~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, 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● EPHW type insert for high hardness material + QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm)								
		40								
		No. of teeth 6N					No. of teeth 7N			
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	0.30	~32	720	3,460	0.30	~32	720	4,030
		150	0.25	~32	650	2,500	0.25	~32	650	2,910
		200	0.20	~32	580	1,670	0.20	~32	580	1,950
		250	0.10	~32	580	1,670	0.10	~32	580	1,950
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~100	0.20	~32	640	1,150	0.20	~32	640	1,340
		150	0.15	~32	580	940	0.15	~32	580	1,100
		200	0.10	~32	510	740	0.10	~32	510	860
		250	–	–	–	–	–	–	–	–

Work Materials	Insert Grades	Tool dia. (mm)								
		50					50 / 52			
		No. of teeth 7N					No. of teeth 8N			
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	0.30	~40	570	3,190	0.30	~40	570	3,650
		200	0.25	~40	510	2,280	0.25	~40	510	2,610
		250	0.20	~40	460	1,550	0.20	~40	460	1,770
		300	0.10	~40	460	1,550	0.10	~40	460	1,770
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.20	~40	510	1,070	0.20	~40	510	1,220
		200	0.15	~40	460	870	0.15	~40	460	990
		250	0.10	~40	410	690	0.10	~40	410	790
		300	–	–	–	–	–	–	–	–

Work Materials	Insert Grades	Tool dia. (mm)								
		63 / 66								
		No. of teeth 8N								
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)				
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~200	0.30	~50	450	2,880				
		250	0.25	~50	410	2,100				
		300	0.20	~50	360	1,380				
		350	0.10	~50	360	1,380				
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~200	0.20	~50	400	960				
		250	0.15	~50	360	780				
		300	0.10	~50	320	610				
		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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type ZPMT*-PL / NL / SL type insert for Shoulder milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)													
			16 / 17					20					20 / 21			
			No. of teeth 2N					No. of teeth 3N					No. of teeth 4N			
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~80	≦5.0	≦12.8	3,180	950	~100	≦5.0	≦16.0	2,550	1,150	≦5.0	≦16.0	2,550	1,530
			120	≦3.0	≦6.4	2,860	770	150	≦3.0	≦8.0	2,300	930	≦3.0	≦8.0	2,300	1,240
			160	≦2.0	≦3.2	2,540	610	190	≦2.0	≦4.0	2,040	730	≦2.0	≦4.0	2,040	980
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~80	≦5.0	≦12.8	2,980	890	~100	≦5.0	≦16.0	2,390	1,080	≦5.0	≦16.0	2,390	1,430
			120	≦3.0	≦6.4	2,680	720	150	≦3.0	≦8.0	2,150	870	≦3.0	≦8.0	2,150	1,160
			160	≦2.0	≦3.2	2,380	570	190	≦2.0	≦4.0	1,910	690	≦2.0	≦4.0	1,910	920
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~80	≦5.0	≦12.8	2,980	890	~100	≦5.0	≦16.0	2,390	1,080	≦5.0	≦16.0	2,390	1,430
			120	≦3.0	≦6.4	2,680	720	150	≦3.0	≦8.0	2,150	870	≦3.0	≦8.0	2,150	1,160
			160	≦2.0	≦3.2	2,380	570	190	≦2.0	≦4.0	1,910	690	≦2.0	≦4.0	1,910	920
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~80	≦4.0	≦9.6	2,390	570	~100	≦4.0	≦12.0	1,910	690	≦4.0	≦12.0	1,910	920
			120	≦2.5	≦4.8	2,150	470	150	≦2.5	≦6.0	1,720	570	≦2.5	≦6.0	1,720	760
			160	≦2.0	≦2.4	1,910	380	190	≦2.0	≦3.0	1,530	460	≦2.0	≦3.0	1,530	610
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~80	≦3.5	≦8.0	1,990	480	~100	≦3.5	≦10.0	1,590	570	≦3.5	≦10.0	1,590	760
			120	≦2.5	≦4.0	1,790	390	150	≦2.5	≦5.0	1,430	460	≦2.5	≦5.0	1,430	620
			160	≦1.2	≦2.0	1,590	300	190	≦1.2	≦2.5	1,270	360	≦1.2	≦2.5	1,270	480
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~80	≦2.5	≦6.4	1,390	280	~100	≦2.5	≦8.0	1,110	330	≦2.5	≦8.0	1,110	440
			120	≦1.5	≦3.2	1,250	230	150	≦1.5	≦4.0	1,000	270	≦1.5	≦4.0	1,000	360
			160	–	–	–	–	190	–	–	–	–	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~80	≦5.0	≦16.0	2,980	1,190	~100	≦5.0	≦20.0	2,390	1,430	≦5.0	≦20.0	2,390	1,910
			120	≦4.0	≦8.0	2,680	960	150	≦4.0	≦10.0	2,150	1,160	≦4.0	≦10.0	2,150	1,550
			160	≦3.0	≦4.0	2,380	760	190	≦3.0	≦5.0	1,910	920	≦3.0	≦5.0	1,910	1,220
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~80	≦5.0	≦12.8	2,980	890	~100	≦5.0	≦16.0	2,390	1,080	≦5.0	≦16.0	2,390	1,430
			120	≦3.0	≦6.4	2,680	720	150	≦3.0	≦8.0	2,150	870	≦3.0	≦8.0	2,150	1,160
			160	≦2.0	≦3.2	2,380	570	190	≦2.0	≦4.0	1,910	690	≦2.0	≦4.0	1,910	920
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~80	≦5.0	≦9.6	1,190	360	~100	≦5.0	≦12.0	950	430	≦5.0	≦12.0	950	570
			120	≦3.0	≦4.8	1,070	290	150	≦3.0	≦6.0	860	350	≦3.0	≦6.0	860	460
			160	≦2.0	≦2.4	950	230	190	≦2.0	≦3.0	760	270	≦2.0	≦3.0	760	360
Inconel (INCO718)	SL type	JC7518	~80	≦5.0	≦9.6	600	180	~100	≦5.0	≦12.0	480	220	≦5.0	≦12.0	480	290
			120	≦3.0	≦4.8	540	140	150	≦3.0	≦6.0	430	170	≦3.0	≦6.0	430	230
			160	≦2.0	≦2.4	480	110	190	≦2.0	≦3.0	380	140	≦2.0	≦3.0	380	180
Aluminum alloy Hardness 50-110HB	NL type	FC18	~80	≦5.0	≦32.0	12,000	4,800	~100	≦5.0	≦40.0	9,550	5,730	≦5.0	≦40.0	9,550	7,640
			120	≦4.0	≦16.0	9,000	3,240	150	≦4.0	≦20.0	7,160	3,870	≦4.0	≦20.0	7,160	5,160
			160	≦3.0	≦8.0	6,000	1,920	190	≦3.0	≦10.0	4,780	2,290	≦3.0	≦10.0	4,780	3,060

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type ZPMT*-PL / NL / SL type insert for Shoulder milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)								
			25 / 26					25 / 26 / 28			
			No. of teeth 4N					No. of teeth 5N			
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~120	≦5.0	≦20.0	2,040	1,220	≦5.0	≦20.0	2,040	1,530
			190	≦3.0	≦10.0	1,840	990	≦3.0	≦10.0	1,840	1,240
			235	≦2.0	≦5.0	1,630	780	≦2.0	≦5.0	1,630	980
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~120	≦5.0	≦20.0	1,910	1,150	≦5.0	≦20.0	1,910	1,430
			190	≦3.0	≦10.0	1,720	930	≦3.0	≦10.0	1,720	1,160
			235	≦2.0	≦5.0	1,530	730	≦2.0	≦5.0	1,530	920
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~120	≦5.0	≦20.0	1,910	1,150	≦5.0	≦20.0	1,910	1,430
			190	≦3.0	≦10.0	1,720	930	≦3.0	≦10.0	1,720	1,160
			235	≦2.0	≦5.0	1,530	730	≦2.0	≦5.0	1,530	920
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~120	≦4.0	≦15.0	1,530	740	≦4.0	≦15.0	1,530	920
			190	≦2.5	≦7.5	1,380	610	≦2.5	≦7.5	1,380	760
			235	≦1.5	≦3.8	1,220	490	≦1.5	≦3.8	1,220	610
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~120	≦3.5	≦12.5	1,270	610	≦3.5	≦12.5	1,270	760
			190	≦2.5	≦6.2	1,140	490	≦2.5	≦6.2	1,140	620
			235	≦1.2	≦3.2	1,020	390	≦1.2	≦3.2	1,020	490
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~120	≦2.5	≦10.0	890	360	≦2.5	≦10.0	890	440
			190	≦1.5	≦5.0	800	290	≦1.5	≦5.0	800	360
			235	–	–	–	–	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~120	≦5.0	≦25.0	1,910	1,530	≦5.0	≦25.0	1,910	1,910
			190	≦4.0	≦12.5	1,720	1,240	≦4.0	≦12.5	1,720	1,550
			235	≦3.0	≦6.2	1,530	980	≦3.0	≦6.2	1,530	1,220
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~120	≦5.0	≦20.0	1,910	1,150	≦5.0	≦20.0	1,910	1,430
			190	≦3.0	≦10.0	1,720	930	≦3.0	≦10.0	1,720	1,160
			235	≦2.0	≦5.0	1,530	730	≦2.0	≦5.0	1,530	920
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~120	≦5.0	≦15.0	760	460	≦5.0	≦15.0	760	570
			190	≦3.0	≦7.5	680	370	≦3.0	≦7.5	680	460
			235	≦2.0	≦3.8	610	290	≦2.0	≦3.8	610	370
Inconel (INCO718)	SL type	JC7518	~120	≦5.0	≦15.0	380	230	≦5.0	≦15.0	380	280
			190	≦3.0	≦7.5	340	180	≦3.0	≦7.5	340	230
			235	≦2.0	≦3.8	300	140	≦2.0	≦3.8	300	180
Aluminum alloy Hardness 50-110HB	NL type	FC18	~120	≦5.0	≦50.0	7,640	6,110	≦5.0	≦50.0	7,640	7,640
			190	≦4.0	≦25.0	5,730	4,120	≦4.0	≦25.0	5,730	5,160
			235	≦3.0	≦12.5	3,820	2,440	≦3.0	≦12.5	3,820	3,060

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type ZPMT*-PL / NL / SL type insert for Shoulder milling +
Anti-Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)								
			30 / 32 / 35					32 / 35			
			No. of teeth 5N					No. of teeth 6N			
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~160	≦5.0	≦24.0	1,590	1,190	≦5.0	≦24.0	1,590	1,430
			240	≦3.0	≦12.0	1,430	960	≦3.0	≦12.0	1,430	1,160
			290	≦2.0	≦6.0	1,270	760	≦2.0	≦6.0	1,270	910
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~160	≦5.0	≦24.0	1,490	1,120	≦5.0	≦24.0	1,490	1,340
			240	≦3.0	≦12.0	1,340	900	≦3.0	≦12.0	1,340	1,080
			290	≦2.0	≦6.0	1,190	710	≦2.0	≦6.0	1,190	860
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~160	≦5.0	≦24.0	1,490	1,120	≦5.0	≦24.0	1,490	1,340
			240	≦3.0	≦12.0	1,340	900	≦3.0	≦12.0	1,340	1,080
			290	≦2.0	≦6.0	1,190	710	≦2.0	≦6.0	1,190	860
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~160	≦4.0	≦18.0	1,200	720	≦4.0	≦18.0	1,200	860
			240	≦2.5	≦9.0	1,080	600	≦2.5	≦9.0	1,080	710
			290	≦2.0	≦4.5	960	480	≦2.0	≦4.5	960	580
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~160	≦3.5	≦15.0	1,000	600	≦3.5	≦15.0	1,000	720
			240	≦2.5	≦7.5	900	490	≦2.5	≦7.5	900	580
			290	≦1.2	≦3.8	800	380	≦2.0	≦3.8	800	460
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~160	≦2.5	≦12.0	700	350	≦2.5	≦12.0	700	420
			240	≦1.5	≦6.0	630	280	≦1.5	≦6.0	630	340
			290	–	–	–	–	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~160	≦5.0	≦30.0	1,490	1,490	≦5.0	≦30.0	1,490	1,790
			240	≦4.0	≦15.0	1,340	1,210	≦4.0	≦15.0	1,340	1,450
			290	≦3.0	≦7.5	1,190	950	≦3.0	≦7.5	1,190	1,140
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~160	≦5.0	≦24.0	1,490	1,120	≦5.0	≦24.0	1,490	1,340
			240	≦3.0	≦12.0	1,340	900	≦3.0	≦12.0	1,340	1,080
			290	≦2.0	≦6.0	1,190	710	≦2.0	≦6.0	1,190	860
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~160	≦5.0	≦18.0	600	450	≦5.0	≦18.0	600	540
			240	≦3.0	≦9.0	540	360	≦3.0	≦9.0	540	440
			290	≦2.0	≦4.5	480	290	≦2.0	≦4.5	480	340
Inconel (INCO718)	SL type	JC7518	~160	≦5.0	≦18.0	300	230	≦5.0	≦18.0	300	270
			240	≦3.0	≦9.0	270	180	≦3.0	≦9.0	270	220
			290	≦2.0	≦4.5	240	140	≦2.0	≦4.5	240	170
Aluminum alloy Hardness 50-110HB	NL type	FC18	~160	≦5.0	≦64.0	5,970	5,970	≦5.0	≦64.0	5,970	7,160
			240	≦4.0	≦32.0	4,480	4,030	≦4.0	≦32.0	4,480	4,840
			290	≦3.0	≦16.0	2,990	2,390	≦3.0	≦16.0	2,990	2,870

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type ZPMT*-PL / NL / SL type insert for Shoulder milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)								
			40 / 42					40			
			No. of teeth 6N					No. of teeth 7N			
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~160	≦5.0	≦32.0	1,270	1,140	≦5.0	≦32.0	1,270	1,330
			240	≦3.0	≦16.0	1,140	920	≦3.0	≦16.0	1,140	1,080
			290	≦2.0	≦8.0	1,020	730	≦2.0	≦8.0	1,020	860
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~160	≦5.0	≦32.0	1,190	1,070	≦5.0	≦32.0	1,190	1,250
			240	≦3.0	≦16.0	1,070	870	≦3.0	≦16.0	1,070	1,010
			290	≦2.0	≦8.0	950	680	≦2.0	≦8.0	950	800
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~160	≦5.0	≦32.0	1,190	1,070	≦5.0	≦32.0	1,190	1,250
			240	≦3.0	≦16.0	1,070	870	≦3.0	≦16.0	1,070	1,010
			290	≦2.0	≦8.0	950	680	≦2.0	≦8.0	950	800
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~160	≦4.0	≦24.0	950	680	≦4.0	≦24.0	950	800
			240	≦2.5	≦12.0	860	570	≦2.5	≦12.0	860	660
			290	≦2.0	≦6.0	760	460	≦2.0	≦6.0	760	530
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~160	≦3.5	≦20.0	800	580	≦3.5	≦20.0	800	670
			240	≦2.5	≦10.0	720	470	≦2.5	≦10.0	720	540
			290	≦1.2	≦5.0	640	370	≦1.2	≦5.0	640	430
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~160	≦2.5	≦16.0	560	340	≦2.5	≦16.0	560	390
			240	≦1.5	≦8.0	500	270	≦1.5	≦8.0	500	310
			290	–	–	–	–	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~160	≦5.0	≦40.0	1,190	1,430	≦5.0	≦40.0	1,190	1,670
			240	≦4.0	≦20.0	1,070	1,160	≦4.0	≦20.0	1,070	1,350
			290	≦3.0	≦10.0	950	910	≦3.0	≦10.0	950	1,060
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~160	≦5.0	≦32.0	1,190	1,070	≦5.0	≦32.0	1,190	1,250
			240	≦3.0	≦16.0	1,070	870	≦3.0	≦16.0	1,070	1,010
			290	≦2.0	≦8.0	950	680	≦2.0	≦8.0	950	800
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~160	≦5.0	≦24.0	480	430	≦5.0	≦24.0	480	500
			240	≦3.0	≦12.0	430	350	≦3.0	≦12.0	430	410
			290	≦2.0	≦6.0	380	270	≦2.0	≦6.0	380	320
Inconel (INCO718)	SL type	JC7518	~160	≦5.0	≦24.0	240	220	≦5.0	≦24.0	240	250
			240	≦3.0	≦12.0	220	180	≦3.0	≦12.0	220	210
			290	≦2.0	≦6.0	190	140	≦2.0	≦6.0	190	160
Aluminum alloy Hardness 50-110HB	NL type	FC18	~160	≦5.0	≦80.0	4,780	5,740	≦5.0	≦80.0	4,780	6,690
			240	≦4.0	≦40.0	3,580	3,870	≦4.0	≦40.0	3,580	4,510
			290	≦3.0	≦20.0	2,390	2,290	≦3.0	≦20.0	2,390	2,680

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

ZPMT*-PL / NL / SL type insert for Shoulder milling + QM Max Shell type milling cutter

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)								
			40								
			No. of teeth 6N					No. of teeth 7N			
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~150	≦5.0	≦32.0	1,270	1,140	≦5.0	≦32.0	1,270	1,330
			200	≦3.0	≦16.0	1,140	920	≦3.0	≦16.0	1,140	1,080
			250	≦2.0	≦8.0	1,020	730	≦2.0	≦8.0	1,020	860
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~150	≦5.0	≦32.0	1,190	1,070	≦5.0	≦32.0	1,190	1,250
			200	≦3.0	≦16.0	1,070	870	≦3.0	≦16.0	1,070	1,010
			250	≦2.0	≦8.0	950	680	≦2.0	≦8.0	950	800
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~150	≦5.0	≦32.0	1,190	1,070	≦5.0	≦32.0	1,190	1,250
			200	≦3.0	≦16.0	1,070	870	≦3.0	≦16.0	1,070	1,010
			250	≦2.0	≦8.0	950	680	≦2.0	≦8.0	950	800
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~150	≦4.0	≦24.0	950	680	≦4.0	≦24.0	950	800
			200	≦2.5	≦12.0	860	570	≦2.5	≦12.0	860	660
			250	≦2.0	≦6.0	760	460	≦2.0	≦6.0	760	530
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~150	≦3.5	≦20.0	800	580	≦3.5	≦20.0	800	670
			200	≦2.5	≦10.0	720	470	≦2.5	≦10.0	720	540
			250	≦1.2	≦5.0	640	370	≦1.2	≦5.0	640	430
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~150	≦2.5	≦16.0	560	340	≦2.5	≦16.0	560	390
			200	≦1.5	≦8.0	500	270	≦1.5	≦8.0	500	310
			250	–	–	–	–	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~150	≦5.0	≦40.0	1,190	1,430	≦5.0	≦40.0	1,190	1,670
			200	≦4.0	≦20.0	1,070	1,160	≦4.0	≦20.0	1,070	1,350
			250	≦3.0	≦10.0	950	910	≦3.0	≦10.0	950	1,060
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~150	≦5.0	≦32.0	1,190	1,070	≦5.0	≦32.0	1,190	1,250
			200	≦3.0	≦16.0	1,070	870	≦3.0	≦16.0	1,070	1,010
			250	≦2.0	≦8.0	950	680	≦2.0	≦8.0	950	800
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~150	≦5.0	≦24.0	480	430	≦5.0	≦24.0	480	500
			200	≦3.0	≦12.0	430	350	≦3.0	≦12.0	430	410
			250	≦2.0	≦6.0	380	270	≦2.0	≦6.0	380	320
Inconel (INCO718)	SL type	JC7518	~150	≦5.0	≦24.0	240	220	≦5.0	≦24.0	240	250
			200	≦3.0	≦12.0	220	180	≦3.0	≦12.0	220	210
			250	≦2.0	≦6.0	190	140	≦2.0	≦6.0	190	160
Aluminum alloy Hardness 50-110HB	NL type	FC18	~150	≦5.0	≦80.0	4,780	5,740	≦5.0	≦80.0	4,780	6,690
			200	≦4.0	≦40.0	3,580	3,870	≦4.0	≦40.0	3,580	4,510
			250	≦3.0	≦20.0	2,390	2,290	≦3.0	≦20.0	2,390	2,680

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

ZPMT*-PL / NL / SL type insert for Shoulder milling + QM Max Shell type milling cutter

Work Materials	Geometry type	Insert Grades	Tool dia. (mm)								
			50					50 / 52			
			No. of teeth 7N					No. of teeth 8N			
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~200	≦5.0	≦40.0	1,020	1,070	≦5.0	≦40.0	1,020	1,220
			250	≦3.0	≦20.0	920	870	≦3.0	≦20.0	920	990
			300	≦2.0	≦10.0	820	690	≦2.0	≦10.0	820	790
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~200	≦5.0	≦40.0	950	1,000	≦5.0	≦40.0	950	1,140
			250	≦3.0	≦20.0	860	810	≦3.0	≦20.0	860	930
			300	≦2.0	≦10.0	760	640	≦2.0	≦10.0	760	730
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~200	≦5.0	≦40.0	950	1,000	≦5.0	≦40.0	950	1,140
			250	≦3.0	≦20.0	860	810	≦3.0	≦20.0	860	930
			300	≦2.0	≦10.0	760	640	≦2.0	≦10.0	760	730
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~200	≦4.0	≦30.0	760	640	≦4.0	≦30.0	760	730
			250	≦2.5	≦15.0	680	520	≦2.5	≦15.0	680	600
			300	≦2.0	≦7.5	610	430	≦2.0	≦7.5	610	490
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~200	≦3.5	≦25.0	640	540	≦3.5	≦25.0	640	610
			250	≦2.0	≦12.5	580	440	≦2.0	≦12.5	580	500
			300	≦1.2	≦6.0	510	340	≦1.2	≦6.0	510	390
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~200	≦2.5	≦20.0	450	320	≦2.5	≦20.0	450	360
			250	≦1.5	≦10.0	400	250	≦1.5	≦10.0	400	290
			300	≦1.0	≦5.0	360	200	≦1.0	≦5.0	360	230
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~200	≦5.0	≦50.0	950	1,330	≦5.0	≦50.0	950	1,520
			250	≦4.0	≦25.0	860	1,080	≦4.0	≦25.0	860	1,240
			300	≦3.0	≦12.5	760	850	≦3.0	≦12.5	760	970
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~200	≦5.0	≦40.0	950	1,000	≦5.0	≦40.0	950	1,140
			250	≦3.0	≦20.0	860	810	≦3.0	≦20.0	860	930
			300	≦2.0	≦10.0	760	640	≦2.0	≦10.0	760	730
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~200	≦5.0	≦30.0	380	400	≦5.0	≦30.0	380	460
			250	≦3.0	≦15.0	340	320	≦3.0	≦15.0	340	370
			300	≦2.0	≦7.5	300	250	≦2.0	≦7.5	300	290
Inconel (INCO718)	SL type	JC7518	~200	≦5.0	≦30.0	190	200	≦5.0	≦30.0	190	230
			250	≦3.0	≦15.0	170	160	≦3.0	≦15.0	170	180
			300	≦2.0	≦7.5	150	130	≦2.0	≦7.5	150	140
Aluminum alloy Hardness 50-110HB	NL type	FC18	~200	≦5.0	≦100.0	3,820	5,350	≦5.0	≦100.0	3,820	6,110
			250	≦4.0	≦50.0	2,860	3,600	≦4.0	≦50.0	2,860	4,120
			300	≦3.0	≦25.0	1,910	2,140	≦3.0	≦25.0	1,910	2,440

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

ZPMT*-PL / NL / SL type insert for Shoulder milling + QM Max Shell type milling cutter

Work Materials	Geometry type	Insert Grades	Tool dia. (mm) 63/66 No. of teeth 8N								
			r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)				
Carbon steel S50C, S55C (C50, C55) Below 250HB	PL type	JC8050 (JC8118) (CX75)	~250	≦5.0	≦50.0	810	970				
			300	≦3.0	≦25.0	730	790				
			350	≦2.0	≦12.5	650	620				
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	PL type	JC8050 (JC8118)	~250	≦5.0	≦50.0	760	910				
			300	≦3.0	≦25.0	680	730				
			350	≦2.0	≦12.5	610	580				
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	PL type	JC8118 (JC8050)	~250	≦5.0	≦50.0	760	910				
			300	≦3.0	≦25.0	680	730				
			350	≦2.0	≦12.5	610	580				
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	PL type	JC8118 (JC8050)	~250	≦4.0	≦38.0	610	590				
			300	≦2.5	≦19.0	550	480				
			350	≦2.0	≦9.5	490	390				
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	PL type	JC8118 (DH102)	~250	≦3.5	≦32.0	500	480				
			300	≦2.5	≦16.0	450	390				
			350	≦1.5	≦7.5	400	310				
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	PL type	DH102	~250	≦2.5	≦25.0	350	280				
			300	≦1.5	≦12.5	320	230				
			350	≦1.0	≦6.5	280	180				
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	PL type	JC8118 (DH102)	~250	≦5.0	≦64.0	760	1,220				
			300	≦4.0	≦32.0	680	980				
			350	≦3.0	≦16.0	610	780				
Stainless steel SUS304 Below 250HB	PL type (SL type)	JC8050 (JC8118) (JC7518)	~250	≦5.0	≦50.0	760	910				
			300	≦3.0	≦25.0	680	730				
			350	≦2.0	≦12.5	610	580				
Titanium alloy (Ti-6Al-4V)	SL type	JC7518	~250	≦5.0	≦38.0	300	360				
			300	≦3.0	≦19.0	270	290				
			350	≦2.0	≦9.5	240	230				
Inconel (INCO718)	SL type	JC7518	~250	≦5.0	≦38.0	150	180				
			300	≦3.0	≦19.0	140	150				
			350	≦2.0	≦9.5	120	110				
Aluminum alloy Hardness 50-110HB	NL type	FC18	~250	≦5.0	≦128.0	3,030	4,850				
			300	≦4.0	≦63.0	2,270	3,270				
			350	≦3.0	≦31.5	1,520	1,940				

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 same 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) When using ZPMT * -PL / NL / SL type indexable insert for side finishing or bottom finishing.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW*-15 / -F type insert for Up & Down finishing + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~70	0.5	<0.2	8,950	2,680	~70	0.6	<0.2	7,160	3,220	~70	0.6	<0.2	7,160	4,290
		120	0.5	<0.2	6,960	1,390	120	0.6	<0.2	7,160	2,790	120	0.6	<0.2	7,160	3,720
		160	0.5	<0.2	6,960	1,110	190	0.6	<0.2	5,570	1,670	190	0.6	<0.2	5,570	2,230
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (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
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8015 (DH102)	~70	0.5	<0.2	10,900	3,270	~70	0.6	<0.2	8,750	3,940	~70	0.6	<0.2	8,750	5,250
		120	0.5	<0.2	8,950	2,150	120	0.6	<0.2	7,160	2,580	120	0.6	<0.2	7,160	3,440
		160	0.5	<0.2	8,950	1,790	190	0.6	<0.2	7,160	2,150	190	0.6	<0.2	7,160	2,870

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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

● **QM Max MQX type (YPHW*-15 / -F type insert for Up & Down finishing +**
Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		25/26					25/26/28					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	2,680	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
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8015 (DH102)	~90	0.7	<0.2	7,000	4,200	~90	0.7	<0.2	7,000	5,250	~100	0.8	<0.2	5,470	4,100
		140	0.7	<0.2	5,730	2,750	140	0.7	<0.2	5,730	3,440	150	0.8	<0.2	5,470	4,100
		210	0.7	<0.2	5,730	2,290	210	0.7	<0.2	5,730	2,860	210	0.8	<0.2	4,480	2,240

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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW*-15 / -F type insert for Up & Down finishing + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		32/35					40/42					40				
		No. of teeth 6N					No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~100	0.8	<0.2	4,480	4,830	~100	0.88	<0.2	3,580	3,870	~100	0.88	<0.2	3,580	4,520
		150	0.8	<0.2	4,480	4,830	150	0.88	<0.2	3,580	3,870	150	0.88	<0.2	3,580	4,520
		210	0.8	<0.2	3,480	3,130	210	0.88	<0.2	2,790	2,010	210	0.88	<0.2	2,790	2,350
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~100	0.8	<0.2	3,980	4,300	~100	0.88	<0.2	3,180	3,430	~100	0.88	<0.2	3,180	4,000
		150	0.8	<0.2	3,980	4,300	150	0.88	<0.2	3,180	3,430	150	0.88	<0.2	3,180	4,000
		210	0.8	<0.2	2,980	2,090	210	0.88	<0.2	2,390	1,720	210	0.88	<0.2	2,390	2,010
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~100	0.8	<0.2	3,480	3,130	~100	0.88	<0.2	2,790	2,510	~100	0.88	<0.2	2,790	2,930
		150	0.8	<0.2	3,480	3,130	150	0.88	<0.2	2,790	2,510	150	0.88	<0.2	2,790	2,930
		210	0.8	<0.2	2,490	1,500	210	0.88	<0.2	1,990	1,430	210	0.88	<0.2	1,990	1,670
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~100	0.8	<0.2	2,490	1,800	~100	0.88	<0.2	1,990	1,430	~100	0.88	<0.2	1,990	1,670
		150	0.8	<0.2	2,490	1,800	150	0.88	<0.2	1,990	1,430	150	0.88	<0.2	1,990	1,670
		210	0.8	<0.2	1,780	860	210	0.88	<0.2	1,420	820	210	0.88	<0.2	1,420	960
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~100	0.8	<0.15	1,690	1,020	~100	0.88	<0.15	1,350	810	~100	0.88	<0.15	1,350	950
		150	0.8	<0.15	1,690	1,020	150	0.88	<0.15	1,350	810	150	0.88	<0.15	1,350	950
		210	0.8	<0.15	1,210	490	210	0.88	<0.15	960	460	210	0.88	<0.15	960	540
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8015 (DH102)	~100	0.8	<0.2	5,470	4,920	~100	0.88	<0.2	4,380	3,940	~100	0.88	<0.2	4,380	4,600
		150	0.8	<0.2	5,470	4,920	150	0.88	<0.2	4,380	3,940	150	0.88	<0.2	4,380	4,600
		210	0.8	<0.2	4,480	2,690	210	0.88	<0.2	3,580	2,580	210	0.88	<0.2	3,580	3,010

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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert + QM Max Shell type milling cutter for Up & Down Finishing

Work Materials	Insert Grades	Tool dia. (mm) 40									
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	Pf (mm)	ae (mm)	n (min-1)	Vf (mm/min)
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
		200	0.88	＜0.2	3,580	3,870	200	0.88	＜0.2	3,580	4,520
		250	0.88	＜0.2	3,580	3,220	250	0.88	＜0.2	3,580	3,760
		300	0.88	＜0.2	2,790	2,010	300	0.88	＜0.2	2,790	2,350
		350	–	–	–	–	350	–	–	–	–
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
		200	0.88	＜0.2	3,180	3,430	200	0.88	＜0.2	3,180	4,000
		250	0.88	＜0.2	3,180	2,860	250	0.88	＜0.2	3,180	3,340
		300	0.88	＜0.2	2,390	1,720	300	0.88	＜0.2	2,390	2,010
		350	–	–	–	–	350	–	–	–	–
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
		200	0.88	＜0.2	2,790	2,510	200	0.88	＜0.2	2,790	2,930
		250	0.88	＜0.2	2,790	2,010	250	0.88	＜0.2	2,790	2,350
		300	0.88	＜0.2	1,990	1,190	300	0.88	＜0.2	1,990	1,390
		350	–	–	–	–	350	–	–	–	–
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	1,670
		200	0.88	＜0.2	1,990	1,430	200	0.88	＜0.2	1,990	1,670
		250	0.88	＜0.2	1,990	1,150	250	0.88	＜0.2	1,990	1,340
		300	0.88	＜0.2	1,420	680	300	0.88	＜0.2	1,420	790
		350	–	–	–	–	350	–	–	–	–
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
		200	0.88	＜0.15	1,350	810	200	0.88	＜0.15	1,350	950
		250	0.88	＜0.15	1,350	650	250	0.88	＜0.15	1,350	760
		300	0.88	＜0.15	960	390	300	0.88	＜0.15	960	460
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8015 (DH102)	～150	0.88	＜0.2	4,380	3,940	～150	0.88	＜0.2	4,380	4,600
		200	0.88	＜0.2	4,380	3,940	200	0.88	＜0.2	4,380	4,600
		250	0.88	＜0.2	3,580	2,580	250	0.88	＜0.2	3,580	3,010
		300	0.88	＜0.2	3,580	2,150	300	0.88	＜0.2	3,580	2,510
		350	–	–	–	–	350	–	–	–	–

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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS

● YPHW*-15 / -F type insert + QM Max Shell type milling cutter for Up & Down Finishing

Work Materials	Insert Grades	Tool dia. (mm)									
		50					50/52				
		No. of teeth 7N					No. of teeth 8N				
		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)	~150	1	<0.2	2,860	3,600	~150	1	<0.2	2,860	4,110
		200	1	<0.2	2,860	3,600	200	1	<0.2	2,860	4,110
		250	1	<0.2	2,860	3,600	250	1	<0.2	2,860	4,110
		300	1	<0.2	2,860	3,000	300	1	<0.2	2,860	3,430
		350	1	<0.2	2,860	3,000	350	1	<0.2	2,860	3,430
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~150	1	<0.2	2,550	3,210	~150	1	<0.2	2,550	3,670
		200	1	<0.2	2,550	3,210	200	1	<0.2	2,550	3,670
		250	1	<0.2	2,550	3,210	250	1	<0.2	2,550	3,670
		300	1	<0.2	2,550	2,680	300	1	<0.2	2,550	3,060
		350	1	<0.2	2,550	2,680	350	1	<0.2	2,550	3,060
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~150	1	<0.2	2,230	2,340	~150	1	<0.2	2,230	2,670
		200	1	<0.2	2,230	2,340	200	1	<0.2	2,230	2,670
		250	1	<0.2	2,230	2,340	250	1	<0.2	2,230	2,670
		300	1	<0.2	2,230	1,870	300	1	<0.2	2,230	2,140
		350	1	<0.2	2,230	1,870	350	1	<0.2	2,230	2,140
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	1	<0.2	1,590	1,340	~150	1	<0.2	1,590	1,530
		200	1	<0.2	1,590	1,340	200	1	<0.2	1,590	1,530
		250	1	<0.2	1,590	1,340	250	1	<0.2	1,590	1,530
		300	1	<0.2	1,590	1,070	300	1	<0.2	1,590	1,220
		350	1	<0.2	1,590	1,070	350	1	<0.2	1,590	1,220
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~150	1	<0.15	1,080	760	~150	1	<0.15	1,080	870
		200	1	<0.15	1,080	760	200	1	<0.15	1,080	870
		250	1	<0.15	1,080	760	250	1	<0.15	1,080	870
		300	1	<0.15	1,080	610	300	1	<0.15	1,080	700
		350	1	<0.15	1,080	610	350	1	<0.15	1,080	700
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8015 (DH102)	~150	1	<0.2	3,500	3,680	~150	1	<0.2	3,500	4,210
		200	1	<0.2	3,500	3,680	200	1	<0.2	3,500	4,210
		250	1	<0.2	3,500	3,680	250	1	<0.2	3,500	4,210
		300	1	<0.2	2,860	2,400	300	1	<0.2	2,860	2,740
		350	1	<0.2	2,860	2,400	350	1	<0.2	2,860	2,740

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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert + QM Max Shell type milling cutter for Up & Down Finishing

Work Materials	Insert Grades	Tool dia. (mm) 63/66 No. of teeth 8N									
		ℓ (mm)	Pf (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 (DH102)	~200	1.12	<0.2	2,270	3,260					
		250	1.12	<0.2	2,270	3,260					
		300	1.12	<0.2	2,270	3,260					
		350	1.12	<0.2	2,270	2,720					
		400	1.12	<0.2	2,270	2,720					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 (DH102)	~200	1.12	<0.2	2,020	2,910					
		250	1.12	<0.2	2,020	2,910					
		300	1.12	<0.2	2,020	2,910					
		350	1.12	<0.2	2,020	2,420					
		400	1.12	<0.2	2,020	2,420					
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~200	1.12	<0.2	1,770	2,120					
		250	1.12	<0.2	1,770	2,120					
		300	1.12	<0.2	1,770	2,120					
		350	1.12	<0.2	1,770	1,700					
		400	1.12	<0.2	1,770	1,700					
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~200	1.12	<0.2	1,260	1,210					
		250	1.12	<0.2	1,260	1,210					
		300	1.12	<0.2	1,260	1,210					
		350	1.12	<0.2	1,260	970					
		400	1.12	<0.2	1,260	970					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 (JC8015)	~200	1.12	<0.15	860	690					
		250	1.12	<0.15	860	690					
		300	1.12	<0.15	860	690					
		350	1.12	<0.15	860	550					
		400	1.12	<0.15	860	550					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8015 (DH102)	~200	1.12	<0.2	2,780	3,340					
		250	1.12	<0.2	2,780	3,340					
		300	1.12	<0.2	2,780	3,340					
		350	1.12	<0.2	2,270	2,180					
		400	1.12	<0.2	2,270	2,180					

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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-15 / -F type insert for side face finishing) + Anti-Vibration MSN Carbide Shank Holder

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

ℓ: Overhung length, 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-15 / -F type insert for side face finishing) +
Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		25/26					25/26/28				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~90	1.5	<0.2	8,280	4,970	~90	1.5	<0.2	8,280	6,210
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	5,730	2,290	210	0.7	<0.2	5,730	2,860
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~90	1.5	<0.2	5,730	3,440	~90	1.5	<0.2	5,730	4,300
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	4,460	1,780	210	0.7	<0.2	4,460	2,230
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~90	1.5	<0.2	5,730	3,440	~90	1.5	<0.2	5,730	4,300
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	4,460	1,780	210	0.7	<0.2	4,460	2,230
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~90	1.5	<0.2	5,090	2,440	~90	1.5	<0.2	5,090	3,050
		140	1	<0.2	4,460	1,780	140	1	<0.2	4,460	2,230
		210	0.7	<0.2	4,460	1,430	210	0.7	<0.2	4,460	1,790
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~90	1.5	<0.2	2,550	1,020	~90	1.5	<0.2	2,550	1,280
		140	1	<0.2	2,160	690	140	1	<0.2	2,160	860
		210	–	–	–	–	210	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~90	1	<0.2	2,290	920	~90	1	<0.2	2,290	1,150
		140	0.7	<0.2	1,910	610	140	0.7	<0.2	1,910	760
		210	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 (DH102)	~90	1.5	<0.2	7,000	4,200	~90	1.5	<0.2	7,000	5,250
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	5,730	2,290	210	0.7	<0.2	5,730	2,860
Stainless steel SUS304 Below 250HB	JC8015 (DH102)	~90	1.5	<0.2	5,730	3,440	~90	1.5	<0.2	5,730	4,300
		140	1	<0.2	5,730	2,750	140	1	<0.2	5,730	3,440
		210	0.7	<0.2	4,460	1,780	210	0.7	<0.2	4,460	2,230
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~90	1.5	<0.2	1,150	550	~90	1.5	<0.2	1,150	690
		140	1	<0.2	890	360	140	1	<0.2	890	450
		210	0.7	<0.2	890	280	210	0.7	<0.2	890	350

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-15 / -F type insert for side face finishing) + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32/35					32/35				
		No. of teeth 5N					No. of teeth 6N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~100	1.5	<0.2	6,470	4,850	~100	1.5	<0.2	6,470	5,820
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	4,480	2,240	210	1	<0.2	4,480	2,690
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (JC8015) (DH102)	~100	1.5	<0.2	4,480	3,360	~100	1.5	<0.2	4,480	4,030
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	3,480	1,740	210	1	<0.2	3,480	2,090
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 (DH102)	~100	1.5	<0.2	4,480	3,360	~100	1.5	<0.2	4,480	4,030
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	3,480	1,740	210	1	<0.2	3,480	2,090
Mold steel NAK80, HPM1, P21 (1.2311, P21) 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 Below 250HB	JC8015 (DH102)	~100	1.5	<0.2	4,480	3,360	~100	1.5	<0.2	4,480	4,030
		150	1.2	<0.2	4,480	2,690	150	1.2	<0.2	4,480	3,230
		210	1	<0.2	3,480	1,740	210	1	<0.2	3,480	2,090
Titanium alloy (Ti-6Al-4V)	JC8015 (DH102)	~100	1.5	<0.2	900	540	~100	1.5	<0.2	900	650
		150	1.2	<0.2	700	350	150	1.2	<0.2	700	420
		210	1	<0.2	700	280	210	1	<0.2	700	340

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

■ NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-15 / -F type insert for side face finishing) +
Anti-Vibration MSN Carbide Shank Holder

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

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

NOTE

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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS

● YPHW*-15 / -F type insert + QM Max Shell type milling cutter for side face finishing

Work Materials	Insert Grades	Tool dia. (mm) 40									
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (JC8015) (DH102)	~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, 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert + QM Max Shell type milling cutter for side face finishing

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) (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, 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert + QM Max Shell type milling cutter for side face finishing

Work Materials	Insert Grades	Tool dia. (mm) 63/66 No. of teeth 8N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (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, 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW*-15 / -F type insert for bottom face finishing) + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		16/17					20					20/21				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~70	0.2	8~16	5,200	2,600	~70	0.2	10~20	4,200	3,150	~70	0.2	10~18	4,200	4,200
		120	0.2	8~16	3,900	1,550	120	0.2	10~20	3,200	1,950	120	0.2	10~18	3,200	2,550
		160	0.2	8~10	3,400	1,200	190	0.2	10~12	2,700	1,450	190	0.2	10~12	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	0.2	10~20	3,800	2,550	~70	0.2	10~18	3,800	3,400
		120	0.2	8~16	3,500	1,400	120	0.2	10~20	2,900	1,750	120	0.2	10~18	2,900	2,350
		160	0.2	8~10	3,000	1,100	190	0.2	10~12	2,450	1,300	190	0.2	10~12	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	0.2	10~20	3,500	2,100	~70	0.2	10~18	3,500	2,800
		120	0.2	8~16	3,250	1,200	120	0.2	10~20	2,650	1,450	120	0.2	10~18	2,650	1,950
		160	0.2	8~10	2,750	950	190	0.2	10~12	2,250	1,150	190	0.2	10~12	2,250	1,500
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~70	0.2	8~16	4,000	960	~70	0.2	10~20	3,200	1,150	~70	0.2	10~18	3,200	1,500
		120	0.2	8~16	3,000	600	120	0.2	10~20	2,400	720	120	0.2	10~18	2,400	960
		160	0.2	8~10	2,550	500	190	0.2	10~12	2,050	600	190	0.2	10~12	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	0.2	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	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~70	0.2	8~16	1,400	200	~70	0.2	10~20	1,120	240	~70	0.2	10~18	1,120	320
		120	0.2	8~16	1,000	100	120	0.2	10~20	800	120	120	0.2	10~18	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	0.2	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	DH102	~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)	DH102	~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 spindle speed with keeping same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-15 / -F type insert for bottom face finishing) +
Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		25/26					25/26/28				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~90	0.2	12.5~25	3,400	3,400	~90	0.2	12.5~22	3,400	4,250
		140	0.2	12.5~25	2,500	2,000	140	0.2	12.5~22	2,500	2,500
		210	0.2	12.5~15	2,200	1,550	210	0.2	12.5~15	2,200	1,900
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	CX75 (DH102)	~90	0.2	12.5~25	3,050	2,750	~90	0.2	12.5~22	3,050	3,400
		140	0.2	12.5~25	2,250	1,800	140	0.2	12.5~22	2,250	2,250
		210	0.2	12.5~15	2,000	1,400	210	0.2	12.5~15	2,000	1,750
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	DH102	~90	0.2	12.5~25	2,800	2,250	~90	0.2	12.5~22	2,800	2,800
		140	0.2	12.5~25	2,100	1,500	140	0.2	12.5~22	2,100	1,900
		210	0.2	12.5~15	1,800	1,200	210	0.2	12.5~15	1,800	1,500
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102	~90	0.2	12.5~25	2,550	1,250	~90	0.2	12.5~22	2,550	1,500
		140	0.2	12.5~25	1,900	750	140	0.2	12.5~22	1,900	950
		210	0.2	12.5~15	1,650	650	210	0.2	12.5~15	1,650	850
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102	~90	0.2	12.5~25	1,270	510	~90	0.2	12.5~22	1,270	640
		140	0.2	12.5~25	1,020	410	140	0.2	12.5~22	1,020	510
		210	–	–	–	–	210	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~90	0.2	12.5~25	890	250	~90	0.2	12.5~22	890	310
		140	0.2	12.5~25	640	130	140	0.2	12.5~22	640	160
		210	–	–	–	–	210	–	–	–	–
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	DH102	~90	0.2	12.5~25	2,550	2,040	~90	0.2	12.5~22	2,550	2,550
		140	0.2	12.5~25	1,910	1,150	140	0.2	12.5~22	1,910	1,440
		210	0.2	12.5~15	1,660	660	210	0.2	12.5~15	1,660	820
Stainless steel SUS304 Below 250HB	DH102	~90	0.2	12.5~25	2,290	1,370	~90	0.2	12.5~22	2,290	1,710
		140	0.2	12.5~25	1,660	800	140	0.2	12.5~22	1,660	1,000
		210	0.2	12.5~15	1,270	510	210	0.2	12.5~15	1,270	640
Titanium alloy (Ti-6Al-4V)	DH102	~90	0.2	12.5~25	640	380	~90	0.2	12.5~22	640	480
		140	0.2	12.5~25	380	150	140	0.2	12.5~22	380	190
		210	0.2	12.5~15	380	150	210	0.2	12.5~15	380	190

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW*-15 / -F type insert for bottom face finishing) + Anti-Vibration MSN Carbide Shank Holder

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

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-15 / -F type insert for bottom face finishing) +
Anti-Vibration MSN Carbide Shank Holder

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

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert for bottom face finishing + QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm) 40									
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	CX75 (DH102)	~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	280
		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, 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 same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert for bottom face finishing + QM Max Shell type milling cutter

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 chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-15 / -F type insert for bottom face finishing + QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm) 63/66 No. of teeth 8N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (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, 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 same 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) If the machined surface accuracy can not be achieved due to machine vibrations, we recommend to use low cutting parameters.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW100320ZER-24 type insert for contouring milling + Anti-Vibration MSN Carbide Shank Holder

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

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

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

■ NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW100320ZER-24 type insert for contouring milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25/26 No. of teeth 4N ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	25/26/28 No. of teeth 5N ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~90	0.4	<10	2,800	2,800	~90	0.4	<10	2,800	3,500
		140	0.3	<10	2,800	2,800	140	0.3	<10	2,800	3,500
		210	0.2	<10	2,800	2,800	210	0.2	<10	2,800	3,500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~90	0.25	<10	2,040	2,040	~90	0.25	<10	2,040	2,550
		140	0.2	<10	2,040	2,040	140	0.2	<10	2,040	2,550
		210	–	–	–	–	210	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~90	0.2	<8	1,270	1,020	~90	0.2	<8	1,270	1,360
		140	0.15	<8	1,270	1,020	140	0.15	<8	1,270	1,360
		210	–	–	–	–	210	–	–	–	–

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

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

NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW100320ZER-24 type insert for contouring milling + Anti-Vibration MSN Carbide Shank Holder

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

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

■ NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS

● YPHW100320ZER-24 type insert for contouring milling + QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm) 40									
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~100	0.4	<17	1,750	2,620	~100	0.4	<17	1,750	3,060
		150	0.3	<17	1,750	2,620	150	0.3	<17	1,750	3,060
		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)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8015 (DH102)	~150	0.4	<21	1,400	2,450	~150	0.4	<21	1,400	2,800
		200	0.3	<21	1,400	2,450	200	0.3	<21	1,400	2,800
		250	0.2	<21	1,400	2,450	250	0.2	<21	1,400	2,800
		300	0.15	<21	1,400	2,450	300	0.15	<21	1,400	2,800
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8015 (DH102)	~150	0.25	<21	1,020	1,780	~150	0.25	<21	1,020	2,040
		200	0.2	<21	1,020	1,780	200	0.2	<21	1,020	2,040
		250	0.15	<21	1,020	1,780	250	0.15	<21	1,020	2,040
		300	0.1	<21	1,020	1,780	300	0.1	<21	1,020	2,040
		350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	DH102	~150	0.2	<17	640	900	~150	0.2	<17	640	1,030
		200	0.15	<17	640	900	200	0.15	<17	640	1,030
		250	0.1	<17	640	900	250	0.1	<17	640	1,030
		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 spindle speed with keeping same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

● YPHW100320ZER-24 type insert for contouring milling + QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm) 63/66 No. of teeth 8N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (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, 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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW*-F1 type CBN insert for side face milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 16 / 17 No. of teeth 2N ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	20 No. of teeth 3N ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JBN795	~80	≦1.2	<0.1	8,950	1,430	~100	≦1.2	<0.1	7,160	1,720
		120	≦1.0	<0.1	7,960	1,110	150	≦1.0	<0.1	6,370	1,340
		160	–	–	–	–	190	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	~80	≦1.0	<0.1	7,960	1,270	~100	≦1.0	<0.1	6,370	1,530
		120	≦0.8	<0.1	5,970	720	150	≦0.8	<0.1	4,770	860
		160	–	–	–	–	190	–	–	–	–
Grey cast iron FC (GG) Below 300HB	JBN795	~80	≦1.5	<0.1	14,900	4,020	~100	≦1.5	<0.1	11,900	4,820
		120	≦1.0	<0.1	14,900	3,580	150	≦1.0	<0.1	11,900	4,280
		160	≦0.7	<0.1	14,900	2,980	190	≦0.7	<0.1	11,900	3,570
Nodular cast iron FCD (GGG) Below 300HB	JBN795	~80	≦1.5	<0.1	13,900	3,750	~100	≦1.5	<0.1	11,100	4,500
		120	≦1.0	<0.1	13,900	3,340	150	≦1.0	<0.1	11,100	4,000
		160	≦0.7	<0.1	13,900	2,780	190	≦0.7	<0.1	11,100	3,330

Work Materials	Insert Grades	Tool dia. (mm) 20 / 21 No. of teeth 4N ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JBN795	~100	≦1.2	<0.1	7,160	2,290
		150	≦1.0	<0.1	6,370	1,780
		190	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	~100	≦1.0	<0.1	6,370	2,040
		150	≦0.8	<0.1	4,770	1,140
		190	–	–	–	–
Grey cast iron FC (GG) Below 300HB	JBN795	~100	≦1.5	<0.1	11,900	6,430
		150	≦1.0	<0.1	11,900	5,710
		190	≦0.7	<0.1	11,900	4,760
Nodular cast iron FCD (GGG) Below 300HB	JBN795	~100	≦1.5	<0.1	11,100	6,000
		150	≦1.0	<0.1	11,100	5,330
		190	≦0.7	<0.1	11,100	4,440

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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● QM Max MQX type (YPHW*-F1 type CBN insert for side face milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm) 25 / 26 No. of teeth 4N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	25 / 26 / 28 No. of teeth 5N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JBN795	~120	≦1.2	<0.1	5,730	1,830	~120	≦1.2	<0.1	5,730	2,290
		190	≦1.0	<0.1	5,090	1,430	190	≦1.0	<0.1	5,090	1,780
		235	–	–	–	–	235	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	~120	≦1.0	<0.1	5,090	1,630	~120	≦1.0	<0.1	5,090	2,040
		190	≦0.8	<0.1	3,820	920	190	≦0.8	<0.1	3,820	1,150
		235	–	–	–	–	235	–	–	–	–
Grey cast iron FC (GG) Below 300HB	JBN795	~120	≦1.5	<0.1	9,550	5,160	~120	≦1.5	<0.1	9,550	6,450
		190	≦1.0	<0.1	9,550	4,580	190	≦1.0	<0.1	9,550	5,730
		235	≦0.7	<0.1	9,550	3,820	235	≦0.7	<0.1	9,550	4,780
Nodular cast iron FCD (GGG) Below 300HB	JBN795	~120	≦1.5	<0.1	8,910	4,810	~120	≦1.5	<0.1	8,910	6,010
		190	≦1.0	<0.1	8,910	4,280	190	≦1.0	<0.1	8,910	5,350
		235	≦0.7	<0.1	8,910	3,560	235	≦0.7	<0.1	8,910	4,460

Work Materials	Insert Grades	Tool dia. (mm) 30 / 32 / 35 No. of teeth 5N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	32 / 35 No. of teeth 6N ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JBN795	~160	≦1.2	<0.1	4,480	1,790	~160	≦1.2	<0.1	4,480	2,150
		240	≦1.0	<0.1	3,980	1,390	240	≦1.0	<0.1	3,980	1,670
		290	–	–	–	–	290	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	~160	≦1.0	<0.1	3,980	1,590	~160	≦1.0	<0.1	3,980	1,910
		240	≦0.8	<0.1	2,980	900	240	≦0.8	<0.1	2,980	1,070
		290	–	–	–	–	290	–	–	–	–
Grey cast iron FC (GG) Below 300HB	JBN795	~160	≦1.5	<0.1	7,460	5,040	~160	≦1.5	<0.1	7,460	6,040
		240	≦1.0	<0.1	7,460	4,480	240	≦1.0	<0.1	7,460	5,370
		290	≦0.7	<0.1	7,460	3,730	290	≦0.7	<0.1	7,460	4,480
Nodular cast iron FCD (GGG) Below 300HB	JBN795	~160	≦1.5	<0.1	6,960	4,700	~160	≦1.5	<0.1	6,960	5,640
		240	≦1.0	<0.1	6,960	4,180	240	≦1.0	<0.1	6,960	5,010
		290	≦0.7	<0.1	6,960	3,480	290	≦0.7	<0.1	6,960	4,180

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

■ NOTE

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

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max Modular Head QM Series MQX TYPE

RECOMMENDED CUTTING CONDITIONS

QM Max MQX type (YPHW*-F1 type CBN insert for side face milling + Anti-Vibration MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)									
		40 / 42					40				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JBN795	~160	≦1.2	<0.1	3,580	1,720	~160	≦1.2	<0.1	3,580	2,000
		240	≦1.0	<0.1	3,180	1,340	240	≦1.0	<0.1	3,180	1,560
		290	-	-	-	-	290	-	-	-	-
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	~160	≦1.0	<0.1	3,180	1,530	~160	≦1.0	<0.1	3,180	1,780
		240	≦0.8	<0.1	2,390	860	240	≦0.8	<0.1	2,390	1,000
		290	-	-	-	-	290	-	-	-	-
Grey cast iron FC (GG) Below 300HB	JBN795	~160	≦1.5	<0.1	5,970	4,840	~160	≦1.5	<0.1	5,970	5,640
		240	≦1.0	<0.1	5,970	4,300	240	≦1.0	<0.1	5,970	5,010
		290	≦0.7	<0.1	5,970	3,580	290	≦0.7	<0.1	5,970	4,180
Nodular cast iron FCD (GGG) Below 300HB	JBN795	~160	≦1.5	<0.1	5,570	4,510	~160	≦1.5	<0.1	5,570	5,260
		240	≦1.0	<0.1	5,570	4,010	240	≦1.0	<0.1	5,570	4,680
		290	≦0.7	<0.1	5,570	3,340	290	≦0.7	<0.1	5,570	3,900

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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

■ RECOMMENDED CUTTING CONDITIONS

● YPHW*-F1 type CBN insert for side face milling ＋ QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm) 40 No. of teeth 6N					Tool dia. (mm) 40 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	JBN795	～150	≦1.2	＜0.1	3,580	1,720	～150	≦1.2	＜0.1	3,580	2,000
		200	≦1.0	＜0.1	3,180	1,340	200	≦1.0	＜0.1	3,180	1,560
		250	–	–	–	–	250	–	–	–	–
		300	–	–	–	–	300	–	–	–	–
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	～150	≦1.0	＜0.1	3,180	1,530	～150	≦1.0	＜0.1	3,180	1,780
		200	≦0.8	＜0.1	2,390	860	200	≦0.8	＜0.1	2,390	1,000
		250	–	–	–	–	250	–	–	–	–
		300	–	–	–	–	300	–	–	–	–
		350	–	–	–	–	350	–	–	–	–
Grey cast iron FC (GG) Below 300HB	JBN795	～150	≦1.5	＜0.1	5,970	4,840	～150	≦1.5	＜0.1	5,970	5,640
		200	≦1.0	＜0.1	5,970	4,300	200	≦1.0	＜0.1	5,970	5,010
		250	≦0.7	＜0.1	5,970	3,580	250	≦0.7	＜0.1	5,970	4,180
		300	≦0.7	＜0.1	5,970	3,580	300	≦0.7	＜0.1	5,970	4,180
		350	–	–	–	–	350	–	–	–	–
Nodular cast iron FCD (GGG) Below 300HB	JBN795	～150	≦1.5	＜0.1	5,570	4,510	～150	≦1.5	＜0.1	5,570	5,260
		200	≦1.0	＜0.1	5,570	4,010	200	≦1.0	＜0.1	5,570	4,680
		250	≦0.7	＜0.1	5,570	3,340	250	≦0.7	＜0.1	5,570	3,900
		300	≦0.7	＜0.1	5,570	3,340	300	≦0.7	＜0.1	5,570	3,900
		350	–	–	–	–	350	–	–	–	–

Work Materials	Insert Grades	Tool dia. (mm) 50 No. of teeth 7N					Tool dia. (mm) 50/52 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	JBN795	～150	≦1.2	＜0.1	2,860	1,600	～150	≦1.2	＜0.1	2,860	1,830
		200	≦1.2	＜0.1	2,860	1,600	200	≦1.2	＜0.1	2,860	1,830
		250	≦1.0	＜0.1	2,550	1,250	250	≦1.0	＜0.1	2,550	1,430
		300	≦1.0	＜0.1	2,550	1,250	300	≦1.0	＜0.1	2,550	1,430
		350	–	–	–	–	350	–	–	–	–
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	～150	≦1.0	＜0.1	2,550	1,430	～150	≦1.0	＜0.1	2,550	1,630
		200	≦1.0	＜0.1	2,550	1,430	200	≦1.0	＜0.1	2,550	1,630
		250	≦0.8	＜0.1	1,910	800	250	≦0.8	＜0.1	1,910	920
		300	≦0.8	＜0.1	1,910	800	300	≦0.8	＜0.1	1,910	920
		350	–	–	–	–	350	–	–	–	–
Grey cast iron FC (GG) Below 300HB	JBN795	～150	≦1.5	＜0.1	4,780	4,520	～150	≦1.5	＜0.1	4,780	5,160
		200	≦1.5	＜0.1	4,780	4,520	200	≦1.5	＜0.1	4,780	5,160
		250	≦1.0	＜0.1	4,780	4,020	250	≦1.0	＜0.1	4,780	4,590
		300	≦1.0	＜0.1	4,780	4,020	300	≦1.0	＜0.1	4,780	4,590
		350	≦0.7	＜0.1	4,780	3,350	350	≦0.7	＜0.1	4,780	3,820
Nodular cast iron FCD (GGG) Below 300HB	JBN795	～150	≦1.5	＜0.1	4,460	4,210	～150	≦1.5	＜0.1	4,460	4,820
		200	≦1.5	＜0.1	4,460	4,210	200	≦1.5	＜0.1	4,460	4,820
		250	≦1.0	＜0.1	4,460	3,750	250	≦1.0	＜0.1	4,460	4,280
		300	≦1.0	＜0.1	4,460	3,750	300	≦1.0	＜0.1	4,460	4,280
		350	≦0.7	＜0.1	4,460	3,120	350	≦0.7	＜0.1	4,460	3,570

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 same 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.

For high feed / profile / shoulder Milling
For bottom / side finishing

QM Max

QM Series

QXP TYPE

RECOMMENDED CUTTING CONDITIONS

YPHW*-F1 type CBN insert for side face milling + QM Max Shell type milling cutter

Work Materials	Insert Grades	Tool dia. (mm) 63/66 No. of teeth 8N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)					
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JBN795	~200	≦1.2	<0.1	2,270	1,450					
		250	≦1.2	<0.1	2,270	1,450					
		300	≦1.0	<0.1	2,020	1,130					
		350	≦1.0	<0.1	2,020	1,130					
		400	–	–	–	–					
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JBN795	~200	≦1.0	<0.1	2,020	1,290					
		250	≦1.0	<0.1	2,020	1,290					
		300	≦0.8	<0.1	1,520	730					
		350	≦0.8	<0.1	1,520	730					
		400	–	–	–	–					
Grey cast iron FC (GG) Below 300HB	JBN795	~200	≦1.5	<0.1	3,790	4,090					
		250	≦1.5	<0.1	3,790	4,090					
		300	≦1.0	<0.1	3,790	3,640					
		350	≦1.0	<0.1	3,790	3,640					
		400	≦0.7	<0.1	3,790	3,030					
Nodular cast iron FCD (GGG) Below 300HB	JBN795	~200	≦1.5	<0.1	3,540	3,820					
		250	≦1.5	<0.1	3,540	3,820					
		300	≦1.0	<0.1	3,540	3,400					
		350	≦1.0	<0.1	3,540	3,400					
		400	≦0.7	<0.1	3,540	2,830					

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 same 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.

High feed
For profile machining

Max Master GMX / MXG TYPE

Highly improved Metal Removal rate! For high efficient Roughing and semifinishing, Inserts for variety of applications available.

Outstanding chip emissions
Q=317cm³/min
(When using ϕ50 x 7 blades)
(Insert: ENMU-PH type)

Feature 1

Inserts with optimum cutting edge for its use.
※Compared with conventional positive type cutter, chips thickness of QM MAX GII reduced by 14%
※(in case of ap=0.6mm, insert No.:ENMU-PH).

ENMU type (with breaker)

ENMU type (with breaker insert)
Low cutting force inserts for high feed machining.

Negative insert

Optimum cutting edge

ENMQ type (without breaker)

ENMQ type (non-breaker insert)
Inserts with strengthened cutting edge for high hardened materials.

Feature 2

Economical double sided inserts with 4 cutting edges per insert.
Inserts in 4 geometries and 7 types are available.
Wide use for various applications from General steel, die steel, Mould steel, Stainless steel, Titanium alloy, INCONEL and hardened Steels up to 62 HRC

High feed
For profile machining

Max Master GMX / MXG TYPE

Line up

Sharpness → Strength

ENMU100412ZER-SL
- Breaker with low cutting force
- Sharp & wavy cutting edge
- Grade : JC7550, JC7518

ENMU100412ZER-PH
- Breaker for general use
- Strong & wavy cutting edge
- Grade : JC8118, JC8050, JC7560

ENMU100312ZER-HL
- Breaker for high hardened material
- Secure strength by straight cutting edge & low breaker angle
- Grade : DH102
- For high hardened material up to 60HRC

ENMQ100312ZER
- Non-breaker
- Polishing top & bottom surface
- Grade : DH102
- For high hardened material over 60HRC

Application for the choice of inserts

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		JC8050			JC8118		JC8050		DH102		JC8118	JC8050	DH102		JC8118	JC8050	DH102		JC8118
			JC7518		JC7550			JC7518		JC7550				JC7560			JC7518	JC7550			
				JC7560					JC7560									JC7560			

Feature 3

Possible to stable high feed machining in case of long overhung length over L/D=6 .

Feature 4

Excellent in ramping and helical interpolation, and possible to high efficient pocket milling.

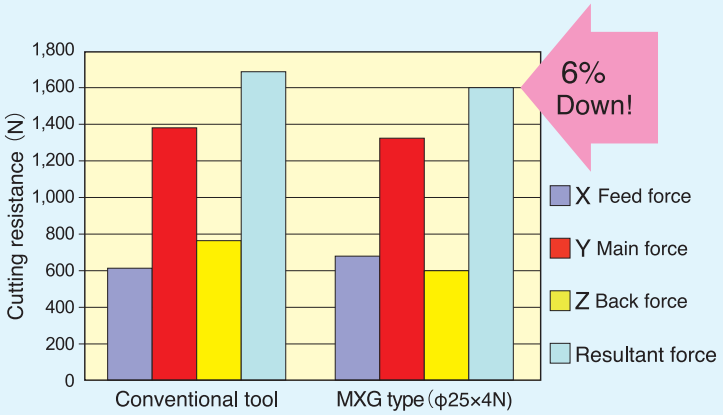
※ Max. ramping angle 1° in case of using ϕ25 tool dia.

High feed
For profile machining

Max Master GMX / MXG TYPE

■ Cutting performance

Cutting force comparison



Material: C50
Cutting conditions : Vc=120m/min,
fz=1.0mm/t,
ap=0.6mm, ae=15mm
Down cut, Air blow
Tool No : MXG-4025-M12
(φ25×4N)
(Modular type)
Insert No :
ENMU100412ZER-PH (JC8118)

Feed limit comparison

	fz=1.1mm/t	fz=1.4mm/t	fz=1.6mm/t
PH breaker	○	○	○
Conventional tool	○	×	

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

Material : 1.2344 SKD61 (46HRC)
Cutting conditions : Vc=95m/min,
ap=1.0mm,
ae=0-19mm
Up & down cut, Air blow
Tool No : MXG-4025-M12
(φ25×4N)
Insert No :
ENMU100412ZER-PH (JC8118)

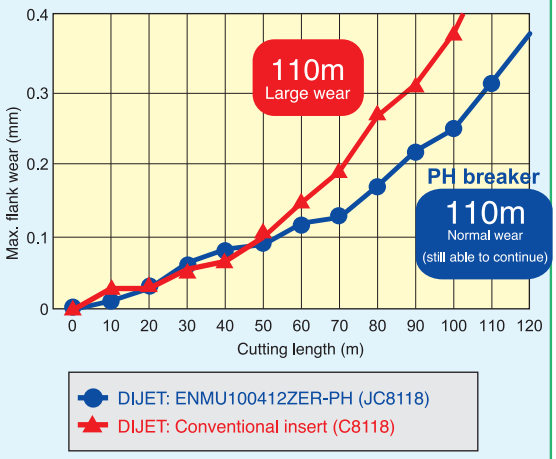
High feed
For profile machining

Max Master GMX / MXG TYPE

Cutting performance

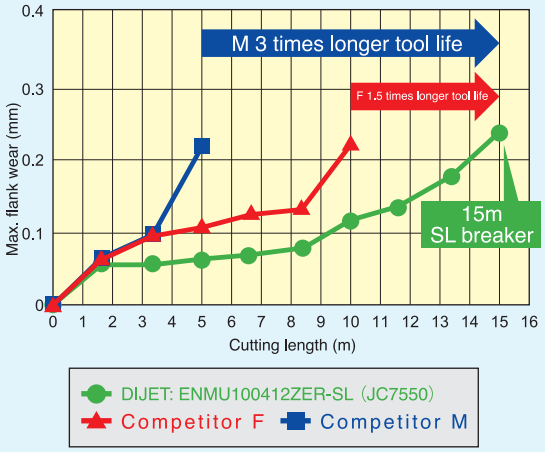
Cutting force comparison

Work material: SKD11
Cutting conditions: Vc = 180m / min, fz = 1.2mm / t, ap = 0.8mm
Pocket machining 75 x 60 x 30 mm
Down cut air blow machining with insert
Overhang length 60 mm Ramping angle 1 °
Tool model number: MXG-4025-M12 (ϕ25 x 4 blades)
Insert model number: ENMU100412ZER-PH (JC8118)



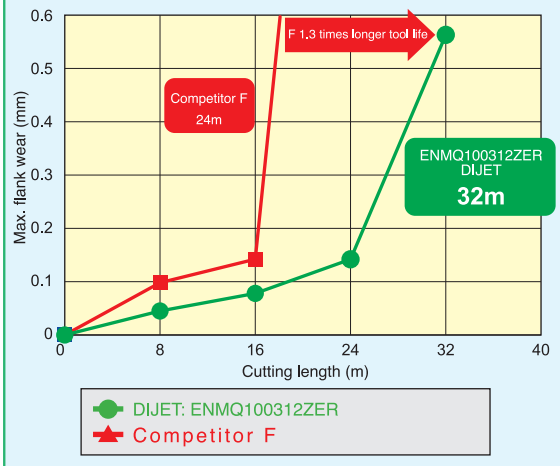
Due to the optimum shape of the PH breaker insert avoids small chipping and extends life

Work Material: Ti-6Al-4V
Cutting conditions: Vc = 60m / min, fz = 0.7mm / t, ap = 0.5mm
ae = 15mm
Down cut wet (external flood) machining with insert
Tool model number: MXG-4025-M12 (ϕ25 x 4 blades)
Insert model number: ENMU100412ZER-SL (JC7550)



Low resistance SL breaker insert
Reduces tool wear and extends life

Work material: SKD11 (60HRC)
Cutting conditions: Vc = 80m / min, fz = 0.3mm / t, ap = 0.2mm,
ae = 15mm
Down cut, external air machining with 4 inserts
Tool model number: MXG-4025-M12 (φ25 x 4 blades)
Insert model number: ENMQ100312ZER (DH102)

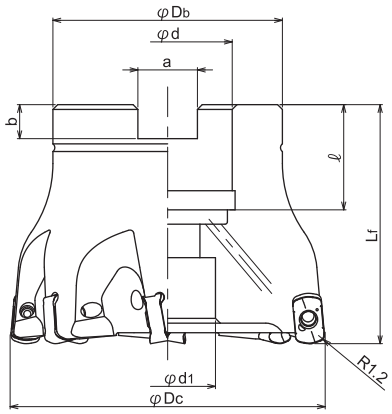


For non-breaker insert cutting edge strength and high hardness
Chipping and chipping by machining grade "DH102"
Reduces tool wear and extends life

High feed
For profile machining

Max Master GMX TYPE

G-Body Through coolant hole

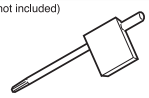


■ Body / Facemill type

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Inserts
Metric Bore	**GMX-7050R-22**	●	7	**50**	50	40	22	17	10.4	6.3	20	ENMU100412 ZER-＊＊
	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	ENM＊100312 ZER-＊＊
	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) 1. All cutters are supplied without inserts.
2. Please refer page E162 - E163 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

■ Parts

Clamp screw	Wrench
	(not included) 
TSW-2567H	A-08

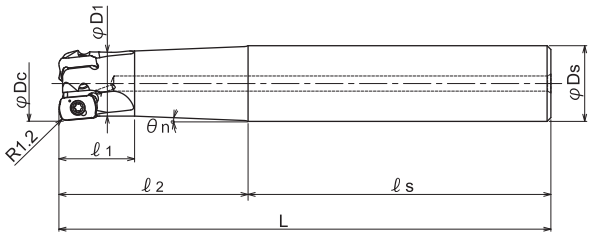
Clamp Screw	Recommended Torque (N・m)
TSW-2567H	1.1

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed
For profile machining

Max Master GMX TYPE

Through coolant hole

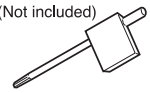


■ Body / End mill type

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	ℓ1	ℓ2	ℓs	L	φD1	φDs	θn° テーパ角	Inserts
GMX-2016-30-S16	●	2	**16**	16	30	70	100	14	16	3.5°	
GMX-2016-50-S16	●	2	**16**	16	50	100	150	14	16	1.2°	
GMX-3020-50-S20	●	3	**20**	20	50	80	130	17.2	20	2.3°	ENMU100412
GMX-3020-80-S20	●	3	**20**	20	80	80	160	17.2	20	1°	ZER-＊＊
GMX-4025-60-S25	●	4	**25**	25	60	80	140	22	25	2°	ENM＊100312
GMX-4025-100-S25	●	4	**25**	25	100	80	180	22	25	0.9°	ZER-＊＊
GMX-5032-70-S32	●	5	**32**	30	70	80	150	29	32	1.5°	
GMX-5032-120-S32	●	5	**32**	30	120	80	200	29	32	0.6°	

Note) 1. All cutters are supplied without inserts.
2. Please refer page E160 - E161 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

■ Parts

Clamp screw	Wrench
	(Not included) 
TSW-2567H	A-08

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

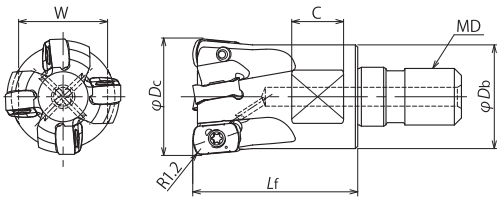
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed
For profile machining

Maxmaster Modular Head MXG TYPE

G-Body

Through coolant hole



■ Body / Modular head type

Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Insert	Parts: Clamp screw	Parts: Wrench
MXG-2016-M8	●	2	16	23	14	M8	8	12	ENMU100412 ZER-＊＊ / ENM＊100312 ZER-＊＊	TSW-2567H	A-08 (not included)
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-5035-M16	●	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 refer page E157 - E159 recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
4. See page D16 for the recommended tightening torque for the modular head.

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

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed
For profile machining

Max Master GMX / MXG TYPE

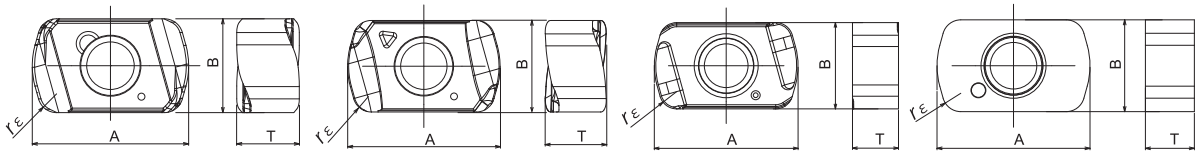
Inserts

ENMU100412ZER-PH

ENMU100412ZER-SL

ENMU100312ZER-HL

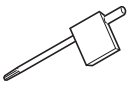
ENMQ100312ZER



Cat No.	Tolerance	PVD Coated						Dimensions (mm)			
		DH102	JC8118	JC7518	JC8050	JC7550	JC7560	A	B	T	rε
ENMU100412ZER-PH	M		●		●		●	10	6	4	1.2
ENMU100412ZER-SL	M			●		●		10	6	4	1.2
ENMU100312ZER-HL	M	●						10	6	3.2	1.2
ENMQ100312ZER	M	●						10	6	3.2	1.2

10 inserts per case.

Parts

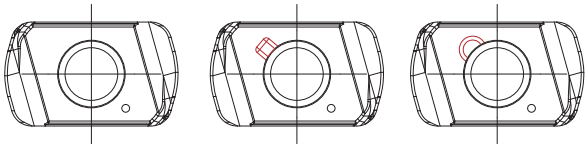
Clamp screw	Wrench
	 (not included)
TSW-2567H	A-08

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

Identification of grade for insert.

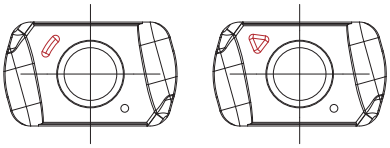
Each grade shows identification mark on the insert surface.

ENMU100412ZER-PH



JC8118 JC8050 JC7560

ENMU100412ZER-SL



JC7518 JC7550

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High feed
For profile machining

Max Master GMX / MXG TYPE

■ Application for the choice of inserts

Work materials	Insert No.	Cat. No.			
		ENMU100412ZER-PH	ENMU100412ZER-SL	ENMU100312ZER-HL	ENMQ100312ZER
Breaker		For general use	Low cutting force	For hardened material	Non-breaker
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8118	○			
	JC8050	◎			
	JC7560	●			
	JC7550				
	JC7518		☆		
	DH102				
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8118	○			
	JC8050	◎			
	JC7560	●			
	JC7550				
	JC7518		☆		
	DH102				
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	○			
	JC8050	◎			
	JC7560	●			
	JC7550				
	JC7518		☆		
	DH102				
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	◎			
	JC8050	●			
	JC7560				
	JC7550				
	JC7518		☆		
	DH102				
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	◎			
	JC8050				
	JC7560				
	JC7550				
	JC7518		☆		
	DH102			●	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	JC8118	×			
	JC8050	×			
	JC7560	×			
	JC7550		×		
	JC7518		×		
	DH102			○	◎
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8118	◎			
	JC8050	○			
	JC7560	●			
	JC7550				
	JC7518				
	DH102				
Stainless steel SUS304 Below 250HB	JC8118				
	JC8050	●			
	JC7560				
	JC7550		◎		
	JC7518		○		
	DH102				
Titanium alloy (Ti-6Al-4V)	JC8118				
	JC8050	●			
	JC7560				
	JC7550		◎		
	JC7518		○		
	DH102				
Inconel (INCO718)	JC8118				
	JC8050	●			
	JC7560				
	JC7550		○		
	JC7518		◎		
	DH102				

◎ : First choice, good condition ○ : —Moderate condition ● : Unfavorable condition ☆ : Light cutting × : No good

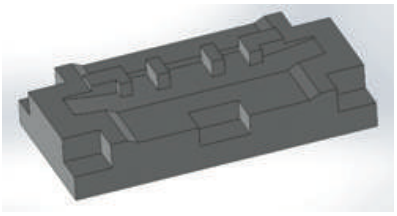
High feed
For profile machining

Max Master GMX / MXG TYPE

■ CASE STUDIES

1. Machining on Plastic mold

Overhung length : 100mm
Gauge : 250mm

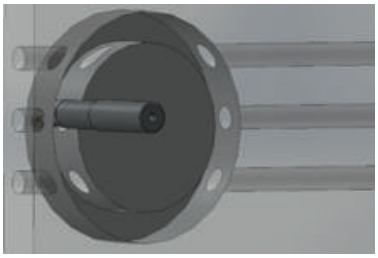


Work	Part name		Plastic mold
	Material		S55C
	Hardness		—
Tool	Tool No.		MXG-5035-M16
			ENMU100412ZER-PH(JC8118)
Cutting conditions	Cutting speed	n	1,910 (min^{-1})
		Vc	210 (m/min)
	Feed speed	Vf	11,460 (mm/min)
		f	1.2 (mm/t)
	a_p (mm)		0.8 (mm)
	a_e (mm)		25 (mm)
	Coolant		Dry
	Machine		Vertical MC

Result Achieved high metal removal rate (Q=229m^3/min). After machining for 3h30min, insert showed normal wear.

2. Machining on Stainless steel

Overhung length : 60mm

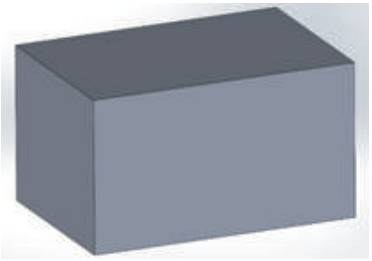


Work	Part name		Machine part
	Material		SUS304
	Hardness		—
Tool	Tool No.		MXG-3020-M10
			ENMU100412ZER-SL(JC7550)
Cutting conditions	Cutting speed	n	1,600 (min^{-1})
		Vc	100 (m/min)
	Feed speed	Vf	3,200 (min) interrupted cutting 2,400 (min)
		f	0.66 (m/min) interrupted cutting 0.5 (m/min)
	a_p (mm)		0.3 (min)
	a_e (mm)		20 (min)
	Coolant		Wet (Internal)
	Machine		Horizontal MC (BT50)

Result Circular grooving while ramping. Competitor machined only 2 or 3 works, but DIJET finished 3 jobs and showed normal wear (still able to continue).

3. Machining on High hardened material

Overhung length : 155mm
Face milling (roughing)
Size : 145mm×98mm×82mm



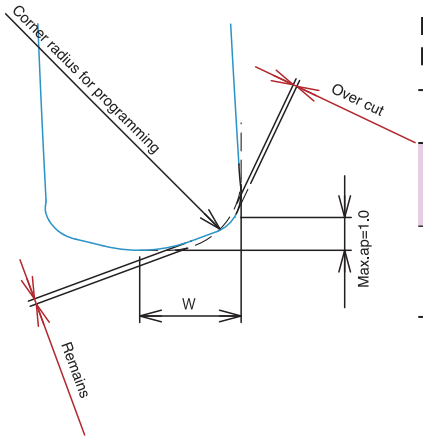
Work	Part name		Test piece
	Material		SKD11
	Hardness		60-63HRC
Tool	Tool No.		MXG-5032-M16
			ENMQ100312ZER(DH102)
Cutting conditions	Cutting speed	n	800 (min^{-1})
		Vc	80 (m/min)
	Feed speed	Vf	1,200 (mm/min)
		f	0.3 (mm/t)
	a_p (mm)		0.2 (mm)
	a_e (mm)		16 (mm)
	Coolant		Air blow (External)
	Machine		Vertical MC

Result Machining time: 3 hours per corner. Cutting length: 225m. Possible to stable machining from beginning to end.

High feed
For profile machining

Max Master GMX / MXG TYPE

Definition of corner radius for programming



Insert No.	W	Corner radius for programming	Remains	Over cut
ENMU100412ZER-PH ENMU100412ZER-SL	3.1	1.0	0.51	0
		1.5 (Standard)	0.36	0
		2.0	0.22	0.05

(mm)

Insert No.	W	Corner radius for programming	Remains	Over cut
ENMU100312ZER-HL ENMQ100312ZER	3.3	1.0	0.55	0
		1.5 (Standard)	0.41	0
		2.0	0.26	0.04

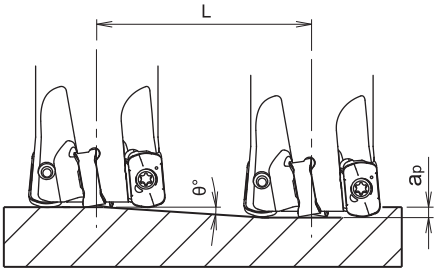
(mm)

High feed
For profile machining

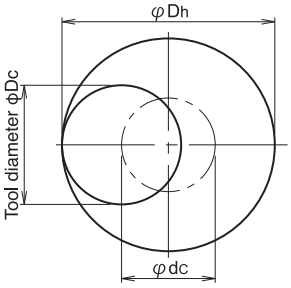
Max Master GMX / MXG TYPE

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. Tool pass rotation should be counter-clockwise.

Note :
- 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.(mm)	Eff. Cutting dia.(mm) Insert No.		Max. depth of cut (mm)	Ramping	
		ENMU100412ZER-※※	ENM※100312ZER-※※		Max. ramping angle θ°	Total cutting length L (m) at max. ap
MXG-2016-M8	16	10.1	9.6	0.7	1°36'	25.1
MXG-2017-M8	17	11	10.5	0.7	1°36'	25.1
MXG-3020-M10	20	13.9	13.5	1	1°30'	38.2
MXG-3021-M10	21	14.9	14.5	1	1°30'	38.2
MXG-∗025-M12	25	18.9	18.4	1	1°12'	47.7
MXG-4026-M12	26	19.9	19.4	1	1°12'	47.7
MXG-5030-M16	30	23.9	23.4	1	0°54'	63.6
MXG-5032-M16	32	25.8	25.4	1	0°54'	63.6
MXG-5035-M16	35	28.8	28.4	1	0°42'	81.8
MXG-6040-M16	40	33.8	33.4	1	0°30'	114.5
MXG-6042-M16	42	35.8	35.4	1	0°30'	114.5
GMX-2016-∗∗-S16	16	10.1	9.6	0.7	1°36'	25.1
GMX-3020-∗∗-S20	20	13.9	13.5	1	1°30'	38.2
GMX-4025-∗∗-S25	25	18.9	18.4	1	1°12'	47.7
GMX-5032-∗∗-S32	32	25.8	25.4	1	0°54'	63.6
GMX-7050R-∗∗	50	43.8	43.4	1	0°24'	143.2
GMX-7052R-22	52	45.8	45.4	1	0°24'	143.2
GMX-7063R-∗∗	63	56.8	56.4	1	0°18'	190.9
GMX-7066R-∗∗	66	59.8	59.4	1	0°18'	190.9

Cat. No.	Tool dia.(mm)	Helical interpolation Min. bore dia. Dh min (mm) Insert No.		Max. bore dia. Dh max (mm)	Max. driling depth(mm) Insert No.	
		ENMU100412ZER-※※	ENM※100312ZER-※※		ENMU100412ZER-※※	ENM※100312ZER-※※
MXG-2016-M8	16	22	21	30	0.3	0.2
MXG-2017-M8	17	24	23	32	0.3	0.2
MXG-3020-M10	20	30	29	38	0.4	0.2
MXG-3021-M10	21	32	31	40	0.4	0.2
MXG-∗025-M12	25	40	39	48	0.5	0.3
MXG-4026-M12	26	42	41	50	0.5	0.3
MXG-5030-M16	30	50	49	58	0.6	0.4
MXG-5032-M16	32	54	53	62	0.6	0.4
MXG-5035-M16	35	60	59	68	0.6	0.4
MXG-6040-M16	40	70	69	78	0.7	0.5
MXG-6042-M16	42	74	73	82	0.7	0.5
GMX-2016-∗∗-S16	16	22	21	30	0.3	0.2
GMX-3020-∗∗-S20	20	30	29	38	0.4	0.2
GMX-4025-∗∗-S25	25	40	39	48	0.5	0.3
GMX-5032-∗∗-S32	32	54	53	62	0.6	0.4
GMX-7050R-∗∗	50	90	89	98	0.8	0.6
GMX-7052R-22	52	94	93	102	0.8	0.6
GMX-7063R-∗∗	63	116	115	124	0.8	0.6
GMX-7066R-∗∗	66	122	121	130	0.8	0.6

High feed
For profile machining

Max Master MXG TYPE

RECOMMENDED CUTTING CONDITIONS

MXG and MSN type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			16/17					20/21				
			No. of teeth 2N					No. of teeth 3N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~50	0.7	~10	3,580	8,590	~60	0.8	~14	2,860	10,300
			80	0.6	~10	3,580	8,590	100	0.6	~14	2,860	10,300
			120	0.6	~10	3,180	7,630	140	0.6	~14	2,550	9,180
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~50	0.7	~10	3,580	8,590	~60	0.8	~14	2,860	10,300
			80	0.6	~10	3,580	8,590	100	0.6	~14	2,860	10,300
			120	0.6	~10	3,180	7,630	140	0.6	~14	2,550	9,180
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	ENMU 100412 ZER-PH	JC8050 (JC7560)	~50	0.7	~10	3,180	7,630	~60	0.8	~14	2,550	9,180
			80	0.6	~10	3,180	7,630	100	0.6	~14	2,550	9,180
			120	0.6	~10	2,590	6,220	140	0.6	~14	2,070	7,450
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	ENMU 100412 ZER-PH	JC8118 (JC8050)	~50	0.6	~10	1,890	4,160	~60	0.6	~14	1,510	4,980
			80	0.5	~10	1,690	3,040	100	0.5	~14	1,350	3,650
			120	0.5	~10	1,590	2,860	140	0.5	~14	1,270	3,430
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	ENMU100412 ZER-PH (ENMU100412 ZER-SL)	JC8118 (JC7518)	~50	0.6	~10	1,890	4,160	~60	0.6	~14	1,510	4,980
			80	0.5	~10	1,690	3,040	100	0.5	~14	1,350	3,650
			120	0.5	~10	1,590	2,860	140	0.5	~14	1,270	3,430
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	ENMQ100312 ZER (ENMU100312 ZER-HL)	DH102	~50	0.2	~10	1,590	950	~60	0.2	~14	1,270	1,140
			80	0.15	~10	1,390	700	100	0.15	~14	1,110	830
			120	0.1	~10	1,290	650	140	0.1	~14	1,030	770
Cast iron (GG25) (FC250) 160-260HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~50	0.7	~10	3,980	11,940	~60	1	~14	3,180	14,310
			80	0.7	~10	3,980	11,940	100	0.8	~14	3,180	14,310
			120	0.6	~10	3,580	8,590	140	0.6	~14	2,860	10,300
Nodular Cast iron (GGG70) 170-300HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~50	0.7	~10	3,980	11,940	~60	1	~14	3,180	14,310
			80	0.7	~10	3,980	11,940	100	0.8	~14	3,180	14,310
			120	0.6	~10	3,580	8,590	140	0.6	~14	2,860	10,300
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	ENMU 100412 ZER-SL	JC7550 (JC7518)	~50	0.6	~10	2,390	4,780	~60	0.6	~14	1,910	5,730
			80	0.5	~10	2,390	4,780	100	0.5	~14	1,910	5,730
			120	0.5	~10	1,990	3,180	140	0.5	~14	1,590	3,820
Precipitation hardening stainless steel (SUS630)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~50	0.5	~10	1,990	2,790	~60	0.5	~14	1,590	3,340
			80	0.4	~10	1,990	2,790	100	0.4	~14	1,590	3,340
			120	0.4	~10	1,790	2,150	140	0.4	~14	1,430	2,570
Super duplex stainless steel (S32750)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~50	0.6	~10	1,990	1,190	~60	0.6	~14	1,590	1,430
			80	0.5	~10	1,990	1,190	100	0.5	~14	1,590	1,430
			120	0.5	~10	1,790	720	140	0.5	~14	1,430	860
Titanium alloy 35-43HRC	ENMU 100412 ZER-SL	JC7550 (JC7518)	~50	0.5	~10	1,190	1,670	~60	0.5	~14	950	2,000
			80	0.4	~10	1,190	1,670	100	0.4	~14	950	2,000
			120	0.4	~10	990	1,190	140	0.4	~14	800	1,440
Inconel 35-43HRC	ENMU 100412 ZER-SL	JC7518 (JC7550)	~50	0.5	~10	600	360	~60	0.5	~14	480	430
			80	0.3	~10	600	360	100	0.3	~14	480	430
			120	0.2	~10	600	360	140	0.2	~14	480	430

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High feed
For profile machining

Max Master MXG TYPE

RECOMMENDED CUTTING CONDITIONS

MXG and MSN type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			25					25/26				
			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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~75	0.8	~19	2,290	8,240	~75	0.8	~19	2,290	10,990
			125	0.6	~19	2,290	8,240	125	0.6	~19	2,290	10,990
			175	0.6	~19	2,040	7,340	175	0.6	~19	2,040	9,790
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~75	0.8	~19	2,290	8,240	~75	0.8	~19	2,290	10,990
			125	0.6	~19	2,290	8,240	125	0.6	~19	2,290	10,990
			175	0.6	~19	2,040	7,340	175	0.6	~19	2,040	9,790
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	ENMU 100412 ZER-PH	JC8050 (JC7560)	~75	0.8	~19	2,040	7,340	~75	0.8	~19	2,040	9,790
			125	0.6	~19	2,040	7,340	125	0.6	~19	2,040	9,790
			175	0.6	~19	1,660	5,980	175	0.6	~19	1,660	7,970
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	ENMU 100412 ZER-PH	JC8118 (JC8050)	~75	0.6	~19	1,210	3,990	~75	0.6	~19	1,210	5,320
			125	0.5	~19	1,080	2,920	125	0.5	~19	1,080	3,890
			175	0.5	~19	1,020	2,750	175	0.5	~19	1,020	3,670
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	ENMU100412 ZER-PH (ENMU100412 ZER-SL)	JC8118 (JC7518)	~75	0.6	~19	1,210	3,990	~75	0.6	~19	1,210	5,320
			125	0.5	~19	1,080	2,920	125	0.5	~19	1,080	3,890
			175	0.5	~19	1,020	2,750	175	0.5	~19	1,020	3,670
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	ENMQ100312 ZER (ENMU100312 ZER-HL)	DH102	~75	0.2	~19	1,020	920	~75	0.2	~19	1,020	1,220
			125	0.15	~19	890	670	125	0.15	~19	890	890
			175	0.1	~19	830	620	175	0.1	~19	830	830
Cast iron (GG25) (FC250) 160-260HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~75	1	~19	2,550	11,480	~75	1	~19	2,550	15,300
			125	0.8	~19	2,550	11,480	125	0.8	~19	2,550	15,300
			175	0.6	~19	2,290	8,240	175	0.6	~19	2,290	10,990
Nodular Cast iron (GGG70) 170-300HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~75	1	~19	2,550	11,480	~75	1	~19	2,550	15,300
			125	0.8	~19	2,550	11,480	125	0.8	~19	2,550	15,300
			175	0.6	~19	2,290	8,240	175	0.6	~19	2,290	10,990
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	ENMU 100412 ZER-SL	JC7550 (JC7518)	~75	0.6	~19	1,530	4,590	~75	0.6	~19	1,530	6,120
			125	0.5	~19	1,530	4,590	125	0.5	~19	1,530	6,120
			175	0.5	~19	1,270	3,050	175	0.5	~19	1,270	4,060
Precipitation hardening stainless steel (SUS630)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~75	0.5	~19	1,270	2,670	~75	0.5	~19	1,270	3,560
			125	0.4	~19	1,270	2,670	125	0.4	~19	1,270	3,560
			175	0.4	~19	1,150	2,070	175	0.4	~19	1,150	2,760
Super duplex stainless steel (S32750)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~75	0.6	~19	1,270	1,140	~75	0.6	~19	1,270	1,520
			125	0.5	~19	1,270	1,140	125	0.5	~19	1,270	1,520
			175	0.5	~19	1,150	690	175	0.5	~19	1,150	920
Titanium alloy 35-43HRC	ENMU 100412 ZER-SL	JC7550 (JC7518)	~75	0.5	~19	760	1,600	~75	0.5	~19	760	2,130
			125	0.4	~19	760	1,600	125	0.4	~19	760	2,130
			175	0.4	~19	640	1,150	175	0.4	~19	640	1,540
Inconel 35-43HRC	ENMU 100412 ZER-SL	JC7518 (JC7550)	~75	0.5	~19	380	340	~75	0.5	~19	380	460
			125	0.3	~19	380	340	125	0.3	~19	380	460
			175	0.2	~19	380	340	175	0.2	~19	380	460

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High feed
For profile machining

Max Master MXG TYPE

RECOMMENDED CUTTING CONDITIONS

MXG and MSN type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			30/32/35					40/42				
			No. of teeth 5N					No. of teeth 6N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~90	0.8	~25	1,910	11,460	~120	0.8	~32	1,430	10,300
			150	0.6	~25	1,910	11,460	200	0.6	~32	1,430	10,300
			210	0.6	~25	1,700	10,200	280	0.6	~32	1,270	9,140
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~90	0.8	~25	1,910	11,460	~120	0.8	~32	1,430	10,300
			150	0.6	~25	1,910	11,460	200	0.6	~32	1,430	10,300
			210	0.6	~25	1,700	10,200	280	0.6	~32	1,270	9,140
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	ENMU 100412 ZER-PH	JC8050 (JC7560)	~90	0.8	~25	1,700	10,200	~120	0.8	~32	1,270	9,140
			150	0.6	~25	1,700	10,200	200	0.6	~32	1,270	9,140
			210	0.6	~25	1,380	8,280	280	0.6	~32	1,030	7,420
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	ENMU 100412 ZER-PH	JC8118 (JC8050)	~90	0.6	~25	1,010	5,560	~120	0.6	~32	760	5,020
			150	0.5	~25	900	4,050	200	0.5	~32	680	3,670
			210	0.5	~25	850	3,830	280	0.5	~32	640	3,460
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	ENMU100412 ZER-PH (ENMU100412 ZER-SL)	JC8118 (JC7518)	~90	0.6	~25	1,010	5,560	~120	0.6	~32	760	5,020
			150	0.5	~25	900	4,050	200	0.5	~32	680	3,670
			210	0.5	~25	850	3,830	280	0.5	~32	640	3,460
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	ENMQ100312 ZER (ENMU100312 ZER-HL)	DH102	~90	0.2	~25	850	1,280	~120	0.2	~32	640	1,150
			150	0.15	~25	740	930	200	0.15	~32	560	840
			210	0.1	~25	690	860	280	0.1	~32	520	780
Cast iron (GG25) (FC250) 160-260HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~90	1	~25	2,120	15,900	~120	1	~32	1,590	14,310
			150	0.8	~25	2,120	15,900	200	0.8	~32	1,590	14,310
			210	0.6	~25	1,910	11,460	280	0.6	~32	1,430	10,300
Nodular Cast iron (GGG70) 170-300HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~90	1	~25	2,120	15,900	~120	1	~32	1,590	14,310
			150	0.8	~25	2,120	15,900	200	0.8	~32	1,590	14,310
			210	0.6	~25	1,910	11,460	280	0.6	~32	1,430	10,300
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	ENMU 100412 ZER-SL	JC7550 (JC7518)	~90	0.6	~25	1,270	6,350	~120	0.6	~32	950	5,700
			150	0.5	~25	1,270	6,350	200	0.5	~32	950	5,700
			210	0.5	~25	1,060	4,240	280	0.5	~32	800	3,840
Precipitation hardening stainless steel (SUS630)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~90	0.5	~25	1,060	3,710	~120	0.5	~32	800	3,360
			150	0.4	~25	1,060	3,710	200	0.4	~32	800	3,360
			210	0.4	~25	950	2,850	280	0.4	~32	720	2,590
Super duplex stainless steel (S32750)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~90	0.6	~25	1,060	1,590	~120	0.6	~32	800	1,440
			150	0.5	~25	1,060	1,590	200	0.5	~32	800	1,440
			210	0.5	~25	950	950	280	0.5	~32	720	860
Titanium alloy 35-43HRC	ENMU 100412 ZER-SL	JC7550 (JC7518)	~90	0.5	~25	640	2,240	~120	0.5	~32	480	2,020
			150	0.4	~25	640	2,240	200	0.4	~32	480	2,020
			210	0.4	~25	530	1,590	280	0.4	~32	400	1,440
Inconel 35-43HRC	ENMU 100412 ZER-SL	JC7518 (JC7550)	~90	0.5	~25	320	480	~120	0.5	~32	240	430
			150	0.3	~25	320	480	200	0.3	~32	240	430
			210	0.2	~25	320	480	280	0.2	~32	240	430

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High feed
For profile machining

Max Master GMX TYPE

■ RECOMMENDED CUTTING CONDITIONS

Shank type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			16					20				
			No. of teeth 2N					No. of teeth 3N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~30	0.7	~10	3,580	8,590					
			30~50	0.6	~10	3,580	8,590	~60	0.6	~14	2,860	10,300
			50~70	0.6	~10	3,180	7,630	60~100	0.6	~14	2,550	9,180
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~30	0.7	~10	3,580	8,590					
			30~50	0.6	~10	3,580	8,590	~60	0.6	~14	2,860	10,300
			50~70	0.6	~10	3,180	7,630	60~100	0.6	~14	2,550	9,180
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	ENMU 100412 ZER-PH	JC8050 (JC7560)	~30	0.7	~10	3,180	7,630					
			30~50	0.6	~10	3,180	7,630	~60	0.6	~14	2,550	9,180
			50~70	0.6	~10	2,590	6,220	60~100	0.6	~14	2,070	7,450
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	ENMU 100412 ZER-PH	JC8118 (JC8050)	~30	0.6	~10	1,890	4,160					
			30~50	0.5	~10	1,690	3,040	~60	0.5	~14	1,350	3,650
			50~70	0.5	~10	1,590	2,860	60~100	0.5	~14	1,270	3,430
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	ENMU100412 ZER-PH (ENMU100412 ZER-SL)	JC8118 (JC7518)	~30	0.6	~10	1,890	4,160					
			30~50	0.5	~10	1,690	3,040	~60	0.5	~14	1,350	3,650
			50~70	0.5	~10	1,590	2,860	60~100	0.5	~14	1,270	3,430
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	ENMQ100312 ZER (ENMU100312 ZER-HL)	DH102	~30	0.2	~10	1,590	950					
			30~50	0.15	~10	1,390	700	~60	0.15	~14	1,110	830
			50~70	0.1	~10	1,290	650	60~100	0.1	~14	1,030	770
Cast iron (GG25) (FC250) 160-260HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~30	0.7	~10	3,980	11,940					
			30~50	0.7	~10	3,980	11,940	~60	0.8	~14	3,180	14,310
			50~70	0.6	~10	3,580	8,590	60~100	0.6	~14	2,860	10,300
Nodular Cast iron (GGG70) 170-300HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~30	0.7	~10	3,980	11,940					
			30~50	0.7	~10	3,980	11,940	~60	0.8	~14	3,180	14,310
			50~70	0.6	~10	3,580	8,590	60~100	0.6	~14	2,860	10,300
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	ENMU 100412 ZER-SL	JC7550 (JC7518)	~30	0.6	~10	2,390	4,780					
			30~50	0.5	~10	2,390	4,780	~60	0.5	~14	1,910	5,730
			50~70	0.5	~10	1,990	3,180	60~100	0.5	~14	1,590	3,820
Precipitation hardening stainless steel (SUS630)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~30	0.5	~10	1,990	2,790					
			30~50	0.4	~10	1,990	2,790	~60	0.4	~14	1,590	3,340
			50~70	0.4	~10	1,790	2,150	60~100	0.4	~14	1,430	2,570
Super duplex stainless steel (S32750)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~30	0.6	~10	1,990	1,190					
			30~50	0.5	~10	1,990	1,190	~60	0.5	~14	1,590	1,430
			50~70	0.5	~10	1,790	720	60~100	0.5	~14	1,430	860
Titanium alloy 35-43HRC	ENMU 100412 ZER-SL	JC7550 (JC7518)	~30	0.5	~10	1,190	1,670					
			30~50	0.4	~10	1,190	1,670	~60	0.4	~14	950	2,000
			50~70	0.4	~10	990	1,190	60~100	0.4	~14	800	1,440
Inconel 35-43HRC	ENMU 100412 ZER-SL	JC7518 (JC7550)	~30	0.5	~10	600	360					
			30~50	0.3	~10	600	360	~60	0.3	~14	480	430
			50~70	0.2	~10	600	360	60~100	0.2	~14	480	430

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed
For profile machining

Max Master GMX TYPE

RECOMMENDED CUTTING CONDITIONS

Shank type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			25					32				
			No. of teeth 4N					No. of teeth 5N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~70	0.6	~19	2,290	10,990	~90	0.6	~25	1,790	10,740
			70~120	0.6	~19	2,040	9,790	90~140	0.6	~25	1,590	9,540
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~70	0.6	~19	2,290	10,990	~90	0.6	~25	1,790	10,740
			70~120	0.6	~19	2,040	9,790	90~140	0.6	~25	1,590	9,540
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	ENMU 100412 ZER-PH	JC8050 (JC7560)	~70	0.6	~19	2,040	9,790	~90	0.6	~25	1,590	9,540
			70~120	0.6	~19	1,660	7,970	90~140	0.6	~25	1,290	7,740
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	ENMU 100412 ZER-PH	JC8118 (JC8050)	~70	0.5	~19	1,080	3,890	~90	0.5	~25	850	3,830
			70~120	0.5	~19	1,020	3,670	90~140	0.5	~25	800	3,600
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	ENMU100412 ZER-PH (ENMU100412 ZER-SL)	JC8118 (JC7518)	~70	0.5	~19	1,080	3,890	~90	0.5	~25	850	3,830
			70~120	0.5	~19	1,020	3,670	90~140	0.5	~25	800	3,600
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	ENMQ100312 ZER (ENMU100312 ZER-HL)	DH102	~70	0.15	~19	890	890	~90	0.15	~25	700	880
			70~120	0.1	~19	830	830	90~140	0.1	~25	650	810
Cast iron (GG25) (FC250) 160-260HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~70	0.8	~19	2,550	15,300	~90	0.8	~25	1,990	14,930
			70~120	0.6	~19	2,290	10,990	90~140	0.6	~25	1,790	10,740
Nodular Cast iron (GGG70) 170-300HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~70	0.8	~19	2,550	15,300	~90	0.8	~25	1,990	14,930
			70~120	0.6	~19	2,290	10,990	90~140	0.6	~25	1,790	10,740
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	ENMU 100412 ZER-SL	JC7550 (JC7518)	~70	0.5	~19	1,530	6,120	~90	0.5	~25	1,190	5,950
			70~120	0.5	~19	1,270	4,060	90~140	0.5	~25	990	3,960
Precipitation hardening stainless steel (SUS630)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~70	0.4	~19	1,270	3,560	~90	0.4	~25	990	3,470
			70~120	0.4	~19	1,150	2,760	90~140	0.4	~25	900	2,700
Super duplex stainless steel (S32750)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~70	0.5	~19	1,270	1,520	~90	0.5	~25	990	1,490
			70~120	0.5	~19	1,150	920	90~140	0.5	~25	900	900
Titanium alloy 35-43HRC	ENMU 100412 ZER-SL	JC7550 (JC7518)	~70	0.4	~19	760	2,130	~90	0.4	~25	600	2,100
			70~120	0.4	~19	640	1,540	90~140	0.4	~25	500	1,500
Inconel 35-43HRC	ENMU 100412 ZER-SL	JC7518 (JC7550)	~70	0.3	~19	380	460	~90	0.3	~25	300	450
			70~120	0.2	~19	380	460	90~140	0.2	~25	300	450

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High feed
For profile machining

Max Master GMX TYPE

■ RECOMMENDED CUTTING CONDITIONS

Facemill type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			50/52					63/66				
			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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~150	1	~40	1,020	8,570	~150	1	~50	810	6,800
			200	0.8	~40	1,020	8,570	200	0.8	~50	810	6,800
			250	0.6	~40	890	7,480	250	0.6	~50	710	5,960
			300	0.5	~40	830	6,970	300	0.5	~50	660	5,540
			350	0.4	~40	830	6,970	350	0.4	~50	660	5,540
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	ENMU 100412 ZER-PH	JC8050 (JC7560)	~150	1	~40	1,020	8,570	~150	1	~50	810	6,800
			200	0.8	~40	1,020	8,570	200	0.8	~50	810	6,800
			250	0.6	~40	890	7,480	250	0.6	~50	710	5,960
			300	0.5	~40	830	6,970	300	0.5	~50	660	5,540
			350	0.4	~40	830	6,970	350	0.4	~50	660	5,540
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	ENMU 100412 ZER-PH	JC8050 (JC7560)	~150	1	~40	1,020	8,570	~150	1	~50	810	6,800
			200	0.8	~40	1,020	8,570	200	0.8	~50	810	6,800
			250	0.6	~40	890	7,480	250	0.6	~50	710	5,960
			300	0.5	~40	830	6,970	300	0.5	~50	660	5,540
			350	0.4	~40	830	6,970	350	0.4	~50	660	5,540
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	ENMU 100412 ZER-PH	JC8118 (JC8050)	~150	0.8	~40	540	4,160	~150	0.8	~50	430	3,310
			200	0.6	~40	540	4,160	200	0.6	~50	430	3,310
			250	0.4	~40	510	3,210	250	0.4	~50	400	2,520
			300	0.3	~40	480	3,020	300	0.3	~50	380	2,390
			350	0.3	~40	480	2,690	350	0.3	~50	380	2,130
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	ENMU100412 ZER-PH (ENMU100412 ZER-SL)	JC8118 (JC7518)	~150	0.6	~40	540	4,160	~150	0.6	~50	430	3,310
			200	0.4	~40	540	4,160	200	0.4	~50	430	3,310
			250	0.2	~40	510	3,210	250	0.2	~50	400	2,520
			300	0.1	~40	510	3,210	300	0.1	~50	400	2,520
			350	—	—	—	—	350	—	—	—	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	ENMQ100312 ZER (ENMU100312 ZER-HL)	DH102	~150	0.2	~40	510	1,070	~150	0.2	~50	400	840
			200	0.15	~40	450	790	200	0.15	~50	350	610
			250	0.1	~40	410	720	250	0.1	~50	330	580
			300	—	—	—	—	300	—	—	—	—
			350	—	—	—	—	350	—	—	—	—
Cast iron (GG25) (FC250) 160-260HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~150	1	~40	1,150	12,080	~150	1	~50	910	9,560
			200	0.8	~40	1,150	12,080	200	0.8	~50	910	9,560
			250	0.6	~40	1,020	10,710	250	0.6	~50	810	8,510
			300	0.5	~40	950	9,980	300	0.5	~50	760	7,980
			350	0.4	~40	950	7,980	350	0.4	~50	760	6,380
Nodular Cast iron (GGG70) 170-300HB	ENMU 100412 ZER-PH	JC8118 (JC8050)	~150	1	~40	1,150	12,080	~150	1	~50	910	9,560
			200	0.8	~40	1,150	12,080	200	0.8	~50	910	9,560
			250	0.6	~40	1,020	10,710	250	0.6	~50	810	8,510
			300	0.5	~40	950	9,980	300	0.5	~50	760	7,980
			350	0.4	~40	950	7,980	350	0.4	~50	760	6,380

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High feed
For profile machining

Max Master GMX TYPE

■ RECOMMENDED CUTTING CONDITIONS

Facemill type

Work Materials	Grades	Insert No.	Tool dia (mm)									
			50/52					63/66				
			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)
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	ENMU 100412 ZER-SL	JC8050 (JC7518)	~150	0.8	~40	760	5,320	~150	0.8	~50	610	4,270
			200	0.6	~40	760	5,320	200	0.6	~50	610	4,270
			250	0.4	~40	640	4,480	250	0.4	~50	510	3,570
			300	0.3	~40	640	4,480	300	0.3	~50	510	3,570
			350	0.3	~40	640	3,580	350	0.3	~50	510	2,860
Precipitation hardening stainless steel (SUS630)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC7550 (JC8050)	~150	0.6	~40	640	3,140	~150	0.6	~50	510	2,500
			200	0.5	~40	640	3,140	200	0.5	~50	510	2,500
			250	0.3	~40	570	2,790	250	0.3	~50	450	2,210
			300	0.2	~40	570	2,790	300	0.2	~50	450	2,210
			350	0.2	~40	570	2,390	350	0.2	~50	450	1,890
Super duplex stainless steel (S32750)	ENMU100412 ZER-SL ENMU100412 ZER-PH	JC755 (JC8050)	~150	0.8	~40	640	1,340	~150	0.8	~50	510	1,070
			200	0.6	~40	640	1,340	200	0.6	~50	510	1,070
			250	0.4	~40	570	1,200	250	0.4	~50	450	950
			300	0.3	~40	570	1,200	300	0.3	~50	450	950
			350	0.3	~40	570	800	350	0.3	~50	450	630
Titanium alloy 35-43HRC	ENMU 100412 ZER-SL	JC7550 (JC7518)	~150	0.7	~40	380	1,860	~150	0.7	~50	300	1,470
			200	0.5	~40	380	1,860	200	0.5	~50	300	1,470
			250	0.3	~40	320	1,570	250	0.3	~50	250	1,230
			300	0.3	~40	320	1,570	300	0.3	~50	250	1,230
			350	0.3	~40	320	1,340	350	0.3	~50	250	1,050
Inconel 35-43HRC	ENMU 100412 ZER-SL	JC7518 (JC7550)	~150	0.7	~40	190	400	~150	0.7	~50	150	320
			200	0.5	~40	190	400	200	0.5	~50	150	320
			250	0.3	~40	160	340	250	0.3	~50	130	270
			300	0.2	~40	160	340	300	0.2	~50	130	270
			350	0.2	~40	130	270	350	0.2	~50	100	210

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

SIC-EVO

Indexable Milling Cutter SSV type

Multi functional indexable cutter "SIC-EVO" achieved high efficient and stable shoulder milling

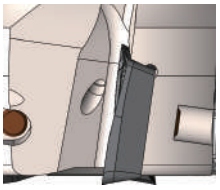
Feature 1

Max. depth of cut (ap)=15mm is possible. SIC-EVO is usable for wide applications such as face milling, slotting, pocket milling

Arc geometry on the periphery cutting edge

Cusp height can be smaller even in case of large ap and achieved high efficient & high precision machining for vertical wall

Applicable to various milling, such as ramping and helical machining



High positive geometry with low cutting force

Feature 2

Corner radius, R0.4, R0.8, R1.6, R2.0 and R3.0 are available.

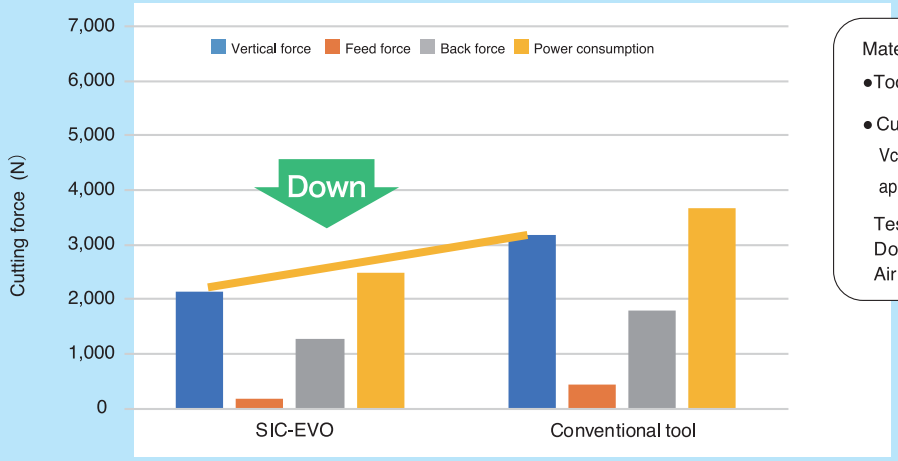
■ Application

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		JC8050				JC8118	JC8050			JC8118								JC8118	

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

Cutting force comparison

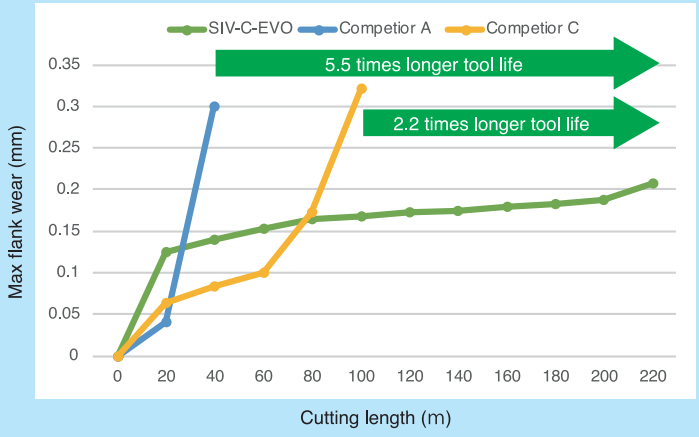


Material : 1.1213
- Tool dia. : ϕ25
- Cutting conditions:
  Vc=200m/min, fz=0.1mm/t
  ap=15mm, ae=1mm

Test by one insert
Down cut,
Air blow (internal)

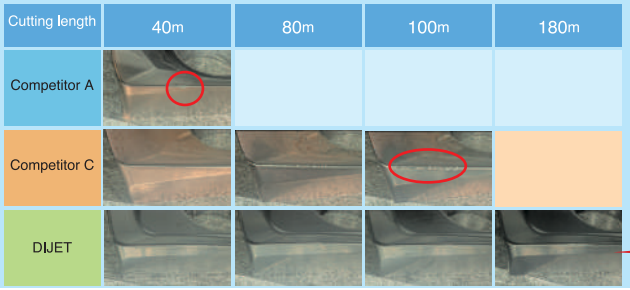
Achieved low cutting force

Tool life comparison



Material : 1.2311
- Tool dia. : ϕ25
- Cutting conditions:
  Vc=150m/min, fz=0.3mm/t
  ap=14mm, ae=1mm

Test by one insert
Down cut,
Air blow (internal)

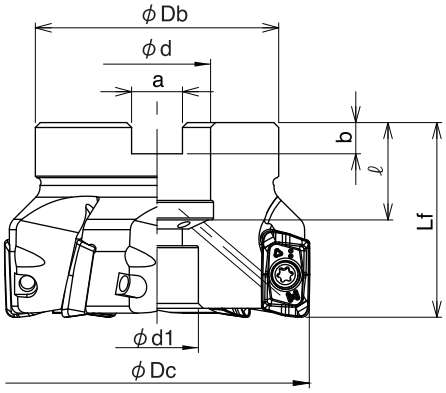


Stable, rough machining is possible!

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

Through coolant hole

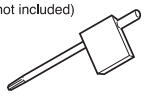


■ Facemill type

Type	Cat. No.	Stock	No. of stock	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Set bolt		Weight (kg)	Applicable Inserts
Metric Bore	**SSV-4040R-16**	●	4	40	40	35	16	14	8.4	5.6	18	M8	Head cap screw (JIS Standard)	0.20	ZO*T1605**ZER-**
	SSV-5050R-22	●	5	50	40	47	22	16	10.4	6.3	20	M10		0.33	
	SSV-6063R-22	●	6	63	40	50	22	17	10.4	6.3	20	M10		0.52	
	SSV-6063R-27	●	6	63	50	60	27	20	12.4	7	22	M12×1.75×30★		0.75	
	SSV-7080R-27	●	7	80	50	60	27	20	12.4	7	22	M12×1.75×30★		1.08	
	SSV-8100R-32	●	8	100	50	85	32	26	14.4	8	25	M16×2×30★		1.95	
	SSV-8125R-40	●	8	125	63	100	40	32	16.4	9	32	M20×2.5×40★		3.73	

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
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. Please see page E172 - E174 for recommended cutting conditions for shoulder milling,
E175 - E177 for recommended Cutting conditions for Facemilling.

■ Parts

Clamp screw	Wrench
	(not included) 
DSW-4075H	A-15T

Clamp Screw	Recommended Torque (N·m)
DSW-4075H	3.6

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

Fig.1

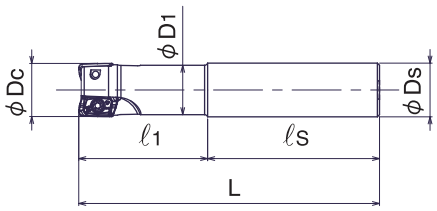
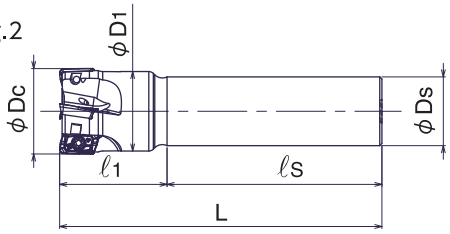


Fig.2



■ Endmill type

Cat. No.	Stock	No. of stock	Dimensions (mm) φDc	ℓ1	ℓs	L	φD1	φDs	Fig.	Applicable Inserts	Parts Wrench (not included)
SSV-2025-60-S25+A	●	2	25	60	80	140	23	25	1	ZO*T1605**ZER-**	A-15
SSV-2025-100-S25+A	●	2	25	100	80	180	23	25	1		
SSV-3032-70-S32+A	●	3	32	70	80	150	29	32	1		
SSV-3032-120-S32+A	●	3	32	120	80	200	29	32	1		
SSV-4040-50-S32+A	●	4	40	50	100	150	37	32	2		
SSV-4040-50L-S32+A	●	4	40	50	150	200	37	32	2		

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
3. Please see page E178 - E181 for recommended cutting conditions for shoulder milling, E175 - E177 for recommended Cutting conditions for Facemilling.

■ Parts

Clamp screw

DSW-4075H

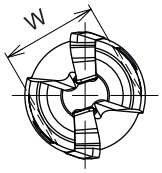
Clamp Screw	Recommended Torque (N・m)
DSW-4075H	3.6

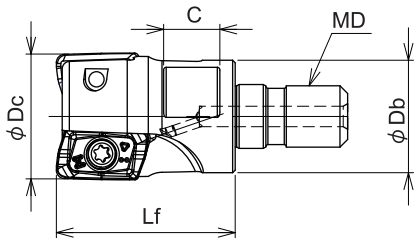
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

Through coolant hole



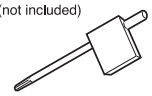


Modular head type

Cat. No.	Stock	No. of inserts	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Applicable Inserts
SSV-2025-M12	●	2	25	35	22	M12	11	19	ZO*T1605**ZER-**
SSV-3032-M16	●	3	32	43	29	M16	12	22	
SSV-3035-M16	□	3	35	43	29	M16	12	22	
SSV-4040-M16	●	4	40	43	29	M16	12	22	

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
3. Please see page E182 - E183 for recommended cutting conditions for shoulder milling,
E184 - E185 for recommended Cutting conditions for Facemilling.

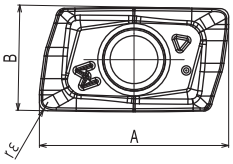
Parts

Clamp screw	Wrench
	(not included) 
DSW-4075H	A-15T

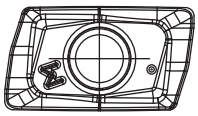
Clamp Screw	Recommended Torque (N·m)
DSW-4075H	3.6

Inserts

JC8050



JC8118



Cat. No.	Tolerance	PVD Coated JC8118	PVD Coated JC8050	Dimensions (mm) A	B	T	rε
ZOMT160504ZER-PM	M	◎	◎	18	10	4.7	0.4
ZOMT160508ZER-PM	M	●	●	18	10	4.7	0.8
ZOMT160516ZER-PM	M	●	●	18	10	4.7	1.6
ZOMT160520ZER-PM	M	◎	◎	18	10	4.7	2.0
ZOMT160530ZER-PM	M	◎	◎	18	10	4.7	3.0

10 inserts per case.

Cat. No.	Tolerance	PVD Coated JC8118	PVD Coated JC8050	Un-Coated FC18	Dimensions (mm) A	B	T	rε
ZOET160508ZER-PM	E	◎	◎		18	10	4.7	0.8
ZOET160508ZFR-NL	E			◎	18	10	4.7	0.8

10 inserts per case.

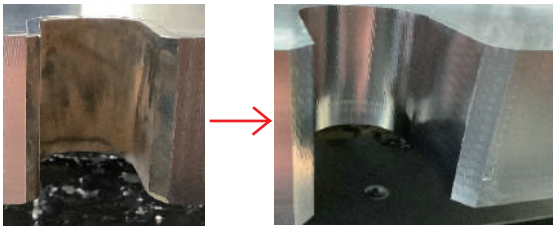
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

■ Cutting data

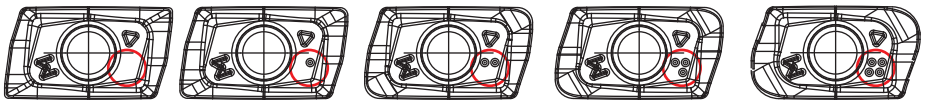
1. Machining Ti-alloy



Work	Part name	Die plate	
	Material	SS400 (JIS)	
	Hardness	—	
Tool	Tool no.	SSV-2025-M16	
	Insert no.	ZOMT160508ZER-PM (JC8118)	
Cutting Conditions	Spindle speed	n	2500 (min^{-1})
	Cutting speed	Vc	196 (m/min)
	Feed speed	Vf	2000 (mm/min)
		fz	0.4 (mm/t)
	ap	3 (mm)	
	ae	5 (mm)	
	Coolant	Air blow (External)	
	Machine	Double column type MC	
Result	Both machining noise and surface are good		

■ Identification of corner radius for insert.

Each corner radius shows identification mark on the insert surface.

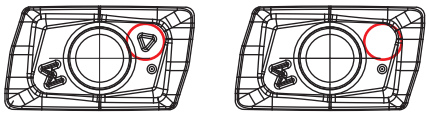


Z0MT160504ZER-PM Z0MT160508ZER-PM Z0MT160516ZER-PM Z0MT160520ZER-PM Z0MT160530ZER-PM

■ Identification of grade for insert.

Each grade shows identification mark on the insert surface.

JC8050 JC8118



Z0ET160508ZER-PM Z0ET160508ZFR-NL

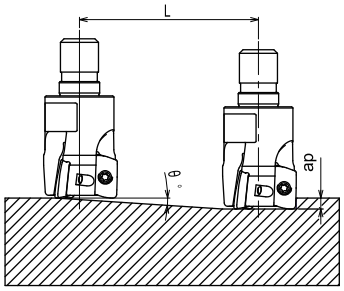
Identification mark of insert grade

High efficient and stable shoulder milling

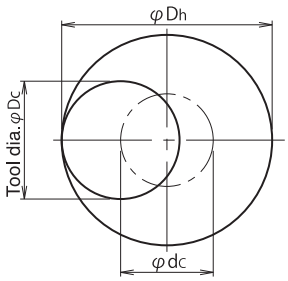
Indexable Milling Cutter SSV TYPE

Instructions for profile milling

● Ramping



● Helical interpolation



● Calculation of tool pass dia.

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

Tool pass dia. Bore dia. Tool dia.

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

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

Note :
- 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.

For ZOMT160504ZER-PM

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
SSV-2025-**	25	23.9	1.5	6.2	13.8	31	48.4	1.6
SSV-3032-**	32	30.9	1.5	4.4	19.5	45	62.4	1.6
SSV-3035-M16	35	33.9	1.5	4.3	19.9	51	68.4	1.6
SSV-4040-**	40	38.9	1.5	3.6	23.8	61	78.4	1.6
SSV-5050R-**	50	48.9	1.5	2.4	35.8	81	98.4	1.4
SSV-6063R-**	63	61.9	1.5	1.7	50.5	107	124.4	1.4
SSV-7080R-**	80	78.9	1.5	1.2	71.6	141	158.4	1.4
SSV-8100R-**	100	98.9	1.5	0.9	95.5	181	198.4	1.4
SSV-8125R-**	125	123.9	1.5	0.65	132.2	231	248.4	1.4

For ZOMT160508ZER-PM

Cat. No.	Tool dia. φDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
SSV-2025-**	25	23.1	1.5	6.4	13.4	31	47.6	1.6
SSV-3032-**	32	30.1	1.5	4.4	19.5	45	61.6	1.6
SSV-3035-M16	35	33.1	1.5	4.3	19.9	51	67.6	1.6
SSV-4040-**	40	38.1	1.5	3.6	23.8	61	77.6	1.6
SSV-5050R-**	50	48.1	1.5	2.4	35.8	81	97.6	1.4
SSV-6063R-**	63	61.1	1.5	1.7	50.5	107	123.6	1.4
SSV-7080R-**	80	78.1	1.5	1.2	71.6	141	157.6	1.4
SSV-8100R-**	100	98.1	1.5	0.9	95.5	181	197.6	1.4
SSV-8125R-**	125	123.1	1.5	0.65	132.2	231	247.6	1.4

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

For ZOMT160516ZER-PM

Cat. No.	Tool dia. ΦDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
SSV-2025-**	25	21.5	1.5	6.7	12.8	31	46	1.5
SSV-3032-**	32	28.5	1.5	4.7	18.2	45	60	1.5
SSV-3035-M16	35	31.5	1.5	4.6	18.6	51	66	1.5
SSV-4040-**	40	36.5	1.5	3.8	22.6	61	76	1.5
SSV-5050R-**	50	46.5	1.5	2.5	34.4	81	96	1.4
SSV-6063R-**	63	59.5	1.5	1.8	47.7	107	122	1.4
SSV-7080R-**	80	76.5	1.5	1.2	71.6	141	156	1.4
SSV-8100R-**	100	96.5	1.5	0.9	95.5	181	196	1.4
SSV-8125R-**	125	121.5	1.5	0.65	132.2	231	246	1.4

For ZOMT160520ZER-PM

Cat. No.	Tool dia. ΦDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
SSV-2025-**	25	20.7	1.5	6.9	12.4	31	45.2	1.5
SSV-3032-**	32	27.7	1.5	4.7	18.2	45	59.2	1.5
SSV-3035-M16	35	30.7	1.5	4.6	18.6	51	65.2	1.5
SSV-4040-**	40	35.7	1.5	3.8	22.6	61	75.2	1.5
SSV-5050R-**	50	45.7	1.5	2.5	34.4	81	95.2	1.4
SSV-6063R-**	63	58.7	1.5	1.8	47.7	107	121.2	1.4
SSV-7080R-**	80	75.7	1.5	1.2	71.6	141	155.2	1.4
SSV-8100R-**	100	95.7	1.5	0.9	95.5	181	195.2	1.4
SSV-8125R-**	125	120.7	1.5	0.65	132.2	231	245.2	1.4

For ZOMT160530ZER-PM

Cat. No.	Tool dia. ΦDc (mm)	Effective cutting dia. (mm)	Max. depth of cut ap (mm)	Ramping		Helical interpolation		Maximum Drilling depth (mm)
				Max. ramping angle θ°	Total cutting length at L (mm) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)	
SSV-2025-**	25	18.7	1.5	7.2	11.9	31	43.2	1.5
SSV-3032-**	32	25.7	1.5	4.8	17.9	45	57.2	1.5
SSV-3035-M16	35	28.7	1.5	4.7	18.2	51	63.2	1.5
SSV-4040-**	40	33.7	1.5	3.9	22.0	61	73.2	1.5
SSV-5050R-**	50	43.7	1.5	2.5	34.4	81	93.2	1.4
SSV-6063R-**	63	56.7	1.5	1.8	47.7	107	119.2	1.4
SSV-7080R-**	80	73.7	1.5	1.3	66.1	141	153.2	1.4
SSV-8100R-**	100	93.7	1.5	0.95	90.5	181	193.2	1.4
SSV-8125R-**	125	118.7	1.5	0.65	132.2	231	243.2	1.4

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		40					50				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~100	~15.0	~30	1,590	1,910	~100	~15.0	~40	1,270	1,910
		150	~12.0	~20	1,430	1,430	150	~12.0	~25	1,150	1,440
		200	~10.0	~12	1,270	1,020	200	~10.0	~15	1,020	1,020
Cast steel (1.7225) Below 285HB	JC8050	~100	~15.0	~30	1,430	1,720	~100	~15.0	~40	1,150	1,730
		150	~12.0	~20	1,270	1,270	150	~12.0	~25	1,020	1,280
		200	~10.0	~12	1,110	890	200	~10.0	~15	890	890
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~100	~15.0	~30	1,590	1,910	~100	~15.0	~40	1,270	1,910
		150	~12.0	~20	1,430	1,430	150	~12.0	~25	1,150	1,440
		200	~10.0	~12	1,270	1,020	200	~10.0	~15	1,020	1,020
Mold steel (1.2311, P20) 30-36HRC	JC8118	~100	~15.0	~30	1,190	1,430	~100	~15.0	~40	950	1,430
		150	~12.0	~20	1,070	1,070	150	~12.0	~25	860	1,080
		200	~10.0	~12	950	760	200	~10.0	~15	760	760
Mold steel (1.2311, P21) 38-43HRC	JC8118	~100	~15.0	~20	950	950	~100	~15.0	~30	760	950
		150	~12.0	~15	840	670	150	~12.0	~20	670	670
		200	~10.0	~8	720	430	200	~10.0	~12	570	430
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~100	~12.0	~12	800	640	~100	~15.0	~18	640	640
		150	~10.0	~8	720	430	150	~12.0	~12	570	430
		200	~8.0	~3	640	260	200	~10.0	~5	510	260
Cast iron (GG25) 160-260HB	JC8118	~100	~15.0	~30	1,990	2,390	~100	~15.0	~40	1,590	2,390
		150	~12.0	~20	1,830	1,830	150	~12.0	~25	1,460	1,830
		200	~10.0	~12	1,670	1,340	200	~10.0	~15	1,340	1,340
Nodular cast iron (GGG70) 170-300HB	JC8118	~100	~15.0	~30	1,190	1,190	~100	~15.0	~40	950	1,190
		150	~12.0	~20	1,030	820	150	~12.0	~25	830	830
		200	~10.0	~12	880	530	200	~10.0	~15	700	530
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~100	~15.0	~30	950	760	~100	~15.0	~40	760	760
		150	~12.0	~20	880	530	150	~12.0	~25	700	530
		200	~10.0	~12	800	320	200	~10.0	~15	640	320
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~100	~15.0	~30	1,430	1,430	~100	~15.0	~40	1,150	1,440
		150	~12.0	~20	1,270	1,020	150	~12.0	~25	1,020	1,020
		200	~10.0	~12	1,110	670	200	~10.0	~15	890	670

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		63					80				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ap x ae (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	ap (mm)	ap x ae (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~100	~15.0	~45	1,010	2,120	~100	~15.0	~45	800	1,960
		150	~12.0	~30	910	1,640	150	~12.0	~30	720	1,510
		200	~10.0	~20	810	1,220	200	~10.0	~20	640	1,120
Cast steel (1.7225) Below 285HB	JC8050	~100	~15.0	~45	910	1,910	~100	~15.0	~45	720	1,760
		150	~12.0	~30	810	1,460	150	~12.0	~30	640	1,340
		200	~10.0	~20	710	1,070	200	~10.0	~20	560	980
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~100	~15.0	~45	1,010	2,120	~100	~15.0	~45	800	1,960
		150	~12.0	~30	910	1,640	150	~12.0	~30	720	1,510
		200	~10.0	~20	810	1,220	200	~10.0	~20	640	1,120
Mold steel (1.2311, P20) 30-36HRC	JC8118	~100	~15.0	~45	760	1,600	~100	~15.0	~45	600	1,470
		150	~12.0	~30	680	1,220	150	~12.0	~30	540	1,130
		200	~10.0	~20	610	920	200	~10.0	~20	480	840
Mold steel (1.2311, P21) 38-43HRC	JC8118	~100	~15.0	~30	610	920	~100	~15.0	~30	480	840
		150	~12.0	~25	530	640	150	~12.0	~25	420	590
		200	~10.0	~15	450	410	200	~10.0	~15	360	380
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~100	~15.0	~25	510	610	~100	~15.0	~25	400	560
		150	~12.0	~15	450	410	150	~12.0	~15	360	380
		200	~10.0	~8	400	240	200	~10.0	~8	320	220
Cast iron (GG25) 160-260HB	JC8118	~100	~15.0	~45	1,260	2,650	~100	~15.0	~45	990	2,430
		150	~12.0	~30	1,160	2,090	150	~12.0	~30	920	1,930
		200	~10.0	~20	1,060	1,590	200	~10.0	~20	840	1,470
Nodular cast iron (GGG70) 170-300HB	JC8118	~100	~15.0	~45	760	1,370	~100	~15.0	~45	600	1,260
		150	~12.0	~30	660	990	150	~12.0	~30	520	910
		200	~10.0	~20	560	670	200	~10.0	~20	440	620
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~100	~15.0	~45	610	730	~100	~15.0	~45	480	670
		150	~12.0	~30	560	500	150	~12.0	~30	440	460
		200	~10.0	~20	510	310	200	~10.0	~20	400	280
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~100	~15.0	~45	910	1,640	~100	~15.0	~45	720	1,510
		150	~12.0	~30	810	1,220	150	~12.0	~30	640	1,120
		200	~10.0	~20	710	850	200	~10.0	~20	560	780

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		100					125				
		No. of teeth 8N					No. of teeth 8N				
		ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~100	~15.0	~45	640	1,790	~100	~15.0	~45	510	1,430
		150	~12.0	~30	570	1,370	150	~12.0	~30	460	1,100
		200	~10.0	~20	510	1,020	200	~10.0	~20	410	820
Cast steel (1.7225) Below 285HB	JC8050	~100	~15.0	~45	570	1,600	~100	~15.0	~45	460	1,290
		150	~12.0	~30	510	1,220	150	~12.0	~30	410	980
		200	~10.0	~20	450	900	200	~10.0	~20	360	720
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~100	~15.0	~45	640	1,790	~100	~15.0	~45	510	1,430
		150	~12.0	~30	570	1,370	150	~12.0	~30	460	1,100
		200	~10.0	~20	510	1,020	200	~10.0	~20	410	820
Mold steel (1.2311, P20) 30-36HRC	JC8118	~100	~15.0	~45	480	1,340	~100	~15.0	~45	380	1,060
		150	~12.0	~30	430	1,030	150	~12.0	~30	340	820
		200	~10.0	~20	380	760	200	~10.0	~20	310	620
Mold steel (1.2311, P21) 38-43HRC	JC8118	~100	~15.0	~30	380	760	~100	~15.0	~30	310	620
		150	~12.0	~25	330	530	150	~12.0	~25	270	430
		200	~10.0	~15	290	350	200	~10.0	~15	230	280
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~100	~15.0	~25	320	510	~100	~15.0	~25	250	400
		150	~12.0	~15	290	350	150	~12.0	~15	230	280
		200	~10.0	~8	250	200	200	~10.0	~8	200	160
Cast iron (GG25) 160-260HB	JC8118	~100	~15.0	~45	800	2,240	~100	~15.0	~45	640	1,790
		150	~12.0	~30	730	1,750	150	~12.0	~30	590	1,420
		200	~10.0	~20	670	1,340	200	~10.0	~20	530	1,060
Nodular cast iron (GGG70) 170-300HB	JC8118	~100	~15.0	~45	480	1,150	~100	~15.0	~45	380	910
		150	~12.0	~30	410	820	150	~12.0	~30	330	660
		200	~10.0	~20	350	560	200	~10.0	~20	280	450
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~100	~15.0	~45	380	610	~100	~15.0	~45	310	500
		150	~12.0	~30	350	420	150	~12.0	~30	280	340
		200	~10.0	~20	320	260	200	~10.0	~20	250	200
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~100	~15.0	~45	570	1,370	~100	~15.0	~45	460	1,100
		150	~12.0	~30	510	1,020	150	~12.0	~30	410	820
		200	~10.0	~20	450	720	200	~10.0	~20	360	580

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

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

● Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		40					50				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	ap (mm)	ap x 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	~100	~3.5	~40	1,190	1,430	~150	~4.0	~50	950	1,430
		150	~2.5	~32	1,030	1,030	200	~3.0	~40	830	1,040
		200	~1.5	~24	880	700	300	~2.0	~30	700	700
Cast steel (1.7225) Below 285HB	JC8050	~100	~3.5	~40	1,190	1,430	~150	~4.0	~50	950	1,430
		150	~2.5	~32	1,030	1,030	200	~3.0	~40	830	1,040
		200	~1.5	~24	880	700	300	~2.0	~30	700	700
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~100	~3.5	~40	1,190	1,190	~150	~4.0	~50	950	1,190
		150	~2.5	~32	1,030	820	200	~3.0	~40	830	830
		200	~1.5	~24	880	530	300	~2.0	~30	700	530
Mold steel (1.2311, P20) 30-36HRC	JC8118	~100	~3.5	~40	1,030	1,030	~150	~4.0	~50	830	1,040
		150	~2.5	~32	950	760	200	~3.0	~40	760	760
		200	~1.5	~24	880	530	300	~2.0	~30	700	530
Mold steel (1.2311, P21) 38-43HRC	JC8118	~100	~2.5	~40	880	880	~150	~3.0	~50	700	880
		150	~2.0	~32	800	640	200	~2.5	~40	640	640
		200	~1.5	~24	720	430	300	~1.5	~30	570	430
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~100	~2.0	~32	720	580	~150	~2.5	~40	570	570
		150	~1.5	~24	640	380	200	~2.0	~30	510	380
		200	~1.0	~16	560	220	300	~1.5	~20	450	230
Cast iron (GG25) 160-260HB	JC8118	~100	~5.5	~40	1,430	1,720	~150	~6.0	~50	1150	1,730
		150	~3.5	~32	1,190	1,190	200	~4.0	~40	950	1,190
		200	~1.5	~24	1,030	820	300	~2.0	~30	830	830
Nodular cast iron (GGG70) 170-300HB	JC8118	~100	~3.5	~40	1,030	1,030	~150	~4.0	~50	830	1,040
		150	~2.5	~32	950	760	200	~3.0	~40	760	760
		200	~1.5	~24	880	530	300	~2.0	~30	700	530
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~100	~3.5	~32	880	700	~150	~4.0	~40	700	700
		150	~2.5	~24	800	480	200	~3.0	~30	640	480
		200	~1.5	~16	720	290	300	~2.0	~20	570	290
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~100	~3.5	~40	1,190	1,190	~150	~4.0	~50	950	1,190
		150	~2.5	~32	1,030	820	200	~3.0	~40	830	830
		200	~1.5	~24	880	530	300	~2.0	~30	700	530

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		63					80				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~150	~4.0	~63	760	1,600	~150	~4.0	~80	600	1,470
		200	~3.0	~55	660	1,190	200	~3.0	~65	520	1,090
		300	~2.0	~40	560	840	300	~2.0	~50	440	770
Cast steel (1.7225) Below 285HB	JC8050	~150	~4.0	~63	760	1,600	~150	~4.0	~80	600	1,470
		200	~3.0	~55	660	1,190	200	~3.0	~65	520	1,090
		300	~2.0	~40	560	840	300	~2.0	~50	440	770
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~150	~4.0	~63	760	1,370	~150	~4.0	~80	600	1,260
		200	~3.0	~55	660	990	200	~3.0	~65	520	910
		300	~2.0	~40	560	670	300	~2.0	~50	440	620
Mold steel (1.2311, P20) 30-36HRC	JC8118	~150	~4.0	~63	660	1,190	~150	~4.0	~80	520	1,090
		200	~3.0	~55	610	920	200	~3.0	~65	480	840
		300	~2.0	~40	560	670	300	~2.0	~50	440	620
Mold steel (1.2311, P21) 38-43HRC	JC8118	~150	~3.0	~63	560	840	~150	~3.0	~80	440	770
		200	~2.5	~55	510	610	200	~2.5	~65	400	560
		300	~1.5	~40	450	410	300	~1.5	~50	360	380
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~55	450	540	~150	~2.5	~65	360	500
		200	~2.0	~40	400	360	200	~2.0	~50	320	340
		300	~1.5	~32	350	210	300	~1.5	~35	280	200
Cast iron (GG25) 160-260HB	JC8118	~150	~6.0	~63	910	1,910	~150	~6.0	~80	720	1,760
		200	~4.0	~55	760	1,370	200	~4.0	~65	600	1,260
		300	~2.0	~40	660	990	300	~2.0	~50	520	910
Nodular cast iron (GGG70) 170-300HB	JC8118	~150	~4.0	~63	660	1,190	~150	~4.0	~80	520	1,090
		200	~3.0	~55	610	920	200	~3.0	~65	480	840
		300	~2.0	~40	560	670	300	~2.0	~50	440	620
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~150	~4.0	~55	560	670	~150	~4.0	~65	440	620
		200	~3.0	~40	510	460	200	~3.0	~50	400	420
		300	~2.0	~32	450	270	300	~2.0	~35	360	250
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~150	~4.0	~63	760	1,370	~150	~4.0	~80	600	1,260
		200	~3.0	~55	660	990	200	~3.0	~65	520	910
		300	~2.0	~40	560	670	300	~2.0	~50	440	620

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		100					125				
		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 (C50, C55) Below 250HB	JC8050	~150	~4.0	~100	480	1,340	~150	~4.0	~125	380	1,060
		200	~3.0	~80	410	980	200	~3.0	~100	330	790
		300	~2.0	~60	350	700	300	~2.0	~75	280	560
Cast steel (1.7225) Below 285HB	JC8050	~150	~4.0	~100	480	1,340	~150	~4.0	~125	380	1,060
		200	~3.0	~80	410	980	200	~3.0	~100	330	790
		300	~2.0	~60	350	700	300	~2.0	~75	280	560
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~150	~4.0	~100	480	1,150	~150	~4.0	~125	380	910
		200	~3.0	~80	410	820	200	~3.0	~100	330	660
		300	~2.0	~60	350	560	300	~2.0	~75	280	450
Mold steel (1.2311, P20) 30-36HRC	JC8118	~150	~4.0	~100	410	980	~150	~4.0	~125	330	790
		200	~3.0	~80	380	760	200	~3.0	~100	310	620
		300	~2.0	~60	350	560	300	~2.0	~75	280	450
Mold steel (1.2311, P21) 38-43HRC	JC8118	~150	~3.0	~100	350	700	~150	~3.0	~125	280	560
		200	~2.5	~80	320	510	200	~2.5	~100	250	400
		300	~1.5	~60	290	350	300	~1.5	~75	230	280
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~80	290	460	~150	~2.5	~100	230	370
		200	~2.0	~60	250	300	200	~2.0	~75	200	240
		300	~1.5	~40	220	180	300	~1.5	~50	180	140
Cast iron (GG25) 160-260HB	JC8118	~150	~6.0	~100	570	1,600	~150	~6.0	~125	460	1,290
		200	~4.0	~80	480	1,150	200	~4.0	~100	380	910
		300	~2.0	~60	410	820	300	~2.0	~75	330	660
Nodular cast iron (GGG70) 170-300HB	JC8118	~150	~4.0	~100	410	980	~150	~4.0	~125	330	790
		200	~3.0	~80	380	760	200	~3.0	~100	310	620
		300	~2.0	~60	350	560	300	~2.0	~75	280	450
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~150	~4.0	~80	350	560	~150	~4.0	~100	280	450
		200	~3.0	~60	320	380	200	~3.0	~75	250	300
		300	~2.0	~40	290	230	300	~2.0	~50	230	180
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~150	~4.0	~100	480	1,150	~150	~4.0	~125	380	910
		200	~3.0	~80	410	820	200	~3.0	~100	330	660
		300	~2.0	~60	350	560	300	~2.0	~75	280	450

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	60	~10.0	~15	2,550	1,380	70	~12.0	~24	1,990	1,610
		100	~7.0	~10	2,290	1,050	120	~9.0	~18	1,790	1,240
Cast steel (1.7225) Below 285HB	JC8050	60	~10.0	~15	2,290	1,240	70	~12.0	~24	1,790	1,450
		100	~7.0	~10	2,040	940	120	~9.0	~18	1,590	1,100
Die steel (1.2344, 1.2379) Below 255HB	JC8050	60	~10.0	~15	2,550	1,380	70	~12.0	~24	1,990	1,610
		100	~7.0	~10	2,290	1,050	120	~9.0	~18	1,790	1,240
Mold steel (1.2311, P20) 30-36HRC	JC8118	60	~10.0	~15	1,910	1,030	70	~12.0	~24	1,490	1,210
		100	~7.0	~10	1,720	790	120	~9.0	~18	1,340	920
Mold steel (1.2311, P21) 38-43HRC	JC8118	60	~10.0	~12	1,530	700	70	~12.0	~18	1,190	820
		100	~7.0	~6	1,340	480	120	~9.0	~13	1,040	560
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	60	~10.0	~8	1,270	460	70	~12.0	~12	990	530
		100	~7.0	~4	1,150	320	120	~9.0	~8	900	380
Cast iron (GG25) 160-260HB	JC8118	60	~10.0	~15	3,180	1,720	70	~12.0	~24	2,490	2,020
		100	~7.0	~10	2,930	1,350	120	~9.0	~18	2,290	1,580
Nodular cast iron (GGG70) 170-300HB	JC8118	60	~10.0	~15	1,910	880	70	~12.0	~24	1,490	1,030
		100	~7.0	~10	1,660	600	120	~9.0	~18	1,290	700
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	60	~10.0	~15	1,530	550	70	~12.0	~24	1,190	640
		100	~7.0	~10	1,400	390	120	~9.0	~18	1,090	460
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	60	~10.0	~15	2,290	1,050	70	~12.0	~24	1,790	1,240
		100	~7.0	~10	2,040	730	120	~9.0	~18	1,590	860

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

● Endmill type

Work Materials	Insert Grades	Tool dia. (mm) 40 No. of teeth 4N									
		ℓ (mm)	ap (mm)	ap x ae (mm²)	n (min⁻¹)	Vf (mm/min)					
Carbon steel (C50, C55) Below 250HB	JC8050	50	~15.0	~30	1,590	1,720					
		100	~10.0	~20	1,430	1,320					
Cast steel (1.7225) Below 285HB	JC8050	50	~15.0	~30	1,430	1,540					
		100	~10.0	~20	1,270	1,170					
Die steel (1.2344, 1.2379) Below 255HB	JC8050	50	~15.0	~30	1,590	1,720					
		100	~10.0	~20	1,430	1,320					
Mold steel (1.2311, P20) 30-36HRC	JC8118	50	~15.0	~30	1,190	1,290					
		100	~10.0	~20	1,070	980					
Mold steel (1.2311, P21) 38-43HRC	JC8118	50	~15.0	~20	950	870					
		100	~10.0	~15	840	600					
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	50	~12.0	~12	800	580					
		100	~10.0	~8	720	400					
Cast iron (GG25) 160-260HB	JC8118	50	~15.0	~30	1,990	2,150					
		100	~10.0	~20	1,830	1,680					
Nodular cast iron (GGG70) 170-300HB	JC8118	50	~15.0	~30	1,190	1,090					
		100	~10.0	~20	1,030	740					
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	50	~15.0	~30	950	680					
		100	~10.0	~20	880	490					
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	50	~15.0	~30	1,430	1,320					
		100	~10.0	~20	1,270	910					

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~60	~3.0	~25	1,910	1,030	~70	~3.5	~32	1,490	1,210
		100	~2.0	~20	1,660	760	120	~2.5	~26	1,290	890
Cast steel (1.7225) Below 285HB	JC8050	~60	~3.0	~25	1,910	1,030	~70	~3.5	~32	1,490	1,210
		100	~2.0	~20	1,660	760	120	~2.5	~26	1,290	890
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~60	~3.0	~25	1,910	880	~70	~3.5	~32	1,490	1,030
		100	~2.0	~20	1,660	600	120	~2.5	~26	1,290	700
Mold steel (1.2311, P20) 30-36HRC	JC8118	~60	~3.0	~25	1,660	760	~70	~3.5	~32	1,290	890
		100	~2.0	~20	1,530	550	120	~2.5	~26	1,190	640
Mold steel (1.2311, P21) 38-43HRC	JC8118	~60	~2.0	~25	1,400	640	~70	~2.5	~32	1,090	750
		100	~1.5	~20	1,270	460	120	~2.0	~26	990	530
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~60	~1.5	~20	1,150	410	~70	~2.0	~26	900	490
		100	~1.0	~15	1,020	290	120	~1.5	~19	800	340
Cast iron (GG25) 160-260HB	JC8118	~60	~5.0	~25	2,550	1,380	~70	~5.5	~32	1,990	1,610
		100	~3.0	~20	2,290	1,050	120	~3.5	~26	1,790	1,240
Nodular cast iron (GGG70) 170-300HB	JC8118	~60	~3.0	~25	1,660	760	~70	~3.5	~32	1,290	890
		100	~2.0	~20	1,530	550	120	~2.5	~26	1,190	640
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~60	~3.0	~20	1,400	500	~70	~3.5	~26	1,090	590
		100	~2.0	~15	1,270	360	120	~2.5	~19	990	420
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~60	~3.0	~25	1,910	880	~70	~3.5	~32	1,490	1,030
		100	~2.0	~20	1,660	600	120	~2.5	~26	1,290	700

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Endmill type

Work Materials	Insert Grades	Tool dia. (mm) 40 No. of teeth 4N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)					
Carbon steel (C50, C55) Below 250HB	JC8050	~50	~3.5	~40	1,190	1,290					
		100	~2.5	~32	1,030	950					
Cast steel (1.7225) Below 285HB	JC8050	~50	~3.5	~40	1,190	1,290					
		100	~2.5	~32	1,030	950					
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~50	~3.5	~40	1,190	1,090					
		100	~2.5	~32	1,030	740					
Mold steel (1.2311, P20) 30-36HRC	JC8118	~50	~3.5	~40	1,030	950					
		100	~2.5	~32	950	680					
Mold steel (1.2311, P21) 38-43HRC	JC8118	~50	~2.5	~40	880	810					
		100	~2.0	~32	800	580					
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~50	~2.0	~32	720	520					
		100	~1.5	~24	640	360					
Cast iron (GG25) 160-260HB	JC8118	~50	~5.5	~40	1,590	1,720					
		100	~3.5	~32	1,430	1,320					
Nodular cast iron (GGG70) 170-300HB	JC8118	~50	~3.5	~40	1,030	950					
		100	~2.5	~32	950	680					
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~50	~3.5	~32	880	630					
		100	~2.5	~24	800	450					
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~50	~3.5	~40	1,190	1,090					
		100	~2.5	~32	1,030	740					

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Modular head type

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ap x ae (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	ap (mm)	ap x ae (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~90	~10.0	~15	2,550	1,530	~100	~12.0	~24	1,990	1,790
		140	~7.0	~10	2,290	1,150	150	~9.0	~18	1,790	1,340
		210	~4.0	~5	2,040	820	210	~6.0	~9	1,590	950
Cast steel (1.7225) Below 285HB	JC8050	~90	~10.0	~15	2,290	1,370	~100	~12.0	~24	1,790	1,610
		140	~7.0	~10	2,040	1,020	150	~9.0	~18	1,590	1,190
		210	~4.0	~5	1,780	710	210	~6.0	~9	1,390	830
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~90	~10.0	~15	2,550	1,530	~100	~12.0	~24	1,990	1,790
		140	~7.0	~10	2,290	1,150	150	~9.0	~18	1,790	1,340
		210	~4.0	~5	2,040	820	210	~6.0	~9	1,590	950
Mold steel (1.2311, P20) 30-36HRC	JC8118	~90	~10.0	~15	1,910	1,150	~100	~12.0	~24	1,490	1,340
		140	~7.0	~10	1,720	860	150	~9.0	~18	1,340	1,010
		210	~4.0	~5	1,530	610	210	~6.0	~9	1,190	710
Mold steel (1.2311, P21) 38-43HRC	JC8118	~90	~10.0	~12	1,530	770	~100	~12.0	~18	1,190	890
		140	~7.0	~6	1,340	540	150	~9.0	~13	1,040	620
		210	~4.0	~2	1,150	350	210	~6.0	~7	900	410
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~90	~10.0	~8	1,270	510	~100	~12.0	~12	990	590
		140	~7.0	~4	1,150	350	150	~9.0	~8	900	410
		210	~4.0	~2	1,020	200	210	~6.0	~3	800	240
Cast iron (GG25) 160-260HB	JC8118	~90	~10.0	~15	3,180	1,910	~100	~12.0	~24	2,490	2,240
		140	~7.0	~10	2,930	1,470	150	~9.0	~18	2,290	1,720
		210	~4.0	~5	2,670	1,070	210	~6.0	~12	2,090	1,250
Nodular cast iron (GGG70) 170-300HB	JC8118	~90	~10.0	~15	1,910	960	~100	~12.0	~24	1,490	1,120
		140	~7.0	~10	1,660	660	150	~9.0	~18	1,290	770
		210	~4.0	~5	1,400	420	210	~6.0	~9	1,090	490
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~90	~10.0	~15	1,530	610	~100	~12.0	~24	1,190	710
		140	~7.0	~10	1,400	420	150	~9.0	~18	1,090	490
		210	~4.0	~5	1,270	250	210	~6.0	~9	990	300
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~90	~10.0	~15	2,290	1,150	~100	~12.0	~24	1,790	1,340
		140	~7.0	~10	2,040	820	150	~9.0	~18	1,590	950
		210	~4.0	~5	1,780	530	210	~6.0	~9	1,390	630

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable shoulder milling

Indexable Milling Cutter SSV TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

● Modular head type

Work Materials	Insert Grades	Tool dia. (mm)									
		35					40				
		No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	ap (mm)	ap x ae (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	ap (mm)	ap x ae (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~100	~12.0	~24	1,820	1,640	~100	~15.0	~30	1,590	1,910
		150	~9.0	~18	1,640	1,230	150	~10.0	~20	1,430	1,430
		210	~6.0	~9	1,460	880	210	~8.0	~12	1,270	1,020
Cast steel (1.7225) Below 285HB	JC8050	~100	~12.0	~24	1,640	1,480	~100	~15.0	~30	1,430	1,720
		150	~9.0	~18	1,460	1,100	150	~10.0	~20	1,270	1,270
		210	~6.0	~9	1,270	760	210	~8.0	~12	1,110	890
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~100	~12.0	~24	1,820	1,640	~100	~15.0	~30	1,590	1,910
		150	~9.0	~18	1,640	1,230	150	~10.0	~20	1,430	1,430
		210	~6.0	~9	1,460	880	210	~8.0	~12	1,270	1,020
Mold steel (1.2311, P20) 30-36HRC	JC8118	~100	~12.0	~24	1,360	1,220	~100	~15.0	~30	1,190	1,430
		150	~9.0	~18	1,230	920	150	~10.0	~20	1,070	1,070
		210	~6.0	~9	1,090	650	210	~8.0	~12	950	760
Mold steel (1.2311, P21) 38-43HRC	JC8118	~100	~12.0	~18	1,090	820	~100	~15.0	~20	950	950
		150	~9.0	~13	950	570	150	~10.0	~15	840	670
		210	~6.0	~7	820	370	210	~8.0	~8	720	430
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~100	~12.0	~12	910	550	~100	~12.0	~12	800	640
		150	~9.0	~8	820	370	150	~10.0	~8	720	430
		210	~6.0	~3	730	220	210	~8.0	~3	640	260
Cast iron (GG25) 160-260HB	JC8118	~100	~12.0	~24	2,270	2,040	~100	~15.0	~30	1,990	2,390
		150	~9.0	~18	2,090	1,570	150	~10.0	~20	1,830	1,830
		210	~6.0	~12	1,910	1,150	210	~8.0	~12	1,670	1,340
Nodular cast iron (GGG70) 170-300HB	JC8118	~100	~12.0	~24	1,360	1,020	~100	~15.0	~30	1,190	1,190
		150	~9.0	~18	1,180	710	150	~10.0	~20	1,030	820
		210	~6.0	~9	1,000	450	210	~8.0	~12	880	530
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~100	~12.0	~24	1,090	650	~100	~15.0	~30	950	760
		150	~9.0	~18	1,000	450	150	~10.0	~20	880	530
		210	~6.0	~9	910	270	210	~8.0	~12	800	320
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~100	~12.0	~24	1,640	1,230	~100	~15.0	~30	1,430	1,430
		150	~9.0	~18	1,460	880	150	~10.0	~20	1,270	1,020
		210	~6.0	~9	1,270	570	210	~8.0	~12	1,110	670

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Modular head type

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32				
		No. of teeth 2N					No. of teeth 3N				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (C50, C55) Below 250HB	JC8050	~90	~3.0	~25	1,910	1,150	~100	~3.5	~32	1,490	1,340
		140	~2.0	~20	1,660	830	150	~2.5	~26	1,290	970
		210	~1.0	~15	1,400	560	210	~1.5	~19	1,090	650
Cast steel (1.7225) Below 285HB	JC8050	~90	~3.0	~25	1,910	1,150	~100	~3.5	~32	1,490	1,340
		140	~2.0	~20	1,660	830	150	~2.5	~26	1,290	970
		210	~1.0	~15	1,400	560	210	~1.5	19	1,090	650
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~90	~3.0	~25	1,910	960	~100	~3.5	~32	1,490	1,120
		140	~2.0	~20	1,660	660	150	~2.5	~26	1,290	770
		210	~1.0	~15	1,400	420	210	~1.5	~19	1,090	490
Mold steel (1.2311, P20) 30-36HRC	JC8118	~90	~3.0	~25	1,660	830	~100	~3.5	~32	1,290	970
		140	~2.0	~20	1,530	610	150	~2.5	~26	1,190	710
		210	~1.0	~15	1,400	420	210	~1.5	~19	1,090	490
Mold steel (1.2311, P21) 38-43HRC	JC8118	~90	~2.0	~25	1,400	700	~100	~2.5	~32	1,090	820
		140	~1.5	~20	1,270	510	150	~2.0	~26	990	590
		210	~1.0	~15	1,150	350	210	~1.5	~19	900	410
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~90	~1.5	~20	1,150	460	~100	~2.0	~26	900	540
		140	~1.0	~15	1,020	310	150	~1.5	~19	800	360
		210	~0.5	~10	890	180	210	~1.0	~13	700	210
Cast iron (GG25) 160-260HB	JC8118	~90	~5.0	~25	2,550	1,530	~100	~5.5	~32	1,990	1,790
		140	~3.0	~20	2,290	1,150	150	~3.5	~26	1,790	1,340
		210	~1.0	~15	2,040	820	210	~1.5	~19	1,590	950
Nodular cast iron (GGG70) 170-300HB	JC8118	~90	~3.0	~25	1,660	830	~100	~3.5	~32	1,290	970
		140	~2.0	~20	1,530	610	150	~2.5	~26	1,190	710
		210	~1.0	~15	1,400	420	210	~1.5	~19	1,090	490
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~90	~3.0	~20	1,400	560	~100	~3.5	~26	1,090	650
		140	~2.0	~15	1,270	380	150	~2.5	~19	990	450
		210	~1.0	~10	1,150	230	210	~1.5	~13	900	270
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~90	~3.0	~25	1,910	960	~100	~3.5	~32	1,490	1,120
		140	~2.0	~20	1,660	660	150	~2.5	~26	1,290	770
		210	~1.0	~15	1,400	420	210	~1.5	~19	1,090	490

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 same 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. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

High efficient and stable face milling

Indexable Milling Cutter SSV TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Modular head type

Work Materials	Insert Grades	Tool dia. (mm)									
		35					40				
		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)
Carbon steel (C50, C55) Below 250HB	JC8050	~100	~3.5	~35	1,360	1,220	~100	~3.5	~40	1,190	1,430
		150	~2.5	~28	1,180	890	150	~2.5	~32	1,030	1,030
		210	~1.5	~21	1,000	600	210	~1.5	~24	880	700
Cast steel (1.7225) Below 285HB	JC8050	~100	~3.5	~35	1,360	1,220	~100	~3.5	~40	1,190	1,430
		150	~2.5	~28	1,180	890	150	~2.5	~32	1,030	1,030
		210	~1.5	~21	1,000	600	210	~1.5	~24	880	700
Die steel (1.2344, 1.2379) Below 255HB	JC8050	~100	~3.5	~35	1,360	1,020	~100	~3.5	~40	1,190	1,190
		150	~2.5	~28	1,180	710	150	~2.5	~32	1,030	820
		210	~1.5	~21	1,000	450	210	~1.5	~24	880	530
Mold steel (1.2311, P20) 30-36HRC	JC8118	~100	~3.5	~35	1,180	890	~100	~3.5	~40	1,030	1,030
		150	~2.5	~28	1,090	650	150	~2.5	~32	950	760
		210	~1.5	~21	1,000	450	210	~1.5	~24	880	530
Mold steel (1.2311, P21) 38-43HRC	JC8118	~100	~2.5	~35	1,000	750	~100	~2.5	~40	880	880
		150	~2.0	~28	910	550	150	~2.0	~32	800	640
		210	~1.5	~21	820	370	210	~1.5	~24	720	430
Hardened die steel (1.2344, 1.2379) 42-52HRC	JC8118	~100	~2.0	~28	820	490	~100	~2.0	~32	720	580
		150	~1.5	~21	730	330	150	~1.5	~24	640	380
		210	~1.0	~14	640	190	210	~1.0	~16	560	220
Cast iron (GG25) 160-260HB	JC8118	~100	~5.5	~35	1,820	1,640	~100	~5.5	~40	1,590	1,910
		150	~3.5	~28	1,640	1,230	150	~3.5	~32	1,430	1,430
		210	~1.5	~21	1,460	880	210	~1.5	~24	1,270	1,020
Nodular cast iron (GGG70) 170-300HB	JC8118	~100	~3.5	~35	1,180	890	~100	~3.5	~40	1,030	1,030
		150	~2.5	~28	1,090	650	150	~2.5	~32	950	760
		210	~1.5	~21	1,000	450	210	~1.5	~24	880	530
Stainless steel Austenitic (AISI 304, 316, 317)	JC8050	~100	~3.5	~28	1,000	600	~100	~3.5	~32	880	700
		150	~2.5	~21	910	410	150	~2.5	~24	800	480
		210	~1.5	~14	820	250	210	~1.5	~16	720	290
Stainless steel Ferritics / Martensitic (AISI 403, 420J2, 430)	JC8118	~100	~3.5	~35	1,360	1,020	~100	~3.5	~40	1,190	1,190
		150	~2.5	~28	1,180	710	150	~2.5	~32	1,030	820
		210	~1.5	~21	1,000	450	210	~1.5	~24	880	530

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.
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4) Use air blow to flush the chips out. In particular, please pay attention to chip disposal when machining cavities with a vertical MC.

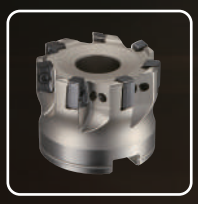
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

High efficient & High precision shoulder milling cutter

SHOULDER EXTREME
EXSAP/MSX TYPE

Features



Facemill type

Modular head type

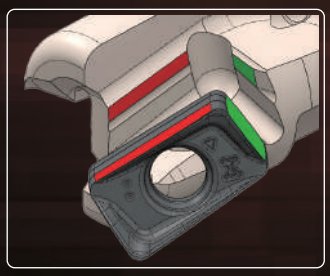
Endmill type

Various line up

EXSAP / MSX are usable for wide applications such as face milling, slotting and plunging

Arc geometry on the periphery cutting edge

Cusp height can be smaller even in case of large ap and achieved high efficient & high precision machining for vertical wall



3D chipbreaker

Strongly clamp system
Due to unique clamp system possible to hold insert
Achieved high efficient machining in roughing

High precision G class periphery grinding

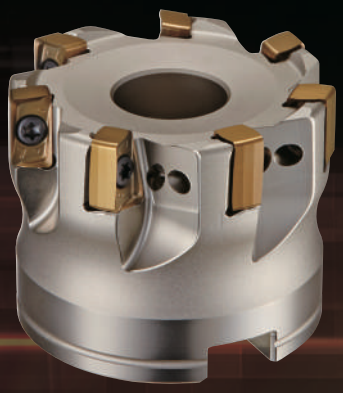
Applicable for Finish & Semi - Machining

Double-side usable!

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

EXSAP-11 type



Max. depth of cut (ap)=10mm is possible.
Possible to applicate from roughing process to semi finishing even with large ap cutting.

Superior cutting performance by multi blades with small inserts
Achieved high efficiency and high speed machining

Accuracy of tool dia. with master insert 0-0.1
Achieves even higher precision semi finishing process

Grade : JC8050
JC8118

PM breaker for general steel
Optimal breaker for mold steel &
High hardened steel less than 50HRC

Grade : JC7550
JC7518

SL breaker for hard-to-cut materials
Optimal breaker for Titanium alloy and Inconel

EXSAP-17 type

Max. depth of cut (ap)=15mm is possible.
Possible to applicate from roughing process to semi finishing even with large ap cutting.

High rigidity insert.
Achieved high precision machining even in large ap machining due to the thick insert.

Grade : JC8050
JC8118

PM breaker for general steel
Optimal breaker for mold steel &
High hardened steel less than 50HRC

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	
			JC8050						JC8050												
		JC7518						JC7518								JC7518				JC7518	
			JC7550						JC7550								JC7550				

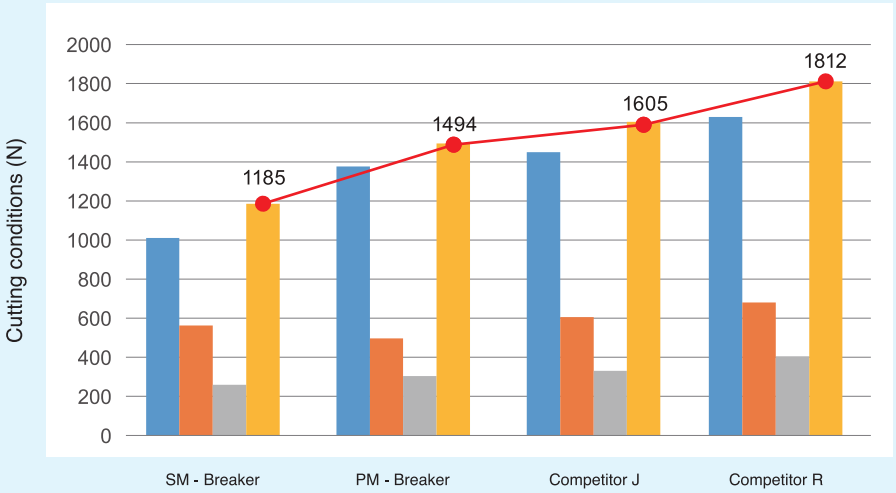
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

■ Cutting Performance

EXSAP-11 type

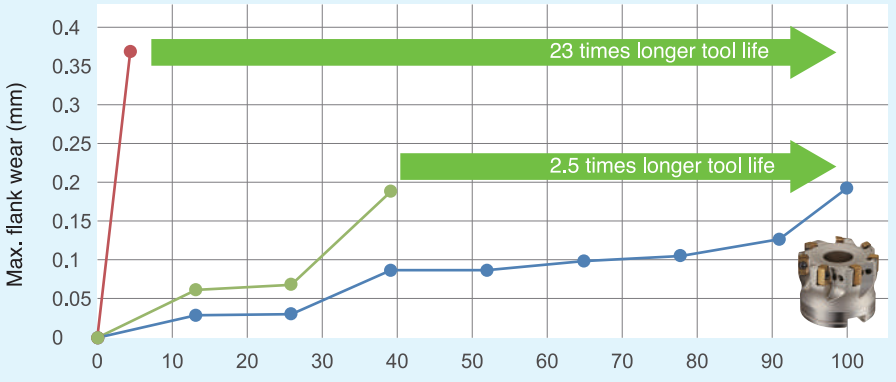
Cutting force comparison



Material : Ti-6AL-4V
Cutting conditions:
Vc = 60m/min,
fz = 0.1mm/t,
ap = 5mm, ae = 1mm
Test by 1 insert,
Air blow,
DOWN CUT
Tool dia. : ϕ16mm

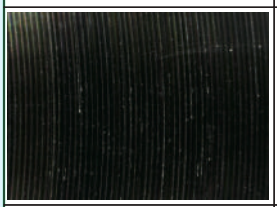
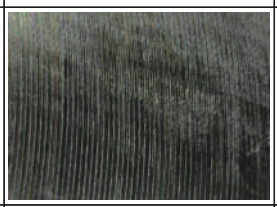
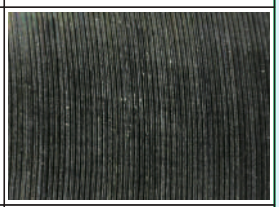
SL breaker is 35% lower cutting force than competitor R. Even in the PM breaker lower cutting force than other competitors

Tool life comparison (For roughing)



Material : NAK80
Cutting conditions:
Vc = 120m/min,
fz = 0.15mm/t,
ap = 2mm,
ae = 35mm
Test by 1 insert,
Air blow, DOWN CUT
Tool dia. : ϕ 50mm

Because the initial wear is small and the cutting resistance is low, EXSAP achieves stable machining

PM - Breaker	Competitor J	Competitor R
		
Ra=0.24μm	Ra=0.27μm	Ra=0.49μm
Rz=1.41μm	Rz=1.71μm	Rz=3.03μm

PM - Breaker suppress rubbing.
Both Ra and Rz are good.
Achieved a beautiful finished surface.

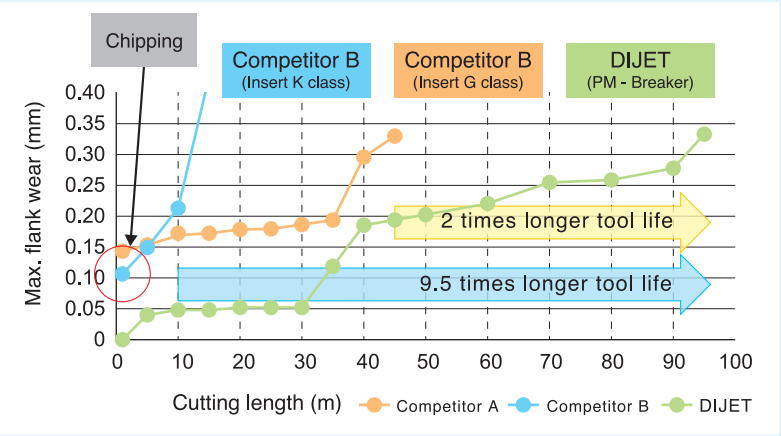
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

■ Cutting Performance

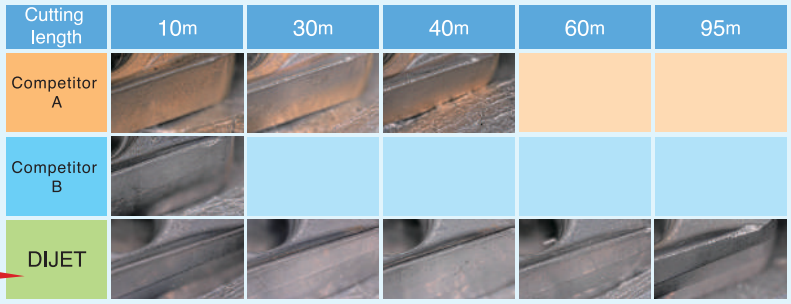
EXSAP-17 type

Tool life comparison (For roughing)



Material : PX5
Cutting conditions:
Vc = 150m/min, fz = 0.3mm/t,
ap = 15mm, ae = 3mm
Test by 1 insert, Air blow,
UP & DOWN CUT
Tool dia. : ϕ50mm
Insert grade: JC8118

●Insert Conditions



Possible to stable roughing!

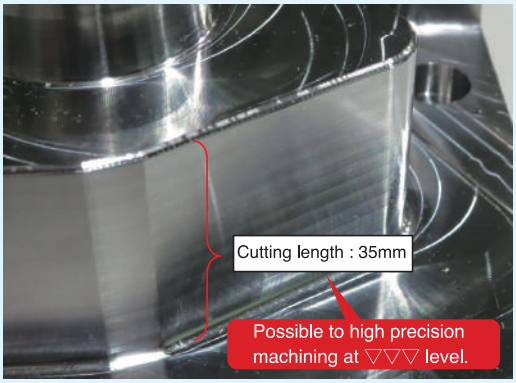
Surface roughness comparison (For semi-finishing)

① Shoulder milling

Material : HPM-MAGIC (P20)
Cutting conditions: Vc = 250m/min, fz = 0.15mm/t,
ap = 3mm, ae = 0.2mm. Test by 2 insert, Air blow,
DOWN CUT
Tool dia. : ϕ25mm
Insert grade: JC8050

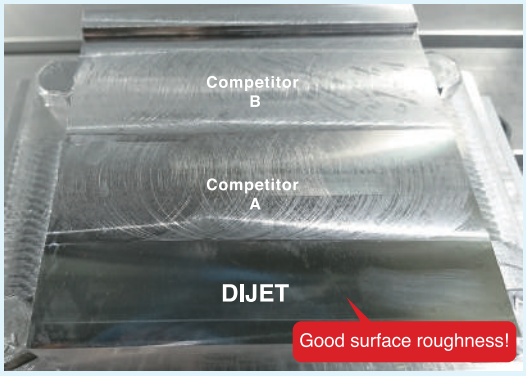
Deflection (vertical wall) (height : 30mm)	Feed direction	Feed direction
6μm	0.47μm	2.92μm

(※) ▽▽▽ ⇒ Ra≦1.6μm Rz≦6.3μm



② Face milling

Material : HPM-MAGIC (P20)
Cutting conditions: Vc = 180m/min, fz = 0.1mm/t,
ap = 3mm, ae = 35mm. Test by 1 insert, Air blow,
DOWN CUT
Tool dia. : ϕ50mm
Insert grade: JC8050

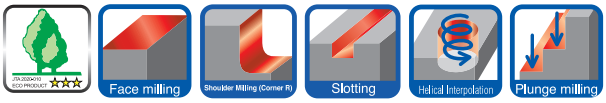


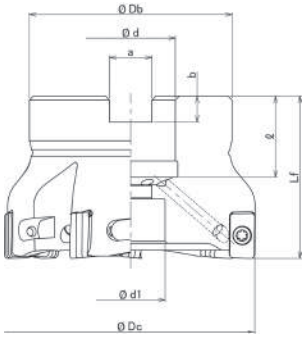
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

Through coolant hole

EXSAP-11 type





■ Body / Facemilling type

Type	Cat No.	Stock	No. of insert	Dimensions (mm)								Set bolt		Weight (kg)	Insert
				φDc	Lf	φDb	φd	φd1	a	b	ℓ				
Metric bore	EXSAP-6040R-11-16	☆	6	40	40	35	16	14	8.4	5.6	18	M8	Head cap screw (JIS Standard)	0.22	ZNGU1105**ZER-**
	EXSAP-7050R-11-22	●	7	50	40	47	22	16.5	10.4	6.3	20	M10		0.38	
	EXSAP-7052R-11-22	☆	7	52	40	47	22	16.5	10.4	6.3	20	M10		0.39	
	EXSAP-7063R-11-22	●	7	63	40	50	22	17	10.4	6.3	20	M10		0.53	
	EXSAP-7063R-11-27	●	7	63	50	50	27	20	12.4	7	22	M12×1.75×30★		0.62	
	EXSAP-8080R-11-27	☆	8	80	50	56	27	20	12.4	7	22	M12×1.75×30★		0.99	

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. The ★ mark indicates the size, so a set bolt for arbor is attached. For other items, please use the bolts attached to the arbor body.
3. Please refer to pages E201 - E202 / E207 - E208 for recommended cutting conditions.
4. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Parts	
Clamp screw	Wrench (Not included)
TSW-307H	A-10

Clamp Screw	Recommended Torque (N·m)
TSW-307H	2.1

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

Through coolant hole

EXSAP-11 type

Face milling | Shoulder Milling (Corner R) | Slotting | Helical Interpolation | Plunge milling

Fig.1

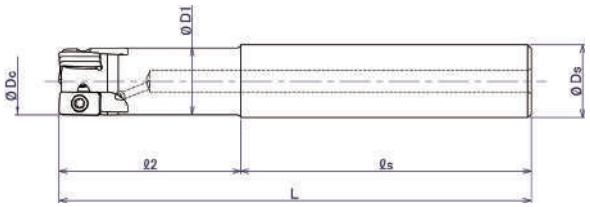
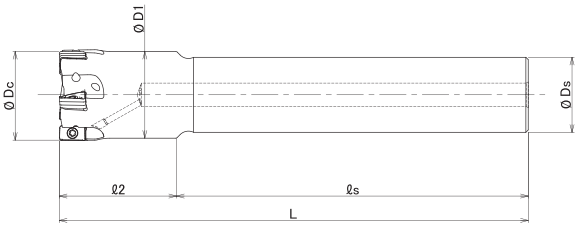


Fig.2



■ Body / Endmill type

Cat No.	Stock	No. of insert	Dimensions (mm)						Flg.	Insert
			φDc	ℓ2	ℓs	L	φD1	φDs		
EXSAP-2016-11-30-S16	●	2	16	30	60	90	14.6	16	1	ZNGU1105**ZER-**
EXSAP-2016-11-50-S16	●	2	16	50	60	110	14.6	16	1	
EXSAP-3020-11-50-S20	●	3	20	50	80	130	18.3	20	1	
EXSAP-3020-11-80-S20	●	3	20	80	80	160	18.3	20	1	
EXSAP-3025-11-60-S25	●	3	25	60	80	140	23.4	25	1	
EXSAP-3025-11-100-S25	●	3	25	100	80	180	23.4	25	1	
EXSAP-4030-11-70-S32	●	4	30	70	80	150	28.4	32	1	
EXSAP-4030-11-120-S32	●	4	30	120	80	200	28.4	32	1	
EXSAP-4032-11-70-S32	●	4	32	70	80	150	29	32	1	
EXSAP-4032-11-120-S32	●	4	32	120	80	200	29	32	1	
EXSAP-5040-11-50-S32	●	5	40	50	100	150	37	32	2	
EXSAP-5040-11-50L-S32	●	5	40	50	150	200	37	32	2	

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. Please refer to pages E203 - E204 / E209 - E210 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Parts	
Clamp screw	Wrench (Not included)
TSW-307H	A-10

Clamp Screw	Recommended Torque (N·m)
TSW-307H	2.1

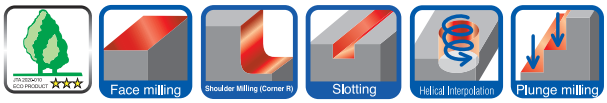
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

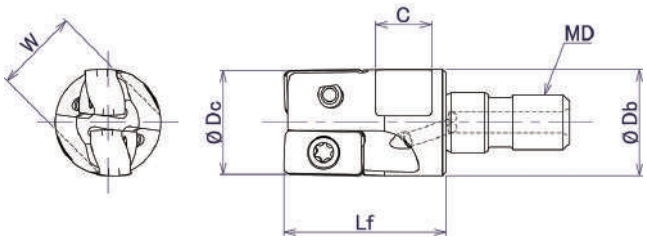
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

Through coolant hole

EXSAP-11 type





■ Body / Modular head type

Cat No.	Stock	No. of insert	Dimensions (mm)						Insert
			ϕDc	Lf	ϕDb	MD	C	W	
MSX-2016-11-M8	●	2	16	23	15	M8	8	12	ZNGU1105**ZER-**
MSX-3020-11-M10	●	3	20	30	18	M10	9	14	
MSX-3025-11-M12	●	3	25	35	22	M12	11	19	
MSX-4030-11-M16	●	4	30	43	29	M16	12	22	
MSX-4032-11-M16	●	4	32	43	29	M16	12	22	
MSX-5040-11-M16	●	5	40	43	29	M16	12	22	

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. Please refer to pages E205 - E206 / E211 - E212 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Parts	
Clamp screw	Wrench
TSW-307H	A-10

Clamp Screw	Recommended Torque (N・m)
TSW-307H	2.1

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

EXSAP-11 type

■ Inserts

Fig.1

Fig.1

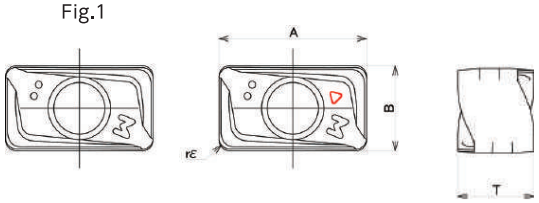
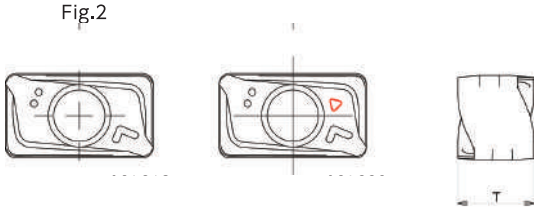


Fig.2

Fig.2

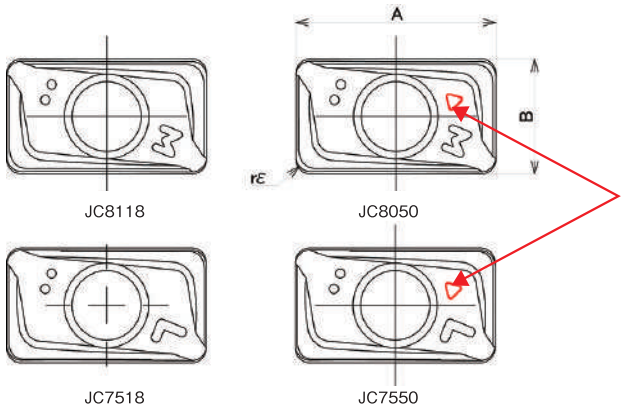


Cat No.	Tolerance	PVD Coated				Dimensions (mm)				Fig.
		JC8118	JC8050	JC7518	JC7550	A	B	T	rε	
ZNGU110504ZER-PM	G	◎	◎			11	6.3	5.6	0.4	1
ZNGU110508ZER-PM	G	●	●			11	6.3	5.6	0.8	1
ZNGU110516ZER-PM	G	◎	◎			11	6.3	5.6	1.6	1
ZNGU110504ZER-SL	G			◎	◎	11	6.3	5.6	0.4	2
ZNGU110508ZER-SL	G			●	●	11	6.3	5.6	0.8	2
ZNGU110516ZER-SL	G			◎	◎	11	6.3	5.6	1.6	2

10 inserts per case

Identification mark of Insert Grade

Each grade shows identification mark on the insert surface



●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficiency shoulder Milling. For multi-functional machining.

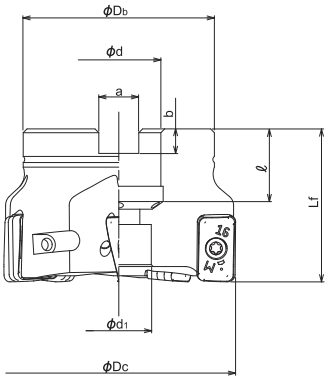
Shoulder Extreme Extreme series EXSAP / MSX TYPE

Through coolant hole

EXSAP-17 type

G-Body

Face milling | Shoulder Milling (Corner R) | Slotting | Helical Interpolation | Plunge milling



■ Body / Facemill type

Type	Cat No.	Stock	No. of insert	Dimensions (mm) ϕDc	Lf	ϕDb	ϕd	ϕd1	a	b	ℓ	Set bolt	Weight (kg)	Insert
Metric bore	**EXSAP-4050R-22**	●	4	50	40	47	22	17	10.4	6.3	20	M10	0.38	ZNGU1709** ZER-PM
	EXSAP-5050R-22	●	5	50	40	47	22	17	10.4	6.3	20	M10	0.38	
	EXSAP-5052R-22	☆	5	52	40	47	22	17	10.4	6.3	20	M10	0.41	
	EXSAP-5063R-22	●	5	63	40	50	22	17	10.4	6.3	20	M10	0.58	
	EXSAP-7080R-27	●	7	80	50	56	27	20	12.4	7	22	M12×1.75×30★	1.09	
	EXSAP-7100R-32	●	7	100	50	85	32	26	14.4	8	25	M16×2×25★	1.93	
	EXSAP-8125R-40	●	8	125	63	100	40	32	16.4	9	32	M20×2.5×40★	3.66	

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. The ★ mark indicates the size, so a set bolt for arbor is attached. For other items, please use the bolts attached to the arbor body.
3. Please refer to pages E213 - E214 / E219 - E220 for recommended cutting conditions.
4. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
5. Attention to use 3.0mm corner radius insert (ZNGU170930ZER-PM); Body must be modified to 2mm radius or 1.5mm chamfer at corner

Parts	
Clamp screw	Wrench
TSW-410H	A-15T

Clamp Screw	Recommended Torque (N•m)
TSW-410H	3.5

G-Body Adopted GN surface-hardening treatement 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 stocked ○: Soon to be deleted ※ : Production after order received

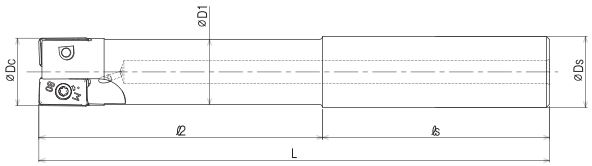
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

Through coolant hole

EXSAP-17 type

Face milling | Shoulder Milling (Corner R) | Slotting | Helical Interpolation | Plunge milling



■ Body / Endmill type

Cat No.	Stock	No. of insert	Dimensions (mm)						Insert
			φDc	ℓ2	ℓs	L	φD1	φDs	
EXSAP-2025-60-S25	●	2	25	60	80	140	23	25	ZNGU1709**ZER-PM
EXSAP-2025-100-S25	●	2	25	100	80	180	23	25	
EXSAP-2032-70-S32	●	2	32	70	80	150	29	32	
EXSAP-2032-120-S32	●	2	32	120	80	200	29	32	
EXSAP-3032-70-S32	●	3	32	70	80	150	29	32	
EXSAP-3032-120-S32	●	3	32	120	80	200	29	32	

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. Please refer to pages E215 - E216 / E221 - E222 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
4. Attention to use 3.0mm corner radius insert (ZNGU170930ZER-PM); Body must be modified to 2mm radius or 1.5mm chamfer at corner

Parts	
Clamp screw	Wrench
TSW-410H	A-15T

Clamp Screw	Recommended Torque (N・m)
TSW-410H	3.5

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

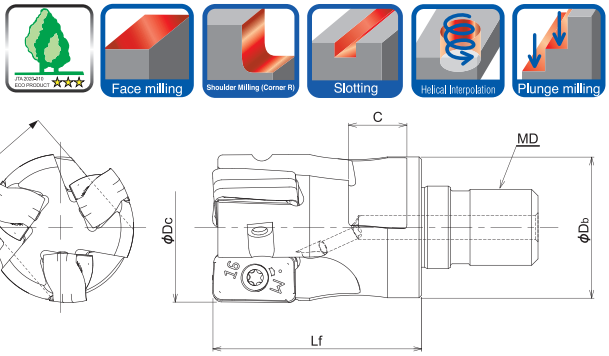
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

Through coolant hole

EXSAP-17 type

G-Body



■ Body / Modular head type

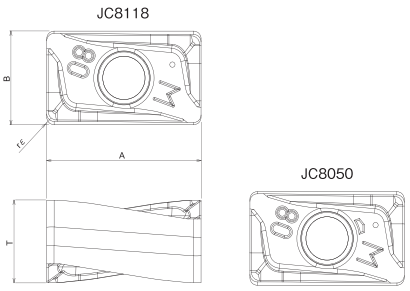
Cat No.	Stock	No. of insert	Dimensions (mm)						Insert	Parts	
			ϕDc	Lf	ϕDb	MD	C	W		Clamp screw	Wrench (not included)
MSX-2025-M12	●	2	25	35	22	M12	11	19	ZNGU1709**ZER-PM	TSW-410H	A-15
MSX-2026-M12	●	2	26	35	22	M12	11	19			
MSX-2028-M12	●	2	28	35	22	M12	11	19			
MSX-2030-M16	●	2	30	43	29	M16	12	22			
MSX-2032-M16	●	2	32	43	29	M16	12	22			
MSX-2032-M16	●	3	32	43	29	M16	12	22			
MSX-3033-M16	●	3	33	43	29	M16	12	22			
MSX-3035-M16	●	3	35	43	29	M16	12	22			
MSX-4040-M16	●	4	40	43	29	M16	12	22			

● : stock in Japan

Note) 1. The insert is not installed in the main body.
2. Please refer to pages E217 - E218 / E223 - E224 recommended for standard cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
4. Attention to use 3.0mm corner radius insert (ZNGU170930ZER-PM); Body must be modified to 2mm radius or 1.5mm chamfer at corner

Clamp Screw	Recommended Torque (N•m)
TSW-410H	3.5

■ Insert



Cat No.	Tolerance	PVD Coated		Dimensions (mm)			
		JC8050	JC8118	A	B	T	rε
ZNGU170904ZER-PM	G	●	●	16.9	10	8.8	0.4
ZNGU170908ZER-PM	G	●	●	16.9	10	8.8	0.8
ZNGU170916ZER-PM	G	●	●	16.9	10	8.8	1.6
ZNGU170920ZER-PM	G	●	●	16.9	10	8.8	2
ZNGU170930ZER-PM	G	●	●	16.9	10	8.6	3

10 inserts per case

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

■ Case Studies

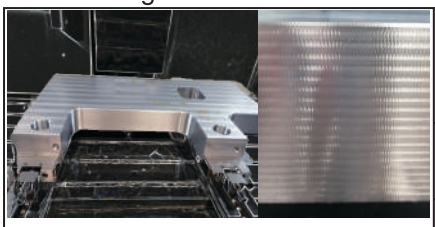
EXSAP-11 type

1. Machining Super duplex Stainless steel

Work	Part name	Parts			
	Material	Super duplex stainless steel			
	Hardness	32HRC			
Tool	Tool No.	EXSAP-7050R-11-22			
	Insert No.	ZNGU110508ZER-PM (JC8050)			
Cutting conditions	Cutting speed	n	600 (min^{-1})	Vc	95 (m/min)
	Feed speed	Vf	700 (mm/min)	fz	0.16 (mm/t)
	a_p	5mm			
	a_e	6mm			
	Coolant	Water coolant (Internal)			
	Machine	Vertical MC			

Result: Machining of three units completed compared to one unit with conventional products. In addition, reducing the cutting speed makes possible to machining four units.

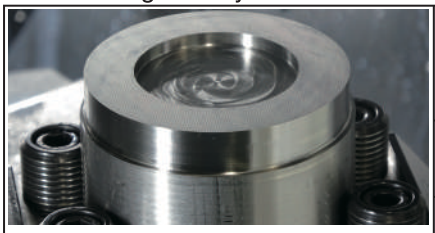
2. Machining Carbon steel



Work	Part name	Plate			
	Material	S45C			
	Hardness	200HB			
Tool	Tool No.	EXSAP-7050R-11-22			
	Insert No.	ZNGU110508ZER-PM (JC8050)			
Cutting conditions	Cutting speed	n	900 (min^{-1})	Vc	140 (m/min)
	Feed speed	Vf	1,400 (mm/min)	fz	0.22 (mm/t)
	a_p	10mm			
	a_e	1mm			
	Coolant	Air blow (Internal)			
	Machine	Vertical MC			

Result: It can be machined machine even high loading conditions such as ap=10mm, ae=1mm.

3. Machining Ti-alloy



Work	Part name	Test piece			
	Material	Ti-6AL-4V			
	Hardness	—			
Tool	Tool No.	MSX-2016-11-M8			
	Insert No.	ZNGU110508ZER-SL (JC7550)			
Cutting conditions	Cutting speed	n	1,200 (min^{-1})	Vc	60 (m/min)
	Feed speed	Vf	300 (mm/min)	fz	0.125 (mm/t)
	a_p	3mm			
	a_e	1mm			
	Coolant	Water coolant (Internal)			
	Machine	Vertical MC			

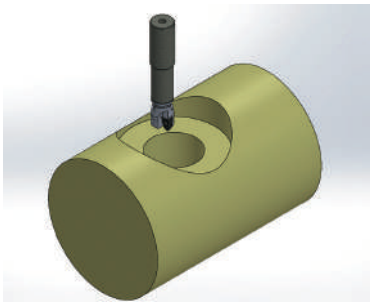
Result: No welding and beautiful surface finish even in shoulder milling of hard-to-cut materials. After 1 hour machining, it is still possible to use.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

■ Case Studies

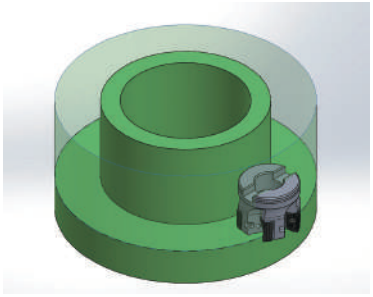
1. Machining Stainless steel



Work	Part name	Shaft				
	Material	SUS304				
	Hardness	—				
Tool	Tool No.	MSX-2032-M16				
	Insert No.	ZNGU170908ZER-PM (JC8050)				
Cutting conditions	Cutting speed	n	1,230 (min^{-1})	Vc	124 (m/min)	
	Feed speed	Vf	490 (mm/min)	fz	0.2 (mm/t)	
	a_p	5.4mm				
	a_e	4mm				
	Coolant	Oil coolant				
	Machine	Vertical MC				

Result: Achieved 4 times longer tool life per corner compared with competitor's tool and has two more corners

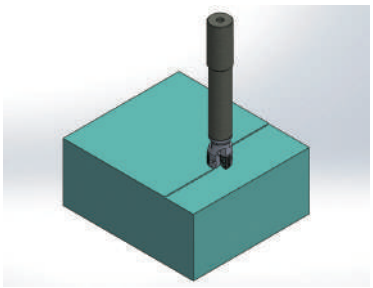
2. Machining Hardened die steel



Work	Part name	Forging die				
	Material	DAC10				
	Hardness	48-52HRC				
Tool	Tool No.	EXSAP-5050R-22				
	Insert No.	ZNGU170908ZER-PM (JC8118)				
Cutting conditions	Cutting speed	n	570 (min^{-1})	Vc	90 (m/min)	
	Feed speed	Vf	300 (mm/min)	fz	0.11 (mm/t)	
	a_p	0.5mm				
	a_e	35mm				
	Coolant	Water coolant (External)				
	Machine	Vertical MC				

Result: Stable machining, better tool life and efficiency compared with conventional tool. EXSAP has 4 corners against 2 corners of conventional tool.

3. Machining Carbon steel



Work	Part name	Parts				
	Material	S50C				
	Hardness	—				
Tool	Tool No.	MSX-3032-M16				
	Insert No.	ZNGU170908ZER-PM (JC8050)				
Cutting conditions	Cutting speed	n	1,400 (min^{-1})	Vc	140 (m/min)	
	Feed speed	Vf	1,200 (mm/min)	fz	0.29 (mm/t)	
	a_p	1.0mm				
	a_e	20mm				
	Coolant	Water coolant (External)				
	Machine	Vertical MC				

Result: EXSAP could integrate roughing process with finishing process and achieved excellent surface roughness.

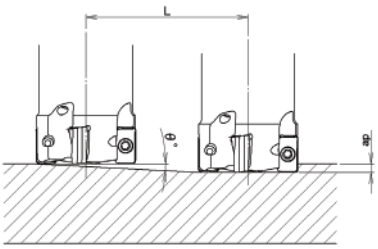
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

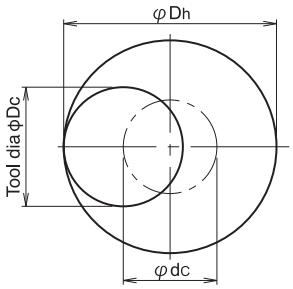
■ Instructions for profile milling

EXSAP-11 type

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 counter-clockwise.

Note :
- 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.(mm)	Eff. Cutting dia.(mm)	Max. depth of cut (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length L (m) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
MSX-2016-11-M8	16	14.1	1.5	1.0°	86	18	29.6
MSX-3020-11-M10	20	18.1	1.5	0.7°	123	26	37.6
MSX-3025-11-M12	25	23.1	1.5	0.4°	215	36	47.6
MSX-4030-11-M16	30	28.1	1.5	0.3°	286	46	57.6
MSX-4032-11-M16	32	30.1	1.5	0.3°	286	50	61.6
MSX-5040-11-M16	40	38.1	1.5	0.2°	430	66	77.6
EXSAP-2016-11-**-S16	16	14.1	1.5	1.0°	86	18	29.6
EXSAP-3020-11-**-S20	20	18.1	1.5	0.7°	123	26	37.6
EXSAP-3025-11-**-S25	25	23.1	1.5	0.4°	215	36	47.6
EXSAP-4030-11-**-S32	30	28.1	1.5	0.3°	286	46	57.6
EXSAP-4032-11-**-S32	32	30.1	1.5	0.3°	286	50	61.6
EXSAP-5040-11-**-S32	40	38.1	1.5	0.2°	430	66	77.6
EXSAP-6040R-11-16	40	38.1	1.5	0.2°	430	66	77.6
EXSAP-7050R-11-22	50	48.1	1.5	0.15°	573	86	97.6
EXSAP-7052R-11-22	52	50.1	1.5	0.15°	573	90	101.6
EXSAP-7063R-11-22	63	61.1	1.5				
EXSAP-7063R-11-27	63	61.1	1.5	Ramping and Helical interpolation is not recommended			
EXSAP-8080R-11-27	80	78.1	1.5				

Note : Above figures at this table is for R0.8, so incase of the other corner radius, please calculate eff.cutting dia. and Min, & Max. bore dia. according to the above table for "Calculation of tool pass dia".

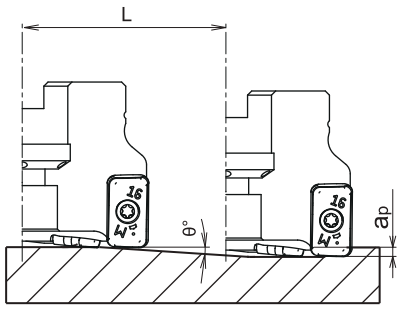
High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

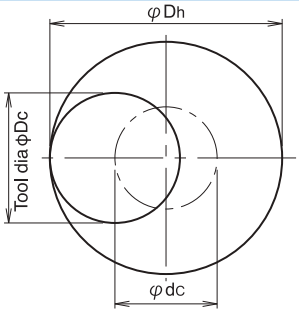
■ Instructions for profile milling

EXSAP-17 type

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 counter-clockwise.

Note :
- 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.(mm)	Eff. Cutting dia.(mm)	Max. depth of cut (mm)	Ramping		Helical interpolation	
				Max. ramping angle θ°	Total cutting length L (m) at max. ap	Min. bore dia. Dh min (mm)	Max. bore dia. Dh max (mm)
EXSAP/MSX-2025	25	21.5	1.5	0.7°	123	34	46
MSX-2026-M12	26	22.5	1.5	0.7°	123	36	48
MSX-2028-M12	28	25.5	1.5	0.6°	143	40	52
MSX-2030-M16	30	26.5	1.5	0.6°	143	44	56
EXSAP/MSX-*032	32	28.5	1.5	0.5°	172	48	60
MSX-3033-M16	33	29.5	1.5	0.5°	172	50	62
MSX-3035-M16	35	31.5	1.5	0.4°	215	54	66
MSX-4040-M16	40	36.5	1.5	0.4°	215	64	76
EXSAP-*050R-22	50	46.5	1.5	0.3°	286	84	96
EXSAP-5052R-22	52	48.5	1.5	0.3°	286	88	100
EXSAP-5063R-22	63	59.5	1.5	0.2°	430	110	122
EXSAP-7080R-27	80	76.5	1.5	0.15°	573	144	156
EXSAP-7100R-32	100	96.5		Ramping and Helical interpolation is not recommended			
EXSAP-8125R-40	125	121.5					

Note : Above figures at this table is for R1.6, so incase of the other corner radius, please calculate eff.cutting dia. and Min, & Max. bore dia. according to the above table for “Calculation of tool pass dia”.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-11 type

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		40					50/52				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~150	~8	~20	1,430	1,540	~200	~8	~24	1,150	1,610
		200	~6	~6	1,270	1,220	250	~6	~7.3	1,020	1,290
		250	~4	~2	1,110	930	300	~5	~2.4	890	1,000
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~150	~8	~20	1,430	1,540	~200	~8	~24	1,150	1,610
		200	~6	~6	1,270	1,220	250	~6	~7.3	1,020	1,290
		250	~4	~2	1,110	930	300	~5	~2.4	890	1,000
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~150	~8	~20	1,430	1,540	~200	~8	~24	1,150	1,610
		200	~6	~6	1,270	1,220	250	~6	~7.3	1,020	1,290
		250	~4	~2	1,110	930	300	~5	~2.4	890	1,000
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~150	~8	~20	1,030	870	~200	~8	~24	830	1,050
		200	~6	~6	950	680	250	~6	~7.3	760	850
		250	~4	~2	880	530	300	~5	~2.4	700	690
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~150	~8	~16	950	800	~200	~8	~20	760	960
		200	~6	~4.8	840	600	250	~6	~6	670	750
		250	~4	~1.6	720	430	300	~5	~2	570	560
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~5	~4.8	800	580	~200	~6	~8	640	540
		200	~4	~1.6	720	430	250	~5	~2.4	570	400
		250	~3	~0.5	640	310	300	~4	~0.8	510	290
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~150	~8	~22	1,590	1,720	~200	~8	~28	1,270	1,780
		200	~6	~6.7	1,430	1,200	250	~6	~8.5	1,150	1,450
		250	~4	~2.2	1,270	910	300	~5	~2.8	1,020	1,140
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~150	~8	~22	1,430	1,370	~200	~8	~28	1,150	1,610
		200	~6	~6.7	1,270	1,070	250	~6	~8.5	1,020	1,290
		250	~4	~2.2	1,110	800	300	~5	~28	890	1,000
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~150	~8	~20	950	800	~200	~8	~24	760	960
		200	~6	~6	880	630	250	~6	~7.3	700	780
		250	~4	~2	800	480	300	~5	~2.4	640	630
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~150	~8	~20	1,110	930	~200	~8	~24	890	1,120
		200	~6	~6	950	680	250	~6	~7.3	760	850
		250	~4	~2	800	480	300	~5	~2.4	640	630
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~150	~8	~14	560	440	~200	~8	~20	450	410
		200	~6	~4.2	480	350	250	~6	~6	380	320
		250	~4	~1.4	400	260	300	~5	~2	320	250
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~150	~8	~14	240	140	~200	~8	~20	190	130
		200	~6	~4.2	200	110	250	~6	~6	160	100
		250	~4	~1.4	160	80	300	~5	~2	130	70

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-11 type

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		63					80				
		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 S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~250	~9	~30	910	1,270	~300	~9	~36	720	1,150
		300	~7	~9	810	1,020	~350	~7	~11	640	920
		350	~5	~3	710	800	~400	~5	~3.6	560	720
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~250	~9	~30	910	1,270	~300	~9	~36	720	1,150
		300	~7	~9	810	1,020	~350	~7	~11	640	920
		350	~5	~3	710	800	~400	~5	~3.6	560	720
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~250	~9	~30	910	1,270	~300	~9	~36	720	1,150
		300	~7	~9	810	1,020	~350	~7	~11	640	920
		350	~5	~3	710	800	~400	~5	~3.6	560	720
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~250	~9	~30	660	830	~300	~9	~36	520	750
		300	~7	~9	610	680	~350	~7	~11	480	610
		350	~5	~3	560	550	~400	~5	~3.6	440	490
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~250	~9	~24	610	770	~300	~9	~28	480	690
		300	~7	~7.3	530	590	~350	~7	~8.5	420	540
		350	~5	~2.4	450	440	~400	~5	~2.8	360	400
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~250	~9	~9	510	430	~300	~9	~10	400	380
		300	~7	~2.7	450	320	~350	~7	~3	360	290
		350	~5	~0.9	400	220	~400	~5	~1	320	200
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~250	~9	~34	1,010	1,410	~300	~9	~40	800	1,280
		300	~7	~10	910	1,150	~350	~7	~12	720	1,040
		350	~5	~3.4	810	910	~400	~5	~4	640	820
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~250	~9	~34	910	1,270	~300	~9	~40	720	1,150
		300	~7	~10	810	1,020	~350	~7	~12	640	920
		350	~5	~3.4	710	800	~400	~5	~4	560	720
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~250	~9	~30	610	770	~300	~9	~36	480	690
		300	~7	~9	560	630	~350	~7	~11	440	560
		350	~5	~3	510	500	~400	~5	~3.6	400	450
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~250	~9	~30	710	890	~300	~9	~36	560	810
		300	~7	~9	610	680	~350	~7	~11	480	610
		350	~5	~3	510	500	~400	~5	~3.6	400	450
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~250	~9	~26	350	320	~300	~9	~30	280	290
		300	~7	~8	300	250	~350	~7	~9	240	230
		350	~5	~2	250	190	~400	~5	~3	200	180
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~250	~9	~26	150	110	~300	~9	~30	120	100
		300	~7	~8	130	80	~350	~7	~9	100	70
		350	~5	~2.6	100	60	~400	~5	~3	80	50

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-11 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)														
		16					20					25				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		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	JC8050 (JC8118)	~30	~5	~4	3,580	1,000	~50	~5	~5	2,860	1,370	~70	~6	~7.2	2,290	1,100
		70	~3	~1.2	3,180	760	~120	~3	~1.5	2,550	1,070	120	~4	~2.2	2,040	860
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~30	~5	~4	3,580	1,000	~50	~5	~5	2,860	1,370	~70	~6	~7.2	2,290	1,100
		70	~3	~1.2	3,180	760	120	~3	~1.5	2,550	1,070	120	~4	~2.2	2,040	860
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~30	~5	~4	3,580	1,000	~50	~5	~5	2,860	1,370	~70	~6	~7.2	2,290	1,100
		70	~3	~1.2	3,180	760	~120	~3	~1.5	2,550	1,070	120	~4	~2.2	2,040	860
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~30	~5	~4	2,590	620	~50	~5	~5	2,070	870	~70	~6	~7.2	1,660	700
		70	~3	~1.2	2,390	480	120	~3	~1.5	1,910	690	120	~4	~2.2	1,530	550
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~30	~5	~3.4	2,390	570	~50	~5	~4	1,910	800	~70	~6	~6	1,530	640
		70	~3	~1	2,090	420	~120	~3	~1.2	1,670	600	120	~4	~1.8	1,340	480
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~30	~3	~1.6	1,990	320	~50	~3.5	~2	1,590	480	~70	~4	~3.2	1,270	380
		70	~2	~0.6	1,790	250	120	~2.5	~0.6	1,430	390	120	~3	~1	1,150	310
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~30	~5	~5	3,980	1,110	~50	~5	~6	3,180	1,530	~70	~6	~9.8	2,550	1,220
		70	~3	~1.5	3,580	860	~120	~3	~1.8	2,860	1,200	120	~4	~3	2,290	960
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~30	~5	~5	3,580	1,000	~50	~5	~6	2,860	1,370	~70	~6	~9.8	2,290	1,100
		70	~3	~1.5	3,180	760	120	~3	~1.8	2,550	1,070	120	~4	~3	2,040	860
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~30	~5	~4	2,390	570	~50	~5	~5	1,910	800	~70	~6	~7.2	1,530	640
		70	~3	~1.2	2,190	440	~120	~3	~1.5	1,750	630	120	~4	~2.2	1,400	500
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~30	~5	~3.2	2,790	670	~50	~5	~5	2,230	940	~70	~6	~7.2	1,780	750
		70	~3	~1	2,390	480	120	~3	~1.5	1,910	690	120	~4	~2.2	1,530	550
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~30	~5	~3.2	1,390	330	~50	~5	~4	1,110	430	~70	~6	~6	890	350
		70	~3	~1	1,190	260	~120	~3	~1.2	950	340	120	~4	~1.8	760	270
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~30	~5	~3.2	600	110	~50	~5	~4	480	140	~70	~6	~6	380	110
		70	~3	~1	500	80	120	~3	~1.2	400	110	120	~4	~1.8	320	90

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-11 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32					40				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~70	~6	~9.8	1,790	1,150	~70	~7	~14	1,430	1,290
		120	~4	~3	1,590	890	170	~5	~4.2	1,270	1,020
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~70	~6	~9.8	1,790	1,150	~70	~7	~14	1,430	1,290
		120	~4	~3	1,590	890	170	~5	~4.2	1,270	1,020
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~70	~6	~9.8	1,790	1,150	~70	~7	~14	1,430	1,290
		120	~4	~3	1,590	890	170	~5	~4.2	1,270	1,020
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~70	~6	~9.8	1,290	720	~70	~7	~14	1,030	720
		120	~4	~3	1,190	570	170	~5	~4.2	950	570
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~70	~6	~8	1,190	670	~70	~7	~10	950	670
		120	~4	~2.4	1,040	500	170	~5	~3	840	500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	~4	~3.6	990	400	~70	~4.5	~4	800	480
		120	~3	~1	900	320	170	~3.5	~1.2	720	360
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~70	~6	~12	1,990	1,270	~70	~7	~16	1,590	1,430
		120	~4	~3.6	1,790	1,000	170	~5	~4.8	1,430	1,000
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~70	~6	~12	1,790	1,150	~70	~7	~16	1,430	1,140
		120	~4	~3.6	1,590	890	170	~5	~4.8	1,270	890
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~70	~6	~9.8	1,190	670	~70	~7	~14	950	670
		120	~4	~3	1,090	520	170	~5	~4.2	880	530
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~70	~6	~9.8	1,390	780	~70	~7	~14	1,110	780
		120	~4	~3	1,190	570	170	~5	~4.2	950	570
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~70	~6	~8	700	360	~70	~7	~10	560	360
		120	~4	~2.4	600	290	170	~5	~3	480	290
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~70	~6	~8	300	120	~70	~7	~10	240	120
		120	~4	~2.4	250	90	170	~5	~3	200	90

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-11 type

MSX and MSN type

Work Materials	Insert Grades	Tool dia. (mm)														
		16					20					25				
		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})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~80	~5	~4	3,580	1,000	~100	~5	~5	2,860	1,370	~120	~6	~7.2	2,290	1,100
		120	~3	~1.2	3,180	760	150	~3	~1.5	2,550	1,070	190	~4	~2.2	2,040	860
		160	~2	~0.4	2,790	560	190	~2	~0.5	2,230	800	235	~3	~0.7	1,780	640
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~80	~5	~4	3,580	1,000	~100	~5	~5	2,860	1,370	~120	~6	~7.2	2,290	1,100
		120	~3	~1.2	3,180	760	150	~3	~1.5	2,550	1,070	190	~4	~2.2	2,040	860
		160	~2	~0.4	2,790	560	190	~2	~0.5	2,230	800	235	~3	~0.7	1,780	640
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~80	~5	~4	3,580	1,000	~100	~5	~5	2,860	1,370	~120	~6	~7.2	2,290	1,100
		120	~3	~1.2	3,180	760	150	~3	~1.5	2,550	1,070	190	~4	~2.2	2,040	860
		160	~2	~0.4	2,790	560	190	~2	~0.5	2,230	800	235	~3	~0.7	1,780	640
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~80	~5	~4	2,590	620	~100	~5	~5	2,070	870	~120	~6	~7.2	1,660	700
		120	~3	~1.2	2,390	480	150	~3	~1.5	1,910	690	190	~4	~2.2	1,530	550
		160	~2	~0.4	2,190	350	190	~2	~0.5	1,750	530	235	~3	~0.7	1,400	420
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~80	~5	~3.4	2,390	570	~100	~5	~4	1,910	800	~120	~6	~6	1,530	640
		120	~3	~1	2,090	420	150	~3	~1.2	1,670	600	190	~4	~1.8	1,340	480
		160	~2	~0.3	1,790	290	190	~2	~0.4	1,430	430	235	~3	~0.6	1,150	350
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~80	~3	~1.6	1,990	320	~100	~3.5	~2	1,590	480	~120	~4	~3.2	1,270	380
		120	~2	~0.6	1,790	250	150	~2.5	~0.6	1,430	390	190	~3	~1	1,150	310
		160	~1	~0.2	1,590	190	190	~1.5	~0.2	1,270	300	235	~2	~0.3	1,020	240
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~80	~5	~5	3,980	1,110	~100	~5	~6	3,180	1,530	~120	~6	~9.8	2,550	1,220
		120	~3	~1.5	3,580	860	150	~3	~1.8	2,860	1,200	190	~4	~3	2,290	960
		160	~2	~0.5	3,180	640	190	~2	~0.6	2,550	920	235	~3	~1	2,040	730
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~80	~5	~5	3,580	1,000	~100	~5	~6	2,860	1,370	~120	~6	~9.8	2,290	1,100
		120	~3	~1.5	3,180	760	150	~3	~1.8	2,550	1,070	190	~4	~3	2,040	860
		160	~2	~0.5	2,790	560	190	~2	~0.6	2,230	800	235	~3	~1	1,780	640
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~80	~5	~4	2,390	570	~100	~5	~5	1,910	800	~120	~6	~7.2	1,530	640
		120	~3	~1.2	2,190	440	150	~3	~1.5	1,750	630	190	~4	~2.2	1,400	500
		160	~2	~0.4	1,990	320	190	~2	~0.5	1,590	480	235	~3	~0.7	1,270	380
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~80	~5	~3.2	2,790	670	~100	~5	~5	2,230	940	~120	~6	~7.2	1,780	750
		120	~3	~1	2,390	480	150	~3	~1.5	1,910	690	190	~4	~2.2	1,530	550
		160	~2	~0.4	1,990	320	190	~2	~0.5	1,590	480	235	~3	~0.7	1,270	380
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~80	~5	~3.2	1,390	330	~100	~5	~4	1,110	430	~120	~6	~6	890	350
		120	~3	~1	1,190	260	150	~3	~1.2	950	340	190	~4	~1.8	760	270
		160	~2	~0.3	990	200	190	~2	~0.4	800	260	235	~3	~0.6	640	210
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~80	~5	~3.2	600	110	~100	~5	~4	480	140	~120	~6	~6.0	380	110
		120	~3	~1	500	80	150	~3	~1.2	400	110	190	~4	~1.8	320	90
		160	~2	~0.3	400	60	190	~2	~0.4	320	80	235	~3	~0.6	250	60

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLIING

● MSX and MSN type

EXSAP-11 type

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32					40				
		No. of teeth 4N					No. of teeth 5N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~160	~6	~9.8	1,790	1,150	~160	~7	~14	1,430	1,290
		240	~4	~3	1,590	890	240	~5	~4.2	1,270	1,020
		290	~3	~1	1,390	670	290	~3	~1.4	1,110	780
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~160	~6	~9.8	1,790	1,150	~160	~7	~14	1,430	1,290
		240	~4	~3	1,590	890	240	~5	~4.2	1,270	1,020
		290	~3	~1	1,390	670	290	~3	~1.4	1,110	780
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~160	~6	~9.8	1,790	1,150	~160	~7	~14	1,430	1,290
		240	~4	~3	1,590	890	240	~5	~4.2	1,270	1,020
		290	~3	~1	1,390	670	290	~3	~1.4	1,110	780
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~160	~6	~9.8	1,290	720	~160	~7	~14	1,030	720
		240	~4	~3	1,190	570	240	~5	~4.2	950	570
		290	~3	~1	1,090	440	290	~3	~1.4	880	440
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~160	~6	~8	1,190	670	~160	~7	~10	950	670
		240	~4	~2.4	1,040	500	240	~5	~3	840	500
		290	~3	~0.8	900	360	290	~3	~1	720	360
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~160	~4	~3.6	990	400	~160	~4.5	~4	800	480
		240	~3	~1	900	320	240	~3.5	~1.2	720	360
		290	~2	~0.4	800	260	290	~2.5	~0.4	640	260
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~160	~6	~12	1,990	1,270	~160	~7	~16	1,590	1,430
		240	~4	~3.6	1,790	1,000	240	~5	~4.8	1,430	1,000
		290	~3	~1.2	1,590	760	290	~3	~1.6	1,270	760
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~160	~6	~12	1,790	1,150	~160	~7	~16	1,430	1,140
		240	~4	~3.6	1,590	890	240	~5	~4.8	1,270	890
		290	~3	~1.2	1,390	670	290	~3	~1.6	1,110	670
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~160	~6	~9.8	1,190	670	~160	~7	~14	950	670
		240	~4	~3	1,090	520	240	~5	~4.2	880	530
		290	~3	~1	990	400	290	~3	~1.4	800	400
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~160	~6	~9.8	1,390	780	~160	~7	~14	1,110	780
		240	~4	~3	1,190	570	240	~5	~4.2	950	570
		290	~3	~1	990	400	290	~3	~1.4	800	400
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~160	~6	~8	700	360	~160	~7	~10	560	360
		240	~4	~2.4	600	290	240	~5	~3	480	290
		290	~3	~0.8	500	220	290	~3	~1	400	220
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~160	~6	~8	300	120	~160	~7	~10	240	120
		240	~4	~2.4	250	90	240	~5	~3	200	90
		290	~3	~0.8	200	60	290	~3	~1	160	60

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

■ 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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-11 type

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		40					50/52				
		No. of teeth 6N					No. of teeth 7N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1.2	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1.2	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1.2	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~150	~2	~24	1,030	1,110	~200	~2	~30	830	1,050
		200	~1.2	~24	950	860	250	~1.2	~30	760	800
		250	~0.5	~24	880	630	300	~0.5	~30	700	590
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~150	~1.8	~24	950	910	~200	~1.8	~30	760	850
		200	~1	~24	840	660	250	~1	~30	670	610
		250	~0.5	~24	720	430	300	~0.5	~30	570	400
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~1	~16	800	580	~200	~1	~20	640	540
		200	~0.5	~16	720	430	250	~0.5	~20	570	400
		250	~0.3	~16	640	310	300	~0.3	~20	510	290
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~150	~2	~24	1,590	1,910	~200	~2	~30	1,270	1,780
		200	~1.2	~24	1,430	1,460	250	~1.2	~30	1,150	1,370
		250	~0.5	~24	1,270	1,070	300	~0.5	~30	1,020	1,000
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~150	~2	~24	1,430	1,720	~200	~2	~30	1,150	1,610
		200	~1.2	~24	1,270	1,300	250	~1	~30	1,020	1,210
		250	~0.5	~24	1,110	930	300	~0.5	~30	890	870
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~150	~2	~16	950	1,030	~200	~2	~20	760	960
		200	~1.2	~16	880	900	250	~1.2	~20	700	830
		250	~0.5	~16	800	670	300	~0.5	~20	640	630
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~150	~2	~24	1,110	1,200	~200	~2	~30	890	1,120
		200	~1.2	~24	950	970	250	~1.2	~30	760	900
		250	~0.5	~24	800	670	300	~0.5	~30	640	630
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~150	~1.8	~16	560	400	~200	~1.8	~20	450	380
		200	~1	~16	480	290	250	~1	~20	380	270
		250	~0.4	~16	400	190	300	~0.4	~20	320	180
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~150	~1.8	~16	240	160	~200	~1.8	~20	190	150
		200	~1	~16	200	110	250	~1	~20	160	100
		250	~0.4	~16	160	70	300	~0.4	~20	130	60

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Facemill type

EXSAP-11 type

Work Materials	Insert Grades	Tool dia. (mm)									
		63					80				
		No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~250	~2	~38	660	830	~300	~2	~48	520	750
		300	~1.2	~38	610	640	~350	~1.2	~48	480	580
		350	~0.5	~38	560	470	~400	~0.5	~48	440	420
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~250	~1.8	~38	610	680	~300	~1.8	~48	480	610
		300	~1	~38	530	480	~350	~1	~48	420	440
		350	~0.5	~38	450	320	~400	~0.5	~48	360	290
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~250	~1	~25	510	430	~300	~1	~32	400	380
		300	~0.5	~25	450	320	~350	~0.5	~32	360	290
		350	~0.3	~25	400	220	~400	~0.3	~32	320	200
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~250	~2	~38	1,010	1,410	~300	~2	~48	800	1,280
		300	~1.2	~38	910	1,080	~350	~1.2	~48	720	980
		350	~0.5	~38	810	790	~400	~0.5	~48	640	720
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~250	~2	~38	910	1,270	~300	~2	~48	720	1,150
		300	~1.2	~38	810	960	~350	~1.2	~48	640	870
		350	~0.5	~38	710	700	~400	~0.5	~48	560	630
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~250	~2	~25	610	770	~300	~2	~32	480	690
		300	~1.2	~25	560	670	~350	~1.2	~32	440	600
		350	~0.5	~25	510	500	~400	~0.5	~32	400	450
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~250	~2	~38	710	890	~300	~2	~48	560	810
		300	~1.2	~38	610	730	~350	~1.2	~48	480	650
		350	~0.5	~38	510	500	~400	~0.5	~48	400	450
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~250	~1.8	~25	350	290	~300	~1.8	~32	280	270
		300	~1	~25	300	210	~350	~1	~32	240	190
		350	~0.4	~25	250	140	~400	~0.4	~32	200	130
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~250	~1.8	~25	150	120	~300	~1.8	~32	120	110
		300	~1	~25	130	80	~350	~1	~32	100	70
		350	~0.4	~25	100	50	~400	~0.4	~32	80	40

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-11 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)														
		16					20					25				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~30	~1	~10	2,590	670	~70	~1.2	~12	2,070	930	~70	~1.2	~15	1,660	750
		70	~0.5	~10	2,390	480	120	~0.6	~12	1,910	690	120	~0.6	~15	1,530	550
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~30	~0.8	~10	2,190	530	~70	~1	~12	1,750	740	~70	~1	~15	1,400	590
		70	~0.4	~10	1,990	360	120	~0.5	~12	1,590	520	120	~0.5	~15	1,270	420
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~30	~0.4	~6	1,790	360	~70	~0.5	~8	1,430	430	~70	~0.5	~10	1,150	350
		70	~0.3	~6	1,590	250	120	~0.4	~8	1,270	300	120	~0.4	~10	1,020	240
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~30	~1	~10	3,580	1,000	~70	~1.2	~12	2,860	1,370	~70	~1.2	~15	2,290	1,100
		70	~0.5	~10	3,180	700	120	~0.6	~12	2,550	990	120	~0.6	~15	2,040	800
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~30	~1	~10	2,790	780	~70	~1.2	~12	2,230	1,070	~70	~1.2	~15	1,780	850
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~30	~1	~6	2,190	610	~70	~1.2	~8	1,750	840	~70	~1.2	~10	1,400	670
		70	~0.5	~6	1,990	440	120	~0.6	~8	1,590	620	120	~0.6	~10	1,270	500
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~30	~1	~10	2,980	830	~70	~1.2	~12	2,390	1,150	~70	~1.2	~15	1,910	920
		70	~0.5	~10	2,590	570	120	~0.6	~12	2,070	810	120	~0.6	~15	1,660	650
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~30	~0.8	~6	1,190	240	~70	~1	~8	950	290	~70	~1	~10	760	230
		70	~0.4	~6	990	160	120	~0.5	~8	800	190	120	~0.5	~10	640	150
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~30	~0.8	~6	600	110	~70	~1	~8	480	130	~70	~1	~10	380	110
		70	~0.4	~6	500	70	120	~0.5	~8	400	80	120	~0.5	~10	320	80

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-11 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32					40				
		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	JC8050 (JC8118)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~70	~1.5	~18	1,380	830	~70	~1.6	~24	1,030	820
		120	~0.8	~18	1,270	610	170	~1	~24	950	620
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~70	~1.2	~18	1,170	660	~70	~1.4	~24	950	710
		120	~0.6	~18	1,060	470	170	~0.8	~24	840	500
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	~0.6	~12	950	380	~70	~0.8	~16	800	440
		120	~0.4	~12	850	270	170	~0.4	~16	720	320
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~70	~1.5	~18	1,910	1,220	~70	~1.6	~24	1,590	1,430
		120	~0.8	~18	1,700	880	170	~1	~24	1,430	1,070
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~70	~1.5	~18	1,490	950	~70	~1.6	~24	1,430	1,290
		120	~0.8	~18	1,380	720	170	~1	~24	1,270	950
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~70	~1.5	~12	1,170	750	~70	~1.6	~16	950	860
		120	~0.8	~12	1,060	550	170	~1	~16	880	660
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~70	~1.5	~18	1,590	1,020	~70	~1.6	~24	1,110	1,000
		120	~0.8	~18	1,380	720	170	~1	~24	950	710
Titanium alloy Ti-6Al-4V 35-43HRC	JC7550 (JC7518)	~70	~0.8	~12	640	260	~70	~1.4	~16	560	310
		120	~0.5	~12	530	170	170	~0.8	~16	480	220
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~70	~0.8	~12	320	130	~70	~1.4	~16	240	120
		120	~0.5	~12	270	90	170	~0.8	~16	200	80

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

NOTE

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2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-11 type

MSX and MSN type

Work Materials	Insert Grades	Tool dia. (mm)														
		16					20					25				
		No. of teeth 2N					No. of teeth 3N					No. of teeth 3N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 (JC8118)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~80	~1	~10	2,590	670	~100	~1.2	~12	2,070	930	~120	~1.2	~15	1,660	750
		120	~0.5	~10	2,390	480	150	~0.6	~12	1,910	690	190	~0.6	~15	1,530	550
		160	~0.2	~10	2,190	310	190	~0.3	~12	1,750	470	235	~0.3	~15	1,400	380
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~80	~0.8	~10	2,190	530	~100	~1	~12	1,750	740	~120	~1	~15	1,400	590
		120	~0.4	~10	1,990	360	150	~0.5	~12	1,590	520	190	~0.5	~15	1,270	420
		160	~0.2	~10	1,790	210	190	~0.3	~12	1,430	340	235	~0.3	~15	1,150	280
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~80	~0.4	~6	1,790	360	~100	~0.5	~8	1,430	430	~120	~0.5	~10	1,150	350
		120	~0.3	~6	1,590	250	150	~0.4	~8	1,270	300	190	~0.4	~10	1,020	240
		160	~0.2	~6	1,390	170	190	~0.2	~8	1,110	200	235	~0.2	~10	890	160
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~80	~1	~10	3,580	1,000	~100	~1.2	~12	2,860	1,370	~120	~1.2	~15	2,290	1,100
		120	~0.5	~10	3,180	700	150	~0.6	~12	2,550	990	190	~0.6	~15	2,040	800
		160	~0.2	~10	2,790	450	190	~0.3	~12	2,230	670	235	~0.3	~15	1,780	530
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~80	~1	~10	2,790	780	~100	~1.2	~12	2,230	1,070	~120	~1.2	~15	1,780	850
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,390	380	190	~0.3	~12	1,910	570	235	~0.3	~15	1,530	460
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~80	~1	~6	2,190	610	~100	~1.2	~8	1,750	840	~120	~1.2	~10	1,400	670
		120	~0.5	~6	1,990	440	150	~0.6	~8	1,590	620	190	~0.6	~10	1,270	500
		160	~0.2	~6	1,790	290	190	~0.3	~8	1,430	430	235	~0.3	~10	1,150	350
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~80	~1	~10	2,980	830	~100	~1.2	~12	2,390	1,150	~120	~1.2	~15	1,910	920
		120	~0.5	~10	2,590	570	150	~0.6	~12	2,070	810	190	~0.6	~15	1,660	650
		160	~0.2	~10	2,190	350	190	~0.3	~12	1,750	530	235	~0.3	~15	1,400	420
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~80	~0.8	~6	1,190	240	~100	~1	~8	950	290	~120	~1	~10	760	230
		120	~0.4	~6	990	160	150	~0.5	~8	800	190	190	~0.5	~10	640	150
		160	~0.2	~6	800	100	190	~0.3	~8	640	120	235	~0.3	~10	510	90
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~80	~0.8	~6	600	110	~100	~1	~8	480	130	~120	~1	~10	380	110
		120	~0.4	~6	500	70	150	~0.5	~8	400	80	190	~0.5	~10	320	80
		160	~0.2	~6	400	40	190	~0.3	~8	320	50	235	~0.3	~10	250	50

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

MSX and MSN type

EXSAP-11 type

Work Materials	Insert Grades	Tool dia. (mm)									
		30/32					40				
		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	JC8050 (JC8118)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,170	470	290	~0.4	~24	1,110	670
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050 (JC8118)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,170	470	290	~0.4	~24	1,110	670
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050 (JC8118)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,170	470	290	~0.4	~24	1,110	670
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118 (JC8050)	~160	~1.5	~18	1,380	830	~160	~1.6	~24	1,030	820
		240	~0.8	~18	1,270	610	240	~1	~24	950	620
		290	~0.3	~18	1,170	420	290	~0.4	~24	880	440
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118 (JC8050)	~160	~1.2	~18	1,170	660	~160	~1.4	~24	950	710
		240	~0.6	~18	1,060	470	240	~0.8	~24	840	500
		290	~0.3	~18	950	300	290	~0.4	~24	720	320
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~160	~0.6	~12	950	380	~160	~0.8	~16	800	440
		240	~0.4	~12	850	270	240	~0.4	~16	720	320
		290	~0.2	~12	740	180	290	~0.2	~16	640	220
Cast iron FC250 (GG25) 160-260HB	JC8118 (JC8050)	~160	~1.5	~18	1,910	1,220	~160	~1.6	~24	1,590	1,430
		240	~0.8	~18	1,700	880	240	~1	~24	1,430	1,070
		290	~0.3	~18	1,490	600	290	~0.4	~24	1,270	760
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118 (JC8050)	~160	~1.5	~18	1,490	950	~160	~1.6	~24	1,430	1,290
		240	~0.8	~18	1,380	720	240	~1	~24	1,270	950
		290	~0.3	~18	1,270	510	290	~0.4	~24	1,110	670
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050 (JC7550)	~160	~1.5	~12	1,170	750	~160	~1.6	~16	950	860
		240	~0.8	~12	1,060	550	240	~1	~16	880	660
		290	~0.3	~12	950	380	290	~0.4	~16	800	480
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8050 (JC7550)	~160	~1.5	~18	1,590	1,020	~160	~1.6	~24	1,110	1,000
		240	~0.8	~18	1,380	720	240	~1	~24	950	710
		290	~0.3	~18	1,170	470	290	~0.4	~24	800	480
Titanium alloy TI-6AI-4V 35-43HRC	JC7550 (JC7518)	~160	~0.8	~12	640	260	~160	~1.4	~16	560	310
		240	~0.5	~12	530	170	240	~0.8	~16	480	220
		290	~0.2	~12	420	100	290	~0.3	~16	400	140
Inconel (INCO718) 35-43HRC	JC7550 (JC7518)	~160	~0.8	~12	320	130	~160	~1.4	~16	240	120
		240	~0.5	~12	270	90	240	~0.8	~16	200	80
		290	~0.2	~12	210	50	290	~0.3	~16	160	50

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-17 type

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)														
		50					50/52					63				
		No. of teeth 4N					No. of teeth 5N					No. of teeth 5N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~15	~40	1,270	1,520	~100	~15	~40	1,270	1,910	~100	~15	~45	1,010	1,770
		150	~12	~25	1,150	1,150	150	~12	~25	1,150	1,440	150	~12	~30	910	1,370
		200	~10	~15	1,020	820	200	~10	~15	1,020	1,020	200	~10	~20	810	1,010
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~15	~40	1,150	1,380	~100	~15	~40	1,150	1,730	~100	~15	~45	910	1,590
		150	~12	~25	1,020	1,020	150	~12	~25	1,020	1,280	150	~12	~30	810	1,220
		200	~10	~15	890	710	200	~10	~15	890	890	200	~10	~20	710	890
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~15	~40	1,270	1,520	~100	~15	~40	1,270	1,910	~100	~15	~45	1,010	1,770
		150	~12	~25	1,150	1,150	150	~12	~25	1,150	1,440	150	~12	~30	910	1,370
		200	~10	~15	1,020	820	200	~10	~15	1,020	1,020	200	~10	~20	810	1,010
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~15	~40	950	1,140	~100	~15	~40	950	1,430	~100	~15	~45	760	1,330
		150	~12	~25	860	860	150	~12	~25	860	1,080	150	~12	~30	680	1,020
		200	~10	~15	760	610	200	~10	~15	760	760	200	~10	~20	610	760
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~15	~30	760	760	~100	~15	~30	760	950	~100	~15	~30	610	760
		150	~12	~20	670	540	150	~12	~20	670	670	150	~12	~25	530	530
		200	~10	~12	570	340	200	~10	~12	570	430	200	~10	~15	450	340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~15	~18	640	510	~100	~15	~18	640	640	~100	~15	~25	510	510
		150	~12	~12	570	340	150	~12	~12	570	430	150	~12	~15	450	340
		200	~10	~5	510	200	200	~10	~5	510	260	200	~10	~8	400	200
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~15	~40	1,590	1,910	~100	~15	~40	1,590	2,390	~100	~15	~45	1,260	2,210
		150	~12	~25	1,460	1,460	150	~12	~25	1,460	1,830	150	~12	~30	1,160	1,740
		200	~10	~15	1,340	1,070	200	~10	~15	1,340	1,340	200	~10	~20	1,060	1,330
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~15	~40	950	950	~100	~15	~40	950	1,190	~100	~15	~45	760	1,140
		150	~12	~25	830	660	150	~12	~25	830	830	150	~12	~30	660	830
		200	~10	~15	700	420	200	~10	~15	700	530	200	~10	~20	560	560
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~15	~40	760	610	~100	~15	~40	760	760	~100	~15	~45	610	610
		150	~12	~25	700	420	150	~12	~25	700	530	150	~12	~30	560	420
		200	~10	~15	640	260	200	~10	~15	640	320	200	~10	~20	510	260
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~15	~40	1,150	1,150	~100	~15	~40	1,150	1,440	~100	~15	~45	910	1,370
		150	~12	~25	1,020	820	150	~12	~25	1,020	1,020	150	~12	~30	810	1,010
		200	~10	~15	890	530	200	~10	~15	890	670	200	~10	~20	710	710

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Facemill type

EXSAP-17 type

Work Materials	Insert Grades	Tool dia. (mm)														
		80					100					125				
		No. of teeth 7N					No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~15	~45	800	1,960	~100	~15	~45	640	1,570	~100	~15	~45	510	1,430
		150	~12	~30	720	1,510	150	~12	~30	570	1,200	150	~12	~30	460	1,100
		200	~10	~20	640	1,120	200	~10	~20	510	890	200	~10	~20	410	820
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~15	~45	720	1,760	~100	~15	~45	570	1,400	~100	~15	~45	460	1,290
		150	~12	~30	640	1,340	150	~12	~30	510	1,070	150	~12	~30	410	980
		200	~10	~20	560	980	200	~10	~20	450	790	200	~10	~20	360	720
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~15	~45	800	1,960	~100	~15	~45	640	1,570	~100	~15	~45	510	1,430
		150	~12	~30	720	1,510	150	~12	~30	570	1,200	150	~12	~30	460	1,100
		200	~10	~20	640	1,120	200	~10	~20	510	890	200	~10	~20	410	820
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~15	~45	600	1,470	~100	~15	~45	480	1,180	~100	~15	~45	380	1,060
		150	~12	~30	540	1,130	150	~12	~30	430	900	150	~12	~30	340	820
		200	~10	~20	480	840	200	~10	~20	380	670	200	~10	~20	310	620
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~15	~30	480	840	~100	~15	~30	380	670	~100	~15	~30	310	620
		150	~12	~25	420	590	150	~12	~25	330	460	150	~12	~25	270	430
		200	~10	~15	360	380	200	~10	~15	290	300	200	~10	~15	230	280
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~15	~25	400	560	~100	~15	~25	320	450	~100	~15	~25	250	400
		150	~12	~15	360	380	150	~12	~15	290	300	150	~12	~15	230	280
		200	~10	~8	320	220	200	~10	~8	250	180	200	~10	~8	200	160
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~15	~45	990	2,430	~100	~15	~45	800	1,960	~100	~15	~45	640	1,790
		150	~12	~30	920	1,930	150	~12	~30	730	1,530	150	~12	~30	590	1,420
		200	~10	~20	840	1,470	200	~10	~20	670	1,170	200	~10	~20	530	1,060
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~15	~45	600	1,260	~100	~15	~45	480	1,010	~100	~15	~45	380	910
		150	~12	~30	520	910	150	~12	~30	410	720	150	~12	~30	330	660
		200	~10	~20	440	620	200	~10	~20	350	490	200	~10	~20	280	450
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~15	~45	480	670	~100	~15	~45	380	530	~100	~15	~45	310	500
		150	~12	~30	440	460	150	~12	~30	350	370	150	~12	~30	280	340
		200	~10	~20	400	280	200	~10	~20	320	220	200	~10	~20	250	200
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~15	~45	720	1,510	~100	~15	~45	570	1,200	~100	~15	~45	460	1,100
		150	~12	~30	640	1,120	150	~12	~30	510	890	150	~12	~30	410	820
		200	~10	~20	560	780	200	~10	~20	450	630	200	~10	~20	360	580

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-17 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32				
		No. of teeth 2N					No. of teeth 2N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~60	~10	~15	2,550	1,530	~70	~12	~24	1,990	1,190
		90	~7	~10	2,290	1,150	100	~9	~18	1,790	900
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~60	~10	~15	2,290	1,370	~70	~12	~24	1,790	1,070
		90	~7	~10	2,040	1,020	100	~9	~18	1,590	800
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~60	~10	~15	2,550	1,530	~70	~12	~24	1,990	1,190
		90	~7	~10	2,290	1,150	100	~9	~18	1,790	900
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~60	~10	~15	1,910	1,150	~70	~12	~24	1,490	890
		90	~7	~10	1,720	860	100	~9	~18	1,340	670
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~60	~10	~12	1,530	770	~70	~12	~18	1,190	600
		90	~7	~6	1,340	540	100	~9	~13	1,040	420
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~60	~10	~8	1,270	510	~70	~12	~12	990	400
		90	~7	~4	1,150	350	100	~9	~8	900	270
Cast iron FC250 (GG25) 160-260HB	JC8118	~60	~10	~15	3,180	1,910	~70	~12	~24	2,490	1,490
		90	~7	~10	2,930	1,470	100	~9	~18	2,290	1,150
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~60	~10	~15	1,910	960	~70	~12	~24	1,490	750
		90	~7	~10	1,660	660	100	~9	~18	1,290	520
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~60	~10	~15	1,530	610	~70	~12	~24	1,190	480
		90	~7	~10	1,400	420	100	~9	~18	1,090	330
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~60	~10.0	~15	2,290	1,150	~70	~12	~24	1,790	900
		90	~7.0	~10	2,040	820	100	~9	~18	1,590	640

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-17 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)				
		32				
		No. of teeth 3N				
		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	JC8050	~70	~12	~24	1,990	1,790
		100	~9	~18	1,790	1,340
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~70	~12	~24	1,790	1,610
		100	~9	~18	1,590	1,190
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~70	~12	~24	1,990	1,790
		100	~9	~18	1,790	1,340
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~70	~12	~24	1,490	1,340
		100	~9	~18	1,340	1,010
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~70	~12	~18	1,190	890
		100	~9	~13	1,040	620
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	~12	~12	990	590
		100	~9	~8	900	410
Cast iron FC250 (GG25) 160-260HB	JC8118	~70	~12	~24	2,490	2,240
		100	~9	~18	2,290	1,720
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~70	~12	~24	1,490	1,120
		100	~9	~18	1,290	770
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~70	~12	~24	1,190	710
		100	~9	~18	1,090	490
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~70	~12	~24	1,790	1,340
		100	~9	~18	1,590	950

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-17 type

MSX and MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		25/26/28					30/32				
		No. of teeth 2N					No. of teeth 2N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~90	~10	~15	2,450	1,470	~100	~12	~24	2,050	1,230
		140	~7	~10	2,200	1,100	150	~9	~18	1,850	930
		210	~4	~5	1,960	780	210	~6	~9	1,640	660
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~90	~10	~15	2,200	1,320	~100	~12	~24	1,850	1,110
		140	~7	~10	1,960	980	150	~9	~18	1,640	820
		210	~4	~5	1,710	680	210	~6	~9	1,440	580
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~90	~10	~15	2,450	1,470	~100	~12	~24	2,050	1,230
		140	~7	~10	2,200	1,100	150	~9	~18	1,850	930
		210	~4	~5	1,960	780	210	~6	~9	1,640	660
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~90	~10	~15	1,840	1,100	~100	~12	~24	1,540	920
		140	~7	~10	1,650	830	150	~9	~18	1,390	700
		210	~4	~5	1,470	590	210	~6	~9	1,230	490
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~90	~10	~12	1,470	740	~100	~12	~18	1,230	620
		140	~7	~6	1,290	520	150	~9	~13	1,080	430
		210	~4	~2	1,100	330	210	~6	~7	920	280
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~90	~10	~8	1,220	490	~100	~12	~12	1,030	410
		140	~7	~4	1,100	330	150	~9	~8	920	280
		210	~4	~2	980	200	210	~6	~3	820	160
Cast iron FC250 (GG25) 160-260HB	JC8118	~90	~10	~15	3,060	1,840	~100	~12	~24	2,570	1,540
		140	~7	~10	2,820	1,410	150	~9	~18	2,360	1,180
		210	~4	~5	2,570	1,030	210	~6	~12	2,160	860
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~90	~10	~15	1,840	920	~100	~12	~24	1,540	770
		140	~7	~10	1,590	640	150	~9	~18	1,330	530
		210	~4	~5	1,350	410	210	~6	~9	1,130	340
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~90	~10	~15	1,470	590	~100	~12	~24	1,230	490
		140	~7	~10	1,350	410	150	~9	~18	1,130	340
		210	~4	~5	1,220	240	210	~6	~9	1,030	210
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~90	~10	~15	2,200	1,100	~100	~12	~24	1,850	930
		140	~7	~10	1,960	780	150	~9	~18	1,640	660
		210	~4	~5	1,710	510	210	~6	~9	1,440	430

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

EXSAP-17 type

MSX and MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		32/33/35					40				
		No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	$a_p \times a_e$ (mm^2)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~12	~24	1,930	1,740	~100	~15	~30	1,590	1,910
		150	~9	~18	1,740	1,310	150	~10	~20	1,430	1,430
		210	~6	~9	1,540	920	210	~8	~12	1,270	1,020
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~12	~24	1,740	1,570	~100	~15	~30	1,430	1,720
		150	~9	~18	1,540	1,160	150	~10	~20	1,270	1,270
		210	~6	~9	1,350	810	210	~8	~12	1,110	890
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~12	~24	1,930	1,740	~100	~15	~30	1,590	1,910
		150	~9	~18	1,740	1,310	150	~10	~20	1,430	1,430
		210	~6	~9	1,540	920	210	~8	~12	1,270	1,020
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~12	~24	1,450	1,310	~100	~15	~30	1,190	1,430
		150	~9	~18	1,300	980	150	~10	~20	1,070	1,070
		210	~6	~9	1,160	700	210	~8	~12	950	760
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~12	~18	1,160	870	~100	~15	~20	950	950
		150	~9	~13	1,010	610	150	~10	~15	840	670
		210	~6	~7	870	390	210	~8	~8	720	430
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~12	~12	960	580	~100	~12	~12	800	640
		150	~9	~8	870	390	150	~10	~8	720	430
		210	~6	~3	770	230	210	~8	~3	640	260
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~12	~24	2,410	2,170	~100	~15	~30	1,990	2,390
		150	~9	~18	2,220	1,670	150	~10	~20	1,830	1,830
		210	~6	~12	2,030	1,220	210	~8	~16	1,670	1,340
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~12	~24	1,450	1,090	~100	~15	~30	1,190	1,190
		150	~9	~18	1,250	750	150	~10	~20	1,030	820
		210	~6	~9	1,060	480	210	~8	~12	880	530
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~12	~24	1,160	700	~100	~15	~30	950	760
		150	~9	~18	1,060	480	150	~10	~20	880	530
		210	~6	~9	960	290	210	~8	~12	800	320
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~12	~24	1,740	1,310	~100	~15	~30	1,430	1,430
		150	~9	~18	1,540	920	150	~10	~20	1,270	1,020
		210	~6	~9	1,350	610	210	~8	~12	1,110	670

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-17 type

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)														
		50					50/52					63				
		No. of teeth 4N					No. of teeth 5N					No. of teeth 5N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	~4	~50	950	1,140	~150	~4	~1Dc	950	1,430	~150	~4	~63	760	1,330
		200	~3	~40	830	830	200	~3	~40	830	1,040	200	~3	~55	660	990
		300	~2	~30	700	560	300	~2	~30	700	700	300	~2	~40	560	700
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~150	~4	~50	950	1,140	~150	~4	~1Dc	950	1,430	~150	~4	~63	760	1,330
		200	~3	~40	830	830	200	~3	~40	830	1,040	200	~3	~55	660	990
		300	~2	~30	700	560	300	~2	~30	700	700	300	~2	~40	560	700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	~4	~50	950	950	~150	~4	~1Dc	950	1,190	~150	~4	~63	760	1,140
		200	~3	~40	830	660	200	~3	~40	830	830	200	~3	~55	660	830
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	~4	~50	830	830	~150	~4	~1Dc	830	1,040	~150	~4	~63	660	990
		200	~3	~40	760	610	200	~3	~40	760	760	200	~3	~55	610	760
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	~3	~50	700	700	~150	~3	~1Dc	700	880	~150	~3	~63	560	700
		200	~2.5	~40	640	510	200	~2.5	~40	640	640	200	~2.5	~55	510	510
		300	~1.5	~30	570	340	300	~1.5	~30	570	430	300	~1.5	~40	450	340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~40	570	460	~150	~2.5	~40	570	570	~150	~2.5	~55	450	450
		200	~2	~30	510	310	200	~2	~30	510	380	200	~2	~40	400	300
		300	~1.5	~20	450	180	300	~1.5	~20	450	230	300	~1.5	~32	350	180
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	~6	~50	1,150	1,380	~150	~6	~1Dc	1,150	1,730	~150	~6	~63	910	1,590
		200	~4	~40	950	950	200	~4	~40	950	1,190	200	~4	~55	760	1,140
		300	~2	~30	830	660	300	~2	~30	830	830	300	~2	~40	660	830
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	~4	~50	830	830	~150	~4	~1Dc	830	1,040	~150	~4	~63	660	990
		200	~3	~40	760	610	200	~3	~40	760	760	200	~3	~55	610	760
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	~4	~40	700	560	~150	~4	~40	700	700	~150	~4	~55	560	560
		200	~3	~30	640	380	200	~3	~30	640	480	200	~3	~40	510	380
		300	~2	~20	570	230	300	~2	~20	570	290	300	~2	~32	450	230
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	~4	~50	950	950	~150	~4	~1Dc	950	1,190	~150	~4	~63	760	1,140
		200	~3	~40	830	660	200	~3	~40	830	830	200	~3	~55	660	830
		300	~2	~30	700	420	300	~2	~30	700	530	300	~2	~40	560	560

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Facemill type

EXSAP-17 type

Work Materials	Insert Grades	Tool dia. (mm)														
		80					100					125				
		No. of teeth 7N					No. of teeth 7N					No. of teeth 8N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	~4	~80	600	1,470	~150	~4	~100	480	1,010	~150	~4	~125	380	910
		200	~3	~65	520	1,090	200	~3	~80	410	720	200	~3	~100	330	660
		300	~2	~50	440	770	300	~2	~60	350	490	300	~2	~75	280	450
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~150	~4	~80	600	1,470	~150	~4	~100	480	1,010	~150	~4	~125	380	910
		200	~3	~65	520	1,090	200	~3	~80	410	720	200	~3	~100	330	660
		300	~2	~50	440	770	300	~2	~60	350	490	300	~2	~75	280	450
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	~4	~80	600	1,260	~150	~4	~100	480	840	~150	~4	~125	380	760
		200	~3	~65	520	910	200	~3	~80	410	570	200	~3	~100	330	530
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	~4	~80	520	1,090	~150	~4	~100	410	720	~150	~4	~125	330	660
		200	~3	~65	480	840	200	~3	~80	380	530	200	~3	~100	310	500
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	~3	~80	440	770	~150	~4	~100	350	490	~150	~4	~125	280	450
		200	~2.5	~65	400	560	200	~3	~80	320	340	200	~3	~100	250	300
		300	~1.5	~50	360	380	300	~2	~60	290	200	300	~2	~75	230	180
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~65	360	500	~150	~4	~80	290	300	~150	~4	~100	230	280
		200	~2.0	~50	320	340	200	~3	~60	250	180	200	~3	~75	200	160
		300	~1.5	~35	280	200	300	~2	~40	220	150	300	~2	~50	180	140
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	~6	~80	720	1,760	~150	~4	~100	570	1,200	~150	~4	~125	460	1,100
		200	~4	~65	600	1,260	200	~3	~80	480	840	200	~3	~100	380	760
		300	~2	~50	520	910	300	~2	~60	410	570	300	~2	~75	330	530
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	~4	~80	520	1,090	~150	~4	~100	410	720	~150	~4	~125	330	660
		200	~3	~65	480	840	200	~3	~80	380	530	200	~3	~100	310	500
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	~4	~65	440	620	~150	~4	~80	350	370	~150	~4	~100	280	340
		200	~3	~50	400	420	200	~3	~60	320	220	200	~3	~75	250	200
		300	~2	~35	360	250	300	~2	~40	290	200	300	~2	~50	230	180
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	~4	~80	600	1,260	~150	~4	~100	480	840	~150	~4	~125	380	760
		200	~3	~65	520	910	200	~3	~80	410	570	200	~3	~100	330	530
		300	~2	~50	440	620	300	~2	~60	350	370	300	~2	~75	280	340

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-17 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32				
		No. of teeth 2N					No. of teeth 2N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~60	~3	~1Dc	1,910	1,150	~70	~3.5	~1Dc	1,490	890
		90	~2	~20	1,660	830	100	~2.5	~25	1,290	650
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~60	~3	~1Dc	1,910	1,150	~70	~3.5	~1Dc	1,490	890
		90	~2	~20	1,660	830	100	~2.5	~25	1,290	650
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~60	~3	~1Dc	1,910	960	~70	~3.5	~1Dc	1,490	750
		90	~2	~20	1,660	660	100	~2.5	~25	1,290	520
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~60	~3	~1Dc	1,660	830	~70	~3.5	~1Dc	1,290	650
		90	~2	~20	1,530	610	100	~2.5	~25	1,190	480
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~60	~2	~1Dc	1,400	700	~70	~2.5	~1Dc	1,090	550
		90	~1	~20	1,270	510	100	~2	~25	990	400
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~60	~1	~20	1,150	460	~70	~2	~25	900	360
		90	~1	~15	1,020	310	100	~1.5	~20	800	240
Cast iron FC250 (GG25) 160-260HB	JC8118	~60	~5	~1Dc	2,550	1,530	~70	~5.5	~1Dc	1,990	1,190
		90	~3	~20	2,290	1,150	100	~3.5	~25	1,790	900
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~60	~3	~1Dc	1,660	830	~70	~3.5	~1Dc	1,290	650
		90	~2	~20	1,530	610	100	~2.5	~25	1,190	480
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~60	~3	~20	1,400	560	~70	~3.5	~25	1,090	440
		90	~2	~15	1,270	380	100	~2.5	~20	990	300
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~60	~3	~1Dc	1,910	960	~70	~3.5	~1Dc	1,490	750
		90	~2	~20	1,660	660	100	~2.5	~25	1,290	520

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-17 type

Endmill type

Work Materials	Insert Grades	Tool dia. (mm) 32 No. of teeth 3N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	V_f (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~70	~3.5	~1Dc	1,490	1,340
		100	~2.5	~25	1,290	970
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~70	~3.5	~1Dc	1,490	1,340
		100	~2.5	~25	1,290	970
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~70	~3.5	~1Dc	1,490	1,120
		100	~2.5	~25	1,290	770
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~70	~3.5	~1Dc	1,290	970
		100	~2.5	~25	1,190	710
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~70	~2.5	~1Dc	1,090	820
		100	~2	~25	990	590
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~70	~2	~25	900	540
		100	~1.5	~20	800	360
Cast iron FC250 (GG25) 160-260HB	JC8118	~70	~5.5	~1Dc	1,990	1,790
		100	~3.5	~25	1,790	1,340
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~70	~3.5	~1Dc	1,290	970
		100	~2.5	~25	1,190	710
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~70	~3.5	~25	1,090	650
		100	~2.5	~20	990	450
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~70	~3.5	~1Dc	1,490	1,120
		100	~2.5	~25	1,290	770

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

EXSAP-17 type

MSX and MSN type

Work Materials	Insert Grades	Tool dia. (mm)									
		25/26/28					30/32				
		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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~90	~3	~1Dc	1,840	1,100	~100	~3.5	~1Dc	1,540	920
		140	~2	~20	1,590	800	150	~2.5	~25	1,330	670
		210	~1	~15	1,350	540	210	~1.5	~20	1,130	450
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~90	~3	~1Dc	1,840	1,100	~100	~3.5	~1Dc	1,540	920
		140	~2	~20	1,590	800	150	~2.5	~25	1,330	670
		210	~1	~15	1,350	540	210	~1.5	~20	1,130	450
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~90	~3	~1Dc	1,840	920	~100	~3.5	~1Dc	1,540	770
		140	~2	~20	1,590	640	150	~2.5	~25	1,330	530
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~90	~3	~1Dc	1,590	800	~100	~3.5	~1Dc	1,330	670
		140	~2	~20	1,470	590	150	~2.5	~25	1,230	490
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~90	~2	~1Dc	1,350	680	~100	~2.5	~1Dc	1,130	570
		140	~1.5	~20	1,220	490	150	~2	~25	1,030	410
		210	~1	~15	1,100	330	210	~1.5	~20	920	280
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~90	~1.5	~20	1,100	440	~100	~2	~25	920	370
		140	~1	~15	980	290	150	~1.5	~20	820	250
		210	~0.5	~10	860	170	210	~1	~15	720	140
Cast iron FC250 (GG25) 160-260HB	JC8118	~90	~5	~1Dc	2,450	1,470	~100	~5.5	~1Dc	2,050	1,230
		140	~3	~20	2,200	1,100	150	~3.5	~25	1,850	930
		210	~1	~15	1,960	780	210	~1.5	~20	1,640	660
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~90	~3	~1Dc	1,590	800	~100	~3.5	~1Dc	1,330	670
		140	~2	~20	1,470	590	150	~2.5	~25	1,230	490
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~90	~3	~20	1,350	540	~100	~3.5	~25	1,130	450
		140	~2	~15	1,220	370	150	~2.5	~20	1,030	310
		210	~1	~10	1,100	220	210	~1.5	~15	920	180
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~90	~3	~1Dc	1,840	920	~100	~3.5	~1Dc	1,540	770
		140	~2	~20	1,590	640	150	~2.5	~25	1,330	530
		210	~1	~15	1,350	410	210	~1.5	~20	1,130	340

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

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 same 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.

High efficiency shoulder Milling. For multi-functional machining.

Shoulder Extreme Extreme series EXSAP / MSX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

MSX and MSN type type

EXSAP-17 type

Work Materials	Insert Grades	Tool dia. (mm)									
		32/33/35					40				
		No. of teeth 3N					No. of teeth 4N				
		ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	a_p (mm)	a_e (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~3.5	~1Dc	1,450	1,310	~100	~3.5	~40	1,190	1,430
		150	~2.5	~25	1,250	940	150	~2.5	~32	1,030	1,030
		210	~1.5	~20	1,060	640	210	~1.5	~24	880	700
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~3.5	~1Dc	1,450	1,310	~100	~3.5	~40	1,190	1,430
		150	~2.5	~25	1,250	940	150	~2.5	~32	1,030	1,030
		210	~1.5	~20	1,060	640	210	~1.5	~24	880	700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~3.5	~1Dc	1,450	1,090	~100	~3.5	~40	1,190	1,190
		150	~2.5	~25	1,250	750	150	~2.5	~32	1,030	820
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~3.5	~1Dc	1,250	940	~100	~3.5	~40	1,030	1,030
		150	~2.5	~25	1,160	700	150	~2.5	~32	950	760
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~2.5	~1Dc	1,060	800	~100	~2.5	~40	880	880
		150	~2	~25	960	580	150	~2	~32	800	640
		210	~1.5	~20	870	390	210	~1.5	~24	720	430
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~2	~25	870	520	~100	~2	~32	720	580
		150	~1.5	~20	770	350	150	~1.5	~24	640	380
		210	~1	~15	680	200	210	~1	~18	560	220
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~5.5	~1Dc	1,930	1,740	~100	~5.5	~40	1,590	1,910
		150	~3.5	~25	1,740	1,310	150	~3.5	~32	1,430	1,430
		210	~1.5	~20	1,540	920	210	~1.5	~24	1,270	1,020
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~3.5	~1Dc	1,250	940	~100	~3.5	~40	1,030	1,030
		150	~2.5	~25	1,160	700	150	~2.5	~32	950	760
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~3.5	~25	1,060	640	~100	~3.5	~32	880	700
		150	~2.5	~20	960	430	150	~2.5	~24	800	480
		210	~1.5	~15	870	260	210	~1.5	~18	720	290
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~3.5	~1Dc	1,450	1,090	~100	~3.5	~40	1,190	1,190
		150	~2.5	~25	1,250	750	150	~2.5	~32	1,030	820
		210	~1.5	~20	1,060	480	210	~1.5	~24	880	530

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

NOTE

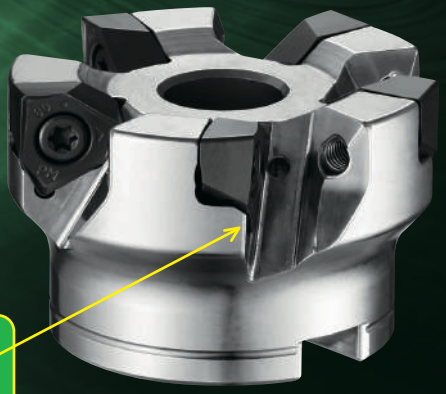
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or spindle speed with keeping same feed per tooth.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle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

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

Indexable shoulder milling cutter "Shoulder 6" EXSIX type have high rigidity 6 corners insert.

Shoulder - 6



Arc-geometry on the peripheral cutting edge

Due to arc-geometry on the periphery cutting edge, cusp height can be smaller even in case of large ap and achieve high efficient & high precision machining on vertical wall.

Positive axial rake angle

Due to unique 3D insert shape, axial rake angle is positive, therefore EXSIX achieve low cutting force.

Features

EXSIX has excellent chip removal rate and high rigidity body. Max depth of cut (ap) = 10mm is possible, EXSIX are usable for wide applications such as face milling, slotting and plunging.

Features of Insert

Economical double-side insert (6 corners).
7.5mm thickness provides high rigidity, enabling stable machining for roughing.
Corner R size is R0.8 & R16

Insert grade <JC8050> for General Steel and Mold steel less than 35HRC.
Insert grade <JC8118> for Cast Iron and High hardened die steel less than 50HRC

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

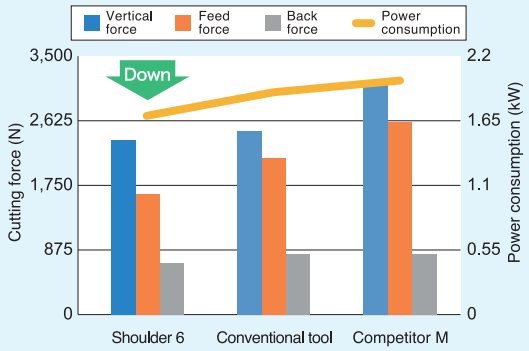
High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

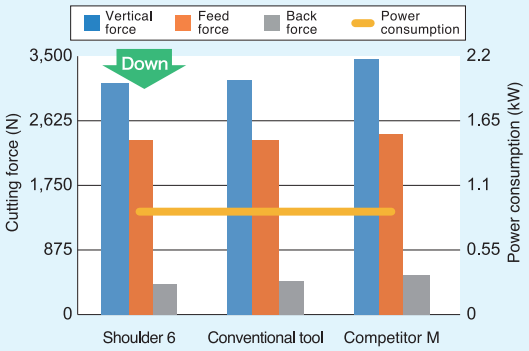
Cutting performance

Cutting force comparison

Small ap cutting condition (ap=3mm, ae=40mm)



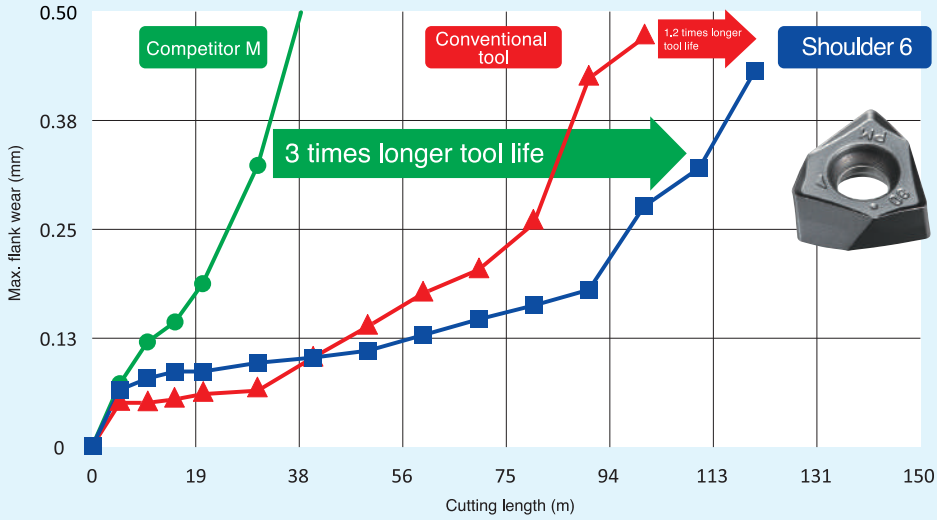
Large ap cutting condition (ap=8mm, ae=30mm)



Achieved low cutting force under both cutting conditions.
It is observed that with smaller depth of cut, cutting force is highly reduced as compared with other cutters.

Material : S50C
Cutting conditions : N=910min^{-1}, Vc=180m/min, fz=0.3mm/t
Overhung lenght : L=140mm
Down cut
Tool dia. : ϕ63mm

Tool life comparison



EXSIX achieved 3 times longer tool life compared with Competitor M, and 1.2 times longer compared with conventional tool

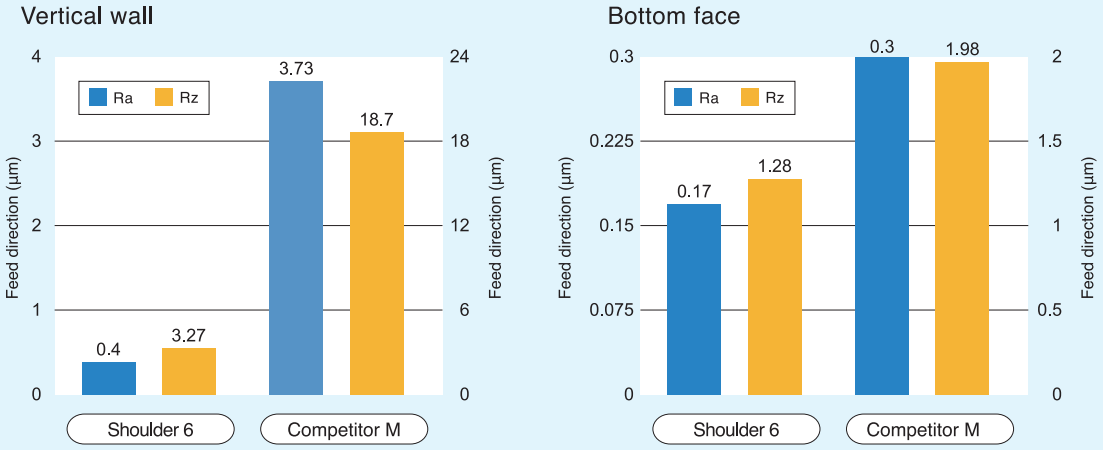
Material : P20 (PX5)
Cutting conditions : N=750min^{-1}, Vc=148m/min, fz=0.3mm/t
Down cut
Tool dia. : ϕ63mm

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

■ Cutting performance

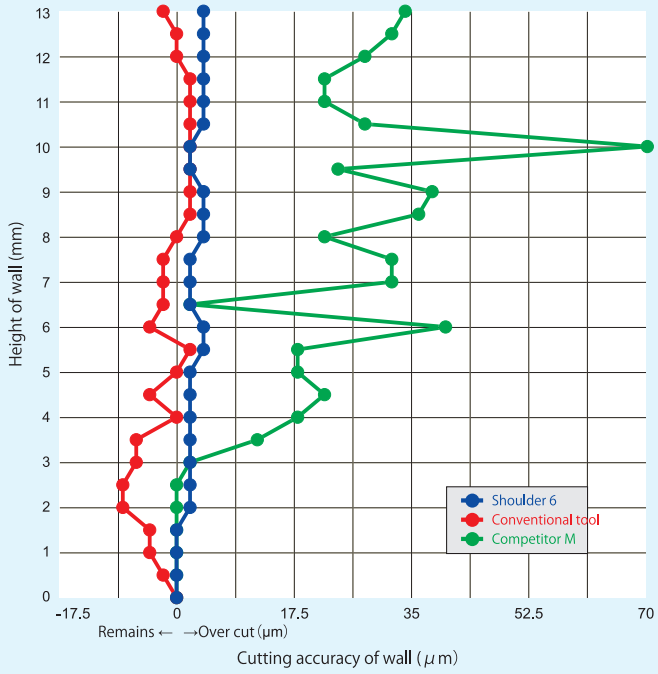
Surface roughness comparison



Achieved good surface finish due to improved chip removal rate at vertical wall and bottom face machining. In addition, achieved better surface finish of bottom face by wiper cutting edge

Material：S50C
Cutting conditions : N=910min^{-1},
Vc=180m/min, fz=0.3mm/t
ap=3mm, ae=40mm
Down cut, Tool dia. : ϕ63mm

Cutting accuracy comparison



Material：C50 (S50C)
Cutting conditions : N=910min^{-1},
Vc=180m/min, fz=0.3mm/t
ap=3mm, ae=40mm
Down cut, Tool dia. : ϕ63mm

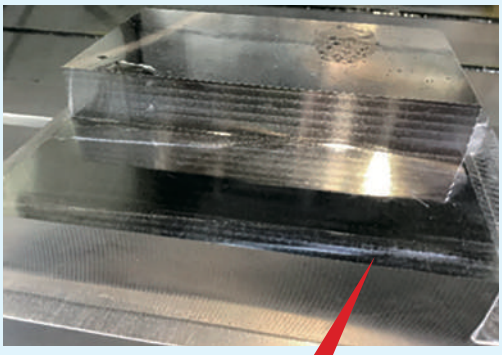
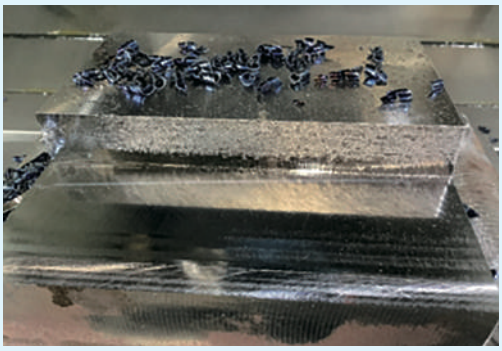
Positive axial rake angle improved chip removal rate. Arc-geometry on the periphery cutting edge achieved high precision machining.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

Cutting performance

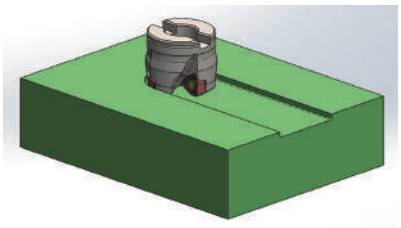
Surface roughness comparison

Shoulder 6	Competitor M
	

Good surface finish!

Material : S50C
Cutting conditions : N=910min^{-1}, Vc=180m/min, fz=0.3mm/t, ap=3mm, ae=40mm, Down cut, Tool dia. : ϕ63mm

Case study



Work	Part name		Stamping die
	Material		FC250
	Hardness		—
Tool	Tool No.		EXSIX-4050R-22
	Insert No.		YCMU090708ZER-PM (JC8118)
Cutting conditions	Cutting speed	n	800 (min^{-1})
		Vc	126 (m/min)
	Feed speed	Vf	800 (mm/min)
		fz	0.25 (mm/t)
	a_p		4mm
	a_e		50mm
	Coolant		Air blow (Internal)
	Machine		Double column type MC
Result	Even in slotting, due to high rigidity, EXSIX achieved 160cm^3/min extremely excellent chip removal rate Also EXSIX enable stable machining without damaging the insert and screws.		

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

Fig.1 (Through coolant hole)

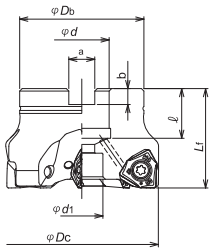
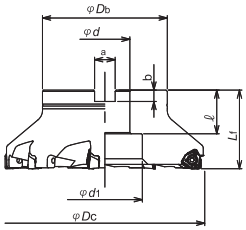
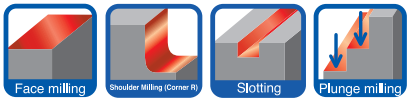


Fig.2 (Without coolant hole)



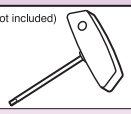


Body / Facemill type

Type	Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	R	Set bolt		Weight (kg)	Fig.	Applicable inserts
Metric bore	EXSIX-4050R-22	●	4	50	40	47	22	14	10.4	6.3	20	M10×1.5×25★	Head cap screw (Slim standard)	0.33	1	YCMU 0907＊＊ ZER-PM
	EXSIX-4052R-22	☆	4	52	40	47	22	14	10.4	6.3	20	M10×1.5×25★		0.35	1	
	EXSIX-5063R-22	●	5	63	40	50	22	17	10.4	6.3	20	M10	Head cap screw (JIS standard)	0.50	1	
	EXSIX-5066R-22	☆	5	66	40	50	22	17	10.4	6.3	20	M10		0.53	1	
	EXSIX-6080R-27	●	6	80	50	56	27	20	12.4	7	22	M12×1.75×30★		0.93	1	
	EXSIX-7100R-32	●	7	100	50	85	32	26	14.4	8	25	M16×2×30★		1.88	1	
	EXSIX-8125R-40	●	8	125	63	100	40	32	16.4	9	32	M20×2.5×40★		3.62	1	
	EXSIX-9160R-40	●	9	160	63	100	40	60	16.4	9	35	M20	For milling arbor Clamp bolt	4.67	2	

Note) 1. All cutters are supplied without inserts.
2. Please refer page E230 - E236 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. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Parts

Clamp screw	Wrench
	(not included) 
CSW-513H	A-20

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

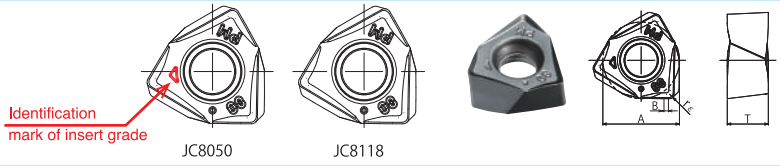
Insert

Cat No.	Tolerance	PVD Coated JC8050	PVD Coated JC8118	Dimensions (mm) A	T	B	r ε
YCMU090708ZER-PM	M	●	●	14	7.5	1.41	0.8
YCMU090716ZER-PM	M	●	●	14	7.5	0.62	1.6

10 inserts per case.

Identification of grade for insert

Each grade shows identification mark on the insert surface.



● : Standard stock items　□ : Stock in Japan　◎ : Soon to be stocked　○ : Soon to be deleted　※ : Production after order received

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		50/52					63/66				
		No. of teeth 4N					No. of teeth 5N				
		r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~9.0	~45	1,270	1,520	~100	~9.0	~45	1,010	1,770
		150	~8.0	~30	1,150	1,150	150	~8.0	~30	910	1,370
		200	~7.0	~20	1,020	820	200	~7.0	~20	810	1,010
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~9.0	~45	1,150	1,380	~100	~9.0	~45	910	1,590
		150	~8.0	~30	1,020	1,020	150	~8.0	~30	810	1,220
		200	~7.0	~20	890	710	200	~7.0	~20	710	890
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~9.0	~45	1,270	1,520	~100	~9.0	~45	1,010	1,770
		150	~8.0	~30	1,150	1,150	150	~8.0	~30	910	1,370
		200	~7.0	~20	1,020	820	200	~7.0	~20	810	1,010
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~9.0	~45	950	1,140	~100	~9.0	~45	760	1,330
		150	~8.0	~30	860	860	150	~8.0	~30	680	1,020
		200	~7.0	~20	760	610	200	~7.0	~20	610	760
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~9.0	~30	760	760	~100	~9.0	~30	610	760
		150	~8.0	~25	670	540	150	~8.0	~25	530	530
		200	~7.0	~15	570	340	200	~7.0	~15	450	340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~9.0	~25	640	510	~100	~9.0	~25	510	510
		150	~8.0	~15	570	340	150	~8.0	~15	450	340
		200	~7.0	~8	510	200	200	~7.0	~8	400	200
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~9.0	~45	1,590	1,910	~100	~9.0	~45	1,260	2,210
		150	~8.0	~30	1,460	1,460	150	~8.0	~30	1,160	1,740
		200	~7.0	~20	1,340	1,070	200	~7.0	~20	1,060	1,330
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~9.0	~45	950	950	~100	~9.0	~45	760	1,140
		150	~8.0	~30	830	660	150	~8.0	~30	660	830
		200	~7.0	~20	700	420	200	~7.0	~20	560	560
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~9.0	~45	760	610	~100	~9.0	~45	610	610
		150	~8.0	~30	700	420	150	~8.0	~30	560	420
		200	~7.0	~20	640	260	200	~7.0	~20	510	260
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~9.0	~45	1,150	1,150	~100	~9.0	~45	910	1,370
		150	~8.0	~30	1,020	820	150	~8.0	~30	810	1,010
		200	~7.0	~20	890	530	200	~7.0	~20	710	710

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

● Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		80					100				
		No. of teeth 6N					No. of teeth 7N				
		r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~9.0	~45	800	1,680	~100	~9.0	~45	640	1,570
		150	~8.0	~30	720	1,300	150	~8.0	~30	570	1,200
		200	~7.0	~20	640	960	200	~7.0	~20	510	890
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~9.0	~45	720	1,510	~100	~9.0	~45	570	1,400
		150	~8.0	~30	640	1,150	150	~8.0	~30	510	1,070
		200	~7.0	~20	560	840	200	~7.0	~20	450	790
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~9.0	~45	800	1,680	~100	~9.0	~45	640	1,570
		150	~8.0	~30	720	1,300	150	~8.0	~30	570	1,200
		200	~7.0	~20	640	960	200	~7.0	~20	510	890
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~9.0	~45	600	1,260	~100	~9.0	~45	480	1,180
		150	~8.0	~30	540	970	150	~8.0	~30	430	900
		200	~7.0	~20	480	720	200	~7.0	~20	380	670
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~9.0	~30	480	720	~100	~9.0	~30	380	670
		150	~8.0	~25	420	500	150	~8.0	~25	330	460
		200	~7.0	~15	360	320	200	~7.0	~15	290	300
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~9.0	~25	400	480	~100	~9.0	~25	320	450
		150	~8.0	~15	360	320	150	~8.0	~15	290	300
		200	~7.0	~8	320	190	200	~7.0	~8	250	180
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~9.0	~45	990	2,080	~100	~9.0	~45	800	1,960
		150	~8.0	~30	920	1,660	150	~8.0	~30	730	1,530
		200	~7.0	~20	840	1,260	200	~7.0	~20	670	1,170
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~9.0	~45	600	1,080	~100	~9.0	~45	480	1,010
		150	~8.0	~30	520	780	150	~8.0	~30	410	720
		200	~7.0	~20	440	530	200	~7.0	~20	350	490
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~9.0	~45	480	580	~100	~9.0	~45	380	530
		150	~8.0	~30	440	400	150	~8.0	~30	350	370
		200	~7.0	~20	400	240	200	~7.0	~20	320	220
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~9.0	~45	720	1,300	~100	~9.0	~45	570	1,200
		150	~8.0	~30	640	960	150	~8.0	~30	510	890
		200	~7.0	~20	560	670	200	~7.0	~20	450	630

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

RECOMMENDED CUTTING CONDITIONS FOR SHOULDER MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		125					160				
		No. of teeth 8N					No. of teeth 9N				
		r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ap×ae (mm²)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~100	~9.0	~45	510	1,430	~100	~9.0	~45	400	1,260
		150	~8.0	~30	460	1,100	150	~8.0	~30	360	970
		200	~7.0	~20	410	820	200	~7.0	~20	320	720
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~100	~9.0	~45	460	1,290	~100	~9.0	~45	360	1,130
		150	~8.0	~30	410	980	150	~8.0	~30	320	860
		200	~7.0	~20	360	720	200	~7.0	~20	280	630
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~100	~9.0	~45	510	1,430	~100	~9.0	~45	400	1,260
		150	~8.0	~30	460	1,100	150	~8.0	~30	360	970
		200	~7.0	~20	410	820	200	~7.0	~20	320	720
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~100	~9.0	~45	380	1,060	~100	~9.0	~45	300	950
		150	~8.0	~30	340	820	150	~8.0	~30	270	730
		200	~7.0	~20	310	620	200	~7.0	~20	240	540
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~100	~9.0	~30	310	620	~100	~9.0	~30	240	540
		150	~8.0	~25	270	430	150	~8.0	~25	210	380
		200	~7.0	~15	230	280	200	~7.0	~15	180	240
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~100	~9.0	~25	250	400	~100	~9.0	~25	200	360
		150	~8.0	~15	230	280	150	~8.0	~15	180	240
		200	~7.0	~8	200	160	200	~7.0	~8	160	140
Cast iron FC250 (GG25) 160-260HB	JC8118	~100	~9.0	~45	640	1,790	~100	~9.0	~45	500	1,580
		150	~8.0	~30	590	1,420	150	~8.0	~30	460	1,240
		200	~7.0	~20	530	1,060	200	~7.0	~20	420	950
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~100	~9.0	~45	380	910	~100	~9.0	~45	300	810
		150	~8.0	~30	330	660	150	~8.0	~30	260	590
		200	~7.0	~20	280	450	200	~7.0	~20	220	400
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~100	~9.0	~45	310	500	~100	~9.0	~45	240	430
		150	~8.0	~30	280	340	150	~8.0	~30	220	300
		200	~7.0	~20	250	200	200	~7.0	~20	200	180
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~100	~9.0	~45	460	1,100	~100	~9.0	~45	360	970
		150	~8.0	~30	410	820	150	~8.0	~30	320	720
		200	~7.0	~20	360	580	200	~7.0	~20	280	500

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

● Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		50/52					63/66				
		No. of teeth 4N					No. of teeth 5N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	~4.0	~1.0Dc	950	1,140	~150	~4.0	~1.0Dc	760	1,330
		200	~3.0	~40	830	830	200	~3.0	~55	660	990
		300	~2.0	~30	700	560	300	~2.0	~40	560	700
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~150	~4.0	~1.0Dc	950	1,140	~150	~4.0	~1.0Dc	760	1,330
		200	~3.0	~40	830	830	200	~3.0	~55	660	990
		300	~2.0	~30	700	560	300	~2.0	~40	560	700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	~4.0	~1.0Dc	950	950	~150	~4.0	~1.0Dc	760	1,140
		200	~3.0	~40	830	660	200	~3.0	~55	660	830
		300	~2.0	~30	700	420	300	~2.0	~40	560	560
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	~4.0	~1.0Dc	830	830	~150	~4.0	~1.0Dc	660	990
		200	~3.0	~40	760	610	200	~3.0	~55	610	760
		300	~2.0	~30	700	420	300	~2.0	~40	560	560
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	~3.0	~1.0Dc	700	700	~150	~3.0	~1.0Dc	560	700
		200	~2.5	~40	640	510	200	~2.5	~55	510	510
		300	~1.5	~30	570	340	300	~1.5	~40	450	340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~40	570	460	~150	~2.5	~55	450	450
		200	~2.0	~30	510	310	200	~2.0	~40	400	300
		300	~1.5	~20	450	180	300	~1.5	~32	350	180
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	~6.0	~1.0Dc	1,150	1,380	~150	~6.0	~1.0Dc	910	1,590
		200	~4.0	~40	950	950	200	~4.0	~55	760	1,140
		300	~2.0	~30	830	660	300	~2.0	~40	660	830
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	~4.0	~1.0Dc	830	830	~150	~4.0	~1.0Dc	660	990
		200	~3.0	~40	760	610	200	~3.0	~55	610	760
		300	~2.0	~30	700	420	300	~2.0	~40	560	560
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	~4.0	~40	700	560	~150	~4.0	~55	560	560
		200	~3.0	~30	640	380	200	~3.0	~40	510	380
		300	~2.0	~20	570	230	300	~2.0	~32	450	230
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	~4.0	~1.0Dc	950	950	~150	~4.0	~1.0Dc	760	1,140
		200	~3.0	~40	830	660	200	~3.0	~55	660	830
		300	~2.0	~30	700	420	300	~2.0	~40	560	560

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		80					100				
		No. of teeth 6N					No. of teeth 7N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	~4.0	~80	600	1,260	~150	~4.0	~100	480	1,010
		200	~3.0	~65	520	940	200	~3.0	~80	410	720
		300	~2.0	~50	440	660	300	~2.0	~60	350	490
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~150	~4.0	~80	600	1,260	~150	~4.0	~100	480	1,010
		200	~3.0	~65	520	940	200	~3.0	~80	410	720
		300	~2.0	~50	440	660	300	~2.0	~60	350	490
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	~4.0	~80	600	1,080	~150	~4.0	~100	480	840
		200	~3.0	~65	520	780	200	~3.0	~80	410	570
		300	~2.0	~50	440	530	300	~2.0	~60	350	370
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	~4.0	~80	520	940	~150	~4.0	~100	410	720
		200	~3.0	~65	480	720	200	~3.0	~80	380	530
		300	~2.0	~50	440	530	300	~2.0	~60	350	370
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	~3.0	~80	440	660	~150	~3.0	~100	350	490
		200	~2.5	~65	400	480	200	~2.5	~80	320	340
		300	~1.5	~50	360	320	300	~1.5	~60	290	200
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~65	360	430	~150	~2.5	~80	290	300
		200	~2.0	~50	320	290	200	~2.0	~60	250	180
		300	~1.5	~35	280	170	300	~1.5	~40	220	150
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	~6.0	~80	720	1,510	~150	~6.0	~100	570	1,200
		200	~4.0	~65	600	1,080	200	~4.0	~80	480	840
		300	~2.0	~50	520	780	300	~2.0	~60	410	570
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	~4.0	~80	520	940	~150	~4.0	~100	410	720
		200	~3.0	~65	480	720	200	~3.0	~80	380	530
		300	~2.0	~50	440	530	300	~2.0	~60	350	370
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	~4.0	~65	440	530	~150	~4.0	~80	350	370
		200	~3.0	~50	400	360	200	~3.0	~60	320	220
		300	~2.0	~35	360	220	300	~2.0	~40	290	200
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	~4.0	~80	600	1,080	~150	~4.0	~100	480	840
		200	~3.0	~65	520	780	200	~3.0	~80	410	570
		300	~2.0	~50	440	530	300	~2.0	~60	350	370

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR FACE MILLING

● Facemill type

Work Materials	Insert Grades	Tool dia. (mm)									
		125					160				
		No. of teeth 8N					No. of teeth 9N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	~150	~4.0	~125	380	910	~150	~4.0	~160	300	810
		200	~3.0	~100	330	660	200	~3.0	~130	260	590
		300	~2.0	~75	280	450	300	~2.0	~95	220	400
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	~150	~4.0	~125	380	910	~150	~4.0	~160	300	810
		200	~3.0	~100	330	660	200	~3.0	~130	260	590
		300	~2.0	~75	280	450	300	~2.0	~95	220	400
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	~150	~4.0	~125	380	760	~150	~4.0	~160	300	680
		200	~3.0	~100	330	530	200	~3.0	~130	260	470
		300	~2.0	~75	280	340	300	~2.0	~95	220	300
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	~150	~4.0	~125	330	660	~150	~4.0	~160	260	590
		200	~3.0	~100	310	500	200	~3.0	~130	240	430
		300	~2.0	~75	280	340	300	~2.0	~95	220	300
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	~150	~3.0	~125	280	450	~150	~3.0	~160	220	400
		200	~2.5	~100	250	300	200	~2.5	~130	200	270
		300	~1.5	~75	230	180	300	~1.5	~95	180	160
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	~150	~2.5	~100	230	280	~150	~2.5	~130	180	240
		200	~2.0	~75	200	160	200	~2.0	~95	160	140
		300	~1.5	~50	180	140	300	~1.5	~60	140	130
Cast iron FC250 (GG25) 160-260HB	JC8118	~150	~6.0	~125	460	1,100	~150	~6.0	~160	360	970
		200	~4.0	~100	380	760	200	~4.0	~130	300	680
		300	~2.0	~75	330	530	300	~2.0	~95	260	470
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	~150	~4.0	~125	330	660	~150	~4.0	~160	260	590
		200	~3.0	~100	310	500	200	~3.0	~130	240	430
		300	~2.0	~75	280	340	300	~2.0	~95	220	300
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	~150	~4.0	~100	280	340	~150	~4.0	~130	220	300
		200	~3.0	~75	250	200	200	~3.0	~95	200	180
		300	~2.0	~50	230	180	300	~2.0	~60	180	160
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	~150	~4.0	~125	380	760	~150	~4.0	~160	300	680
		200	~3.0	~100	330	530	200	~3.0	~130	260	470
		300	~2.0	~75	280	340	300	~2.0	~95	220	300

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

■ 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 same 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.

High efficiency shoulder milling
For multi-functional machining.

Shoulder 6 Extreme series EXSIX TYPE

RECOMMENDED CUTTING CONDITIONS FOR PLUNGE MILLING

Facemill type

Work Materials	Insert Grades	Cutting speed Vc(m/min)	Feed speed per one insert fz(mm/t)	Radial depth of cut ae(mm)	Pick feed Pf(mm)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050	180	0.25	~5	~0.5Dc
Cast steel GM190, ICD5 (1.7225) Below 285HB	JC8050	160	0.25	~5	~0.5Dc
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8050	180	0.2	~5	~0.5Dc
Mold Steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8118	130	0.2	~5	~0.5Dc
Mold Steel NAK80,HPM1, P21 (1.2311, P21) 38-43HRC	JC8118	100	0.15	~5	~0.5Dc
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	JC8118	90	0.1	~5	~0.5Dc
Cast iron FC250 (GG25) 160-260HB	JC8118	200	0.3	~5	~0.5Dc
Nodular cast iron FCD700 (GGG70) 170-300HB	JC8118	130	0.2	~5	~0.5Dc
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	JC8050	110	0.15	~5	~0.5Dc
Stainless steel Ferritics / Martensitic (SUS304, 420J2, 430) 13Cr	JC8118	160	0.2	~5	~0.5Dc

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 same 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.

Heavy milling for flat surface & shape machining

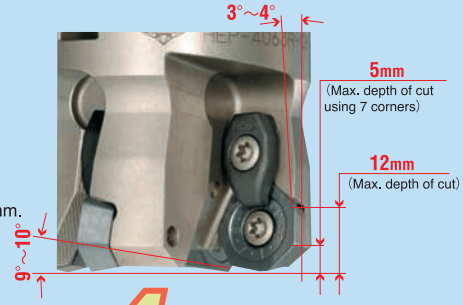
Hepta Mill HEP TYPE

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

Heptagon insert 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 D17 for "Insert set up installation point of double clamping mechanism type

6 Supports high hardness materials from cast iron and general steel

For general steel : JC7560, JC5040
For cast iron, hardened steel : JC8118, JC8015
For stainless steel & strong intermittent milling : JC7560, JC8050
For heat resistant alloys, Titanium alloys : JC8118, JC7550

7 Insert corner identification

Insert has corner identification No. on the top face.

HEPTA MILL

Hep type
HEP-FM type
(Face mill type)

HEPTA MILL with Heptagon insert

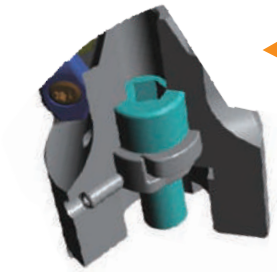
Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

SERIES EXPANSION

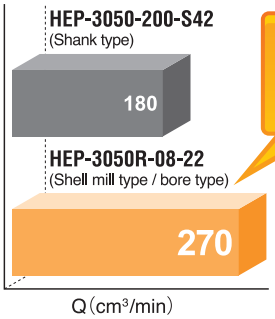
Addition of ϕ50 bore type milling cutter

It was added to the lineup. By adopting a unique mounting mechanism (patent pending), a new small diameter ϕ50 bore type milling cutter that can be used with conventional inserts has been added.



Since it is easily attached to the main arbor and is easily attached to a comm-ercially available L wrench (LW-080), an optional set bolt is built-in for the arbor inside the main body.

Chip emission comparison



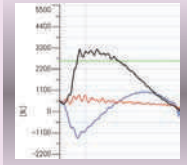
Chip emission compared to shank type **1.5 Times UP!**

Work material:
S53C (raw material)
Vc : 157m / min,
Vf : 1,800mm / min
ap : 5mm, ae : 30mm,
Overhung length: 87mm

Addition of insert with low resistance type breaker

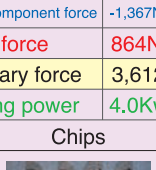
Cutting Conditions

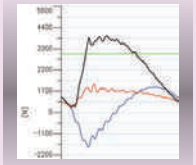
Work material : S50C
Tool diameter : ϕ50mm (HEP-3050R-08-22)
Vc = 125.7m/min, f = 2.4mm/rev (fz=0.8mm/t), ap = 2.5mm, ae = 28mm,
Overhung length : 170mm, Down cut



XDMT080620ZER-ML (low resistance type)

Main force	3,230N
Feed component force	-1,367N
Back force	864N
Auxiliary force	3,612N
Cutting power	4.0Kw
Chips	





XDMT080620ZER (conventional product)

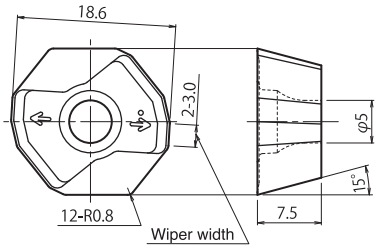
Main force	3,965N
Feed component force	-1,799N
Back force	1,469N
Auxiliary force	4,595N
Cutting power	4.9Kw
Chips	

21% reduction in resultant force

18% reduction cutting power

Addition of wiper blade (wiper insert)

Feed amount f (mm/rev) Exceeds 1.2 mm,
And finished surface roughness Rz = When seeking about 12.5 µm
Please use **XDMT080708ZER** Smooth blade
(refer to the following)



How to attach the blade

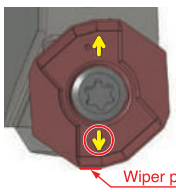
1. Determine the number of shaving blades to be mounted according to the feed amount f (mm / rev).

Feed amount f (mm / rev) = Machine feed rate Vf (mm / min) ÷ Rotation speed n (min⁻¹)

Feed amount f (mm / rev)	Number of shaving blades installed
1.2mm < f (mm / rev) ≤ 3mm	1
3mm < f (mm / rev) ≤ 6mm	2
6mm < f (mm / rev) ≤ 9mm	3
9mm < f (mm / rev) ≤ 12mm	4

Attach the shaving blade to the cutter body so that it is evenly divided with the front cutting blade as the cutting edge.

2. The standard cutting conditions are the same even if a shaving blade is used.



Smooth blade (XDMT080708ZER)
Precautions when using

- The shaving blade for heptamill is a type that uses 2 corners.
- As shown in the figure on the left, attach it so that the arrow comes to the front.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

CUTTING PERFORMANCE

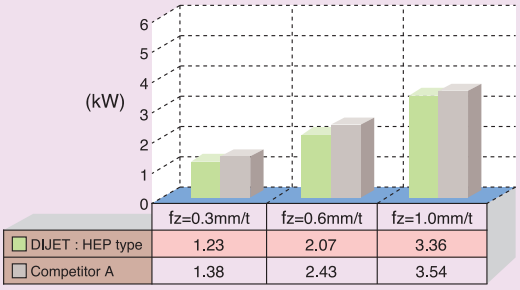
Cutting resistance comparison

Cutting conditions

Work material : S50C (201HB)
Tool diameter : ϕ63mm
Vc = 160m/min
fz=0.3, 0.6, 1.0mm/t
ap=3.0mm
ae=40mm

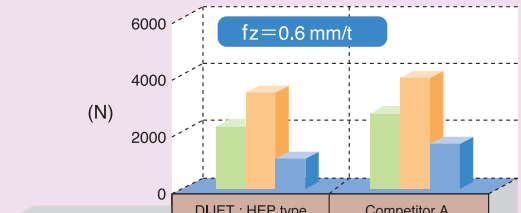
Overhung length : ℓ = 75mm
Down cut
Insert grade : JC5040

● Heptamill chips



	fz=0.3mm/t	fz=0.6mm/t	fz=1.0mm/t
DIJET : HEP type	1.23	2.07	3.36
Competitor A	1.38	2.43	3.54

Q=30cm³/kW



	DIJET : HEP type	Competitor A
X: Feed component	2,150	2,600
Y: Main force	3,350	3,850
Z: Back strength	1,050	1,600

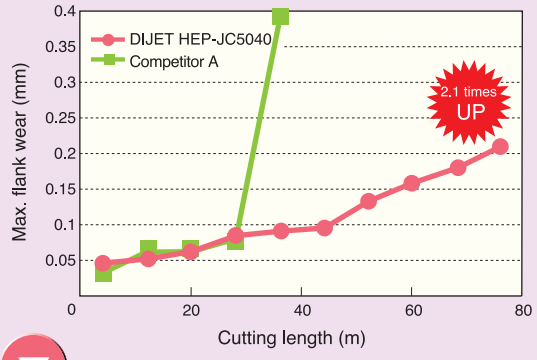
Cutting resistance reduced by 20% or more compared to other companies' products. Machining is possible with low cutting resistance even if the depth of cut is large.

Tool life comparison G-body VS Conventional body

Cutting conditions

Work material : S53C
n=800min⁻¹
Vc = 158m/min
Vf = 800mm/min
fz=1mm/t
ap=3mm
ae=40mm

Dry
Down cut



The machining life is 2.1 times longer than that of other competitor's products.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

CUTTING PERFORMANCE

Chip removal rate comparison

HEP type : HEP-4063R-08-22

Cutting conditions

Work material : S50C (201HB)
Tool diameter : ϕ63mm
n = 800min^{-1}
Vf = 3,200mm/min
ap=3mm
ae=40mm

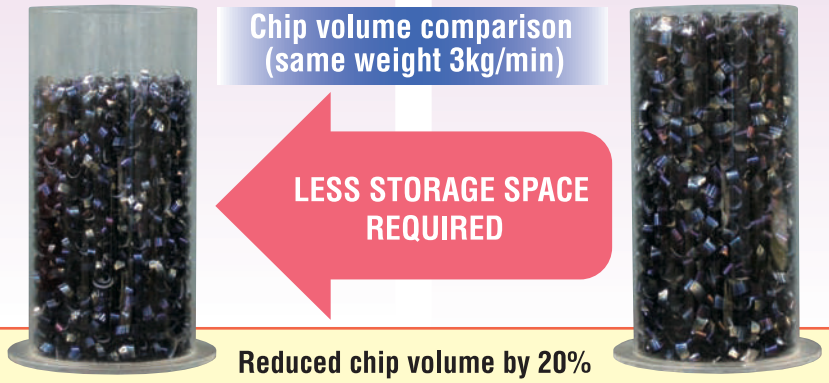
Q=384cm^3/min
Power load: 66%

High feed cutter

Cutting conditions

Work material : S50C (201HB)
Tool diameter : ϕ63mm
n = 800min^{-1}
Vf = 6,400mm/min
ap=1.5mm
ae=40mm

Q=384cm^3/min
Power load: 66%



Reduced chip volume by 20%

CUTTING PERFORMANCE

7 Corner usage confirmation

Cutting edge condition after each corner 60m machining

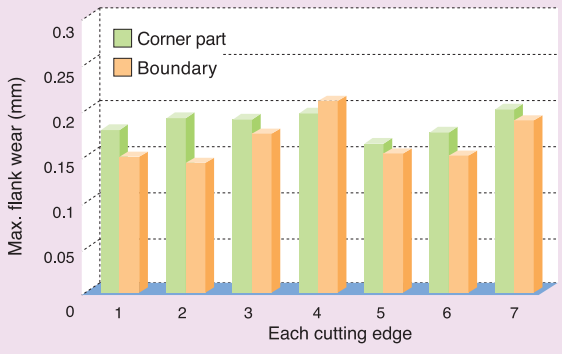
Cutting conditions

Work material : S53C
Tool diameter : ϕ63mm
(HEP-4063R-08-22)

n=800min^{-1}
Vc = 158m/min
fz=1mm/t

ap=3mm
ae=40mm

Dry, Down cut
Insert grade : JC5040



7 corner usage confirmation test comparison

※Tested with 1 blade

All 7 corners can be used with the same machining parameters. The maximum flank wear of each cutting edge is within 0.2 mm after 60 m machining.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

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

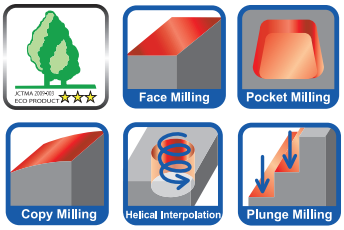


Fig. 1

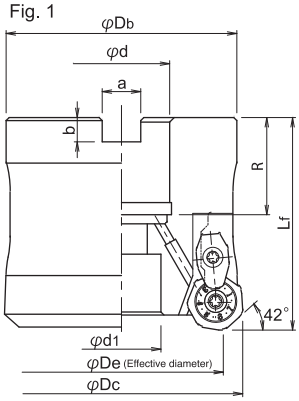


Fig. 2

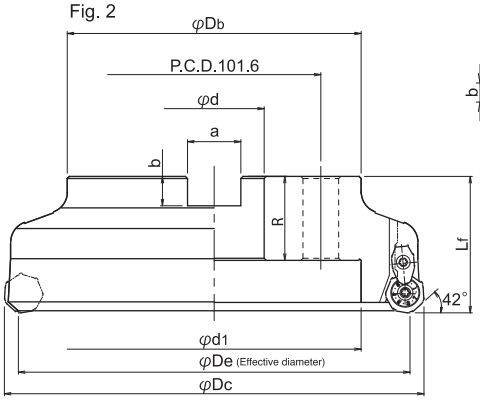
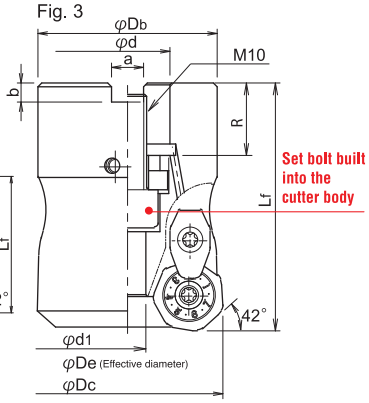


Fig. 3



■ BODY / FACE MILL TYPE

Type	Cat. No.	Stock	No.of flutes	Through coolant hole	Dimensions (mm) φDc	φDe (Effective Diameter)	Lf	φDb	φd	φd1	a	b	R	Head cap screw (JIS Standard) (JIS standard) Bolt with hexagon socket	weight (kg)	Fig.
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	Yes	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	M16×2×45★	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	No	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 E244 - E251 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.

■ How to use of corner change

Insert rotation direction

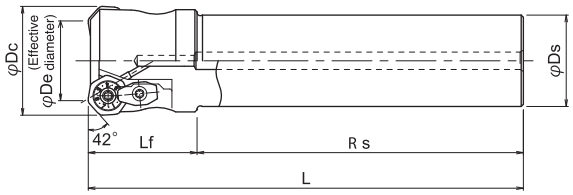
Recommend to rotate the insert counter-clockwise for corner change.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

G-Body

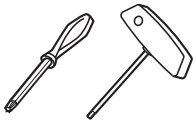


■ BODY / SHANK TYPE MILLING CUTTER

Type	Cat. No.	Stock	No.of flutes	Through coolant hole	Dimensions (mm) φDc	φDe (Effective diameter)	Lf	R s	L	φDs	MD	weight (kg)
Straight	**HEP-3050-200-S42**	●	3	Yes	50	36.7	50	150	200	42	–	2.3
Shank type	**HEP-3050-250-S42**	●	3		50	36.7	50	200	250	42	–	2.9

Note) 1. All cutters are supplied without inserts.
2. Please refer page E244 - E251 for recommended cutting conditions.
3. When using the double clamp mechanism type, be sure to refer to the insert mounting procedure. (See page D17)

■ PARTS

Clamp screw	Clamp set	Wrench (Not included)
Recommended torque 6.0N・m		
DSW-4512H	DCM-17	Bore type : A-20 (~φ125) A-20L (φ160,φ200) Shank type : A-20SD

■ Hexagonal bar wrench size for arbor set bolts

Screw size	Hex wrench size (mm)
M10	8
M12	10
M16	14
M20	17
M24	19

Note) Hexagonal bar wrench for arbor set bolt is not attached to the main body.

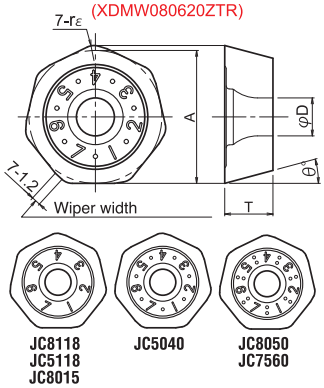
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

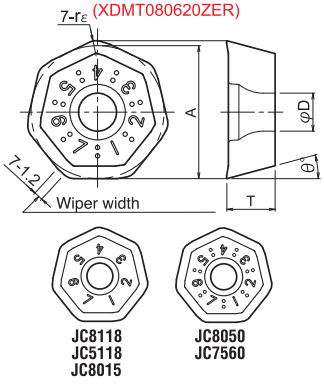
INSERTS

Fig.1 Without Chipbreaker (XDMW080620ZTR)



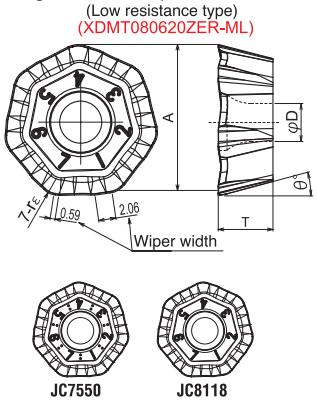
JC8118 JC5118 JC8015 | JC5040 | JC8050 JC7560

Fig.2 With Chipbreaker (XDMT080620ZER)



JC8118 JC5118 JC8015 | JC8050 JC7560

Fig.3 With Chipbreaker (Low resistance type) (XDMT080620ZER-ML)



JC7550 | JC8118

Fig.4 Without Chipbreaker (XDMW080635ZTR-S)

For processing rough cast iron surfaces
Ideal for measures against insert defects

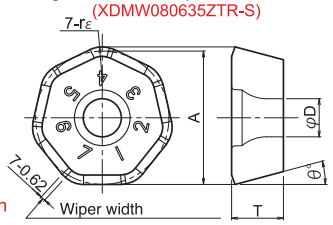
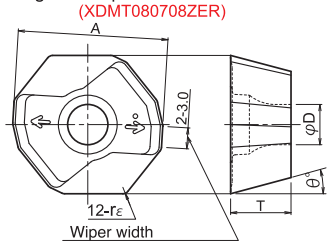


Fig.5 Scrap blade (XDMT080708ZER)



Please refer to the mounting method of the shaving blade. (B page 331)

Cat. No.	Tolerance	Dimensions (mm)					PVD coated						Fig.
		A	T	φD	rε	θ°	JC8015	JC5040	JC8118	JC7550	JC7560	JC8050	
XDMW080620ZTR	M	17.5	6.35	5	2	15	●	●	●		●	●	1
XDMW080635ZTR-S	M	17.5	6.35	5	3.5	15	●						4
XDMT080620ZER	M	17.5	6.35	5	2	15	●		●		●	●	2
XDMT080620ZER-ML	M	17.341	6.5	5	2	15			●	●			3
XDMT080708ZER (Wiper Insert)	M	18.6	7.5	5	0.8	15	●						5

10 inserts per case

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

■ RECOMMENDED CUTTING CONDITIONS General Use

Work Materials	Inserts	Insert Grades	Tool dia. (mm)									
			50					63				
			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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~35	900	2,200	100	4	~42	700	2,300
			150	3.5	~35	800	1,700	150	3.5	~42	650	1,800
			200	3	~35	700	1,300	200	3	~42	600	1,500
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~35	900	1,900	100	3	~42	700	2,000
			150	2.5	~35	800	1,400	150	2.5	~42	650	1,600
			200	2.5	~35	700	1,050	200	2.5	~42	600	1,200
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~35	900	1,900	100	3	~42	700	2,000
			150	2.5	~35	800	1,400	150	2.5	~42	650	1,600
			200	2.5	~35	700	1,050	200	2.5	~42	600	1,200
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~35	650	1,400	100	3	~42	500	1,400
			150	2.5	~35	600	1,100	150	2.5	~42	450	1,100
			200	2.5	~35	500	750	200	2.5	~42	400	700
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~25	450	550	100	2	~30	450	700
			150	1.5	~25	400	450	150	1.5	~30	400	600
			200	1.5	~25	350	320	200	1.5	~30	300	350
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~35	900	2,700	100	5	~42	700	2,800
			150	4	~35	800	2,400	150	4	~42	600	2,400
			200	3.5	~35	700	1,800	200	3.5	~42	550	2,000
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~35	750	1,800	100	4	~42	600	2,000
			150	3	~35	680	1,350	150	3	~42	550	1,450
			200	2.5	~35	600	1,000	200	2.5	~42	500	1,150
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~35	800	1,200	100	4	~42	650	1,200
			150	3.5	~35	700	1,000	150	3.5	~42	600	1,000
			200	3	~35	600	700	200	3	~42	500	800
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~30	380	250	100	3	~38	300	250
			150	2.5	~30	320	150	150	2.5	~38	250	150
			200	2.5	~30	250	120	200	2.5	~38	200	120
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~25	200	120	100	2	~30	150	120
			150	1.5	~25	160	80	150	1.5	~30	120	80
			200	1.5	~25	120	60	200	1.5	~30	100	60

ℓ : Overhung length, ap : 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.
   (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

RECOMMENDED CUTTING CONDITIONS General Use

Work Materials	Inserts	Insert Grades	Tool dia. (mm)									
			80					100				
			No. of teeth 5N					No. of teeth 6N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~55	550	2,200	100	4	~70	450	2,200
			150	4	~55	500	1,800	150	4	~70	400	1,700
			200	3.5	~55	450	1,400	200	3.5	~70	350	1,300
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~55	550	2,000	100	3	~70	450	1,900
			150	3	~55	500	1,500	150	3	~70	400	1,500
			200	2.5	~55	450	1,100	200	2.5	~70	350	1,100
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~55	550	2,000	100	3	~70	450	1,900
			150	3	~55	500	1,500	150	3	~70	400	1,500
			200	2.5	~55	450	1,100	200	2.5	~70	350	1,100
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~55	400	1,300	100	3	~70	350	1,500
			150	3	~55	350	1,050	150	3	~70	300	1,200
			200	2.5	~55	300	800	200	2.5	~70	250	800
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~40	350	700	100	2	~50	250	600
			150	2	~40	300	600	150	2	~50	200	500
			200	1.5	~40	250	400	200	1.5	~50	160	400
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~55	550	2,750	100	5	~70	450	2,700
			150	5	~55	500	2,400	150	5	~70	400	2,400
			200	4	~55	450	1,800	200	4	~70	350	2,000
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~55	450	1,750	100	4	~70	380	1,800
			150	4	~55	400	1,350	150	4	~70	350	1,350
			200	3	~55	380	1,000	200	3	~70	300	1,150
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~55	500	1,200	100	4	~70	400	1,100
			150	4	~55	450	900	150	4	~70	350	1,000
			200	3.5	~55	400	800	200	3.5	~70	300	700
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~50	240	240	100	3	~60	200	240
			150	3	~50	200	150	150	3	~60	160	150
			200	2.5	~50	160	120	200	2.5	~60	130	120
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~40	120	120	100	2	~50	100	120
			150	2	~40	100	75	150	2	~50	80	70
			200	1.5	~40	80	60	200	1.5	~50	70	60

ℓ : Overhung length, ap : 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. (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

■ RECOMMENDED CUTTING CONDITIONS General Use

Work Materials	Inserts	Insert Grades	Tool dia. (mm)									
			125					160				
			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	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~90	350	2,000	100	4	~120	300	1,900
			150	4	~90	320	1,600	150	4	~120	260	1,500
			200	4	~90	300	1,300	200	4	~120	220	1,100
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~90	350	1,700	100	3	~120	300	1,700
			150	3	~90	320	1,350	150	3	~120	260	1,250
			200	3	~90	300	1,050	200	3	~120	220	900
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~90	350	1,700	100	3	~120	300	1,700
			150	3	~90	320	1,350	150	3	~120	260	1,250
			200	3	~90	300	1,050	200	3	~120	220	900
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~90	300	1,500	100	3	~120	250	1,400
			150	3	~90	250	1,100	150	3	~120	200	1,000
			200	3	~90	200	750	200	3	~120	150	600
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~60	200	550	100	2	~80	170	550
			150	2	~60	150	400	150	2	~80	150	500
			200	2	~60	125	260	200	2	~80	120	300
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~90	350	2,450	100	5	~120	300	2,250
			150	5	~90	320	2,200	150	5	~120	260	2,100
			200	5	~90	280	1,800	200	5	~120	220	1,700
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~90	300	1,700	100	4	~120	250	1,500
			150	4	~90	270	1,250	150	4	~120	220	1,200
			200	3	~90	250	1,000	200	4	~120	180	950
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER XDMT080620ZER [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~90	300	1,000	100	4	~120	240	900
			150	4	~90	250	800	150	4	~120	200	750
			200	3	~90	220	650	200	3	~120	180	600
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~75	160	220	100	3	~100	120	200
			150	3	~75	130	140	150	3	~100	100	120
			200	3	~75	100	100	200	3	~100	80	100
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~60	80	120	100	2	~80	60	100
			150	2	~60	65	70	150	2	~80	50	60
			200	2	~60	50	50	200	2	~80	40	50

ℓ : Overhung length, ap : 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.
   (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

RECOMMENDED CUTTING CONDITIONS General Use

Work Materials	Inserts	Insert Grades	Tool dia. (mm) 200 No. of teeth 5N									
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER XDMW080620ZTR XDMW080620ZTR	JC7560 (JC5040) [JC7560]	100	4	~150	220	1,600					
			150	4	~150	200	1,300					
			200	4	~150	180	1,000					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER XDMW080620ZTR [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~150	220	1,400					
			150	3	~150	200	1,100					
			200	3	~150	180	800					
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~150	220	1,400					
			150	3	~150	200	1,100					
			200	3	~150	180	800					
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~150	200	1,100					
			150	3	~150	170	1,000					
			200	3	~150	130	600					
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~100	140	500					
			150	2	~100	120	450					
			200	2	~100	100	280					
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~150	220	2,000					
			150	5	~150	200	1,800					
			200	5	~150	180	1,400					
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~150	180	1,350					
			150	4	~150	170	1,000					
			200	3	~150	150	800					
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~150	200	800					
			150	4	~150	160	650					
			200	3	~150	140	550					
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~120	100	180					
			150	3	~120	80	110					
			200	3	~120	60	80					
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~100	50	90					
			150	2	~100	40	60					
			200	2	~100	30	40					

ℓ : Overhung length, ap : 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. (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

RECOMMENDED CUTTING CONDITIONS Interrupted Cutting

Work Materials	Inserts	Insert Grades	Tool dia. (mm)									
			50					63				
			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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~35	750	1,800	100	4	~42	600	1,950
			150	3.5	~35	680	1,450	150	3.5	~42	550	1,500
			200	3	~35	600	1,100	200	3	~42	500	1,300
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~35	750	1,600	100	3	~42	600	1,700
			150	2.5	~35	680	1,200	150	2.5	~42	550	1,350
			200	2.5	~35	600	900	200	2.5	~42	500	1,000
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~35	750	1,600	100	3	~42	600	1,700
			150	2.5	~35	680	1,200	150	2.5	~42	550	1,350
			200	2.5	~35	600	900	200	2.5	~42	500	1,000
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~35	550	1,100	100	3	~42	450	1,250
			150	2.5	~35	500	900	150	2.5	~42	400	1,000
			200	2.5	~35	400	600	200	2.5	~42	350	700
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~25	450	450	100	2	~30	450	550
			150	1.5	~25	400	350	150	1.5	~30	400	500
			200	1.5	~25	350	250	200	1.5	~30	300	300
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~35	750	2,250	100	5	~42	600	2,400
			150	4	~35	680	2,000	150	4	~42	550	2,200
			200	3.5	~35	600	1,500	200	3.5	~42	500	1,700
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~35	650	1,400	100	4	~42	550	1,500
			150	3	~35	600	1,100	150	3	~42	500	1,200
			200	2.5	~35	500	750	200	2.5	~42	400	800
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~35	650	1,000	100	4	~42	500	1,000
			150	3.5	~35	550	800	150	3.5	~42	450	800
			200	3	~35	500	550	200	3	~42	400	650
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~30	300	200	100	3	~38	240	200
			150	2.5	~30	250	120	150	2.5	~38	200	120
			200	2.5	~30	200	100	200	2.5	~38	160	100
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~25	160	100	100	2	~30	120	100
			150	1.5	~25	130	65	150	1.5	~30	100	65
			200	1.5	~25	100	50	200	1.5	~30	80	50

ℓ : Overhung length, ap : 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.
   (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

■ RECOMMENDED CUTTING CONDITIONS Interrupted Cutting

Work Materials	Inserts	Insert Grades	Tool dia. (mm)									
			80					100				
			No. of teeth 5N					No. of teeth 6N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~55	450	1,800	100	4	~70	380	1,800
			150	4	~55	400	1,500	150	4	~70	350	1,400
			200	3.5	~55	380	1,200	200	3.5	~70	300	1,100
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~55	450	1,700	100	3	~70	380	1,600
			150	3	~55	400	1,250	150	3	~70	350	1,250
			200	2.5	~55	380	900	200	2.5	~70	300	900
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~55	450	1,700	100	3	~70	380	1,600
			150	3	~55	400	1,250	150	3	~70	350	1,250
			200	2.5	~55	380	900	200	2.5	~70	300	900
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~55	350	1,150	100	3	~70	300	1,200
			150	3	~55	300	900	150	3	~70	250	900
			200	2.5	~55	250	700	200	2.5	~70	200	550
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~40	350	550	100	2	~50	250	500
			150	2	~40	300	500	150	2	~50	200	400
			200	1.5	~40	250	320	200	1.5	~50	160	320
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~55	450	2,250	100	5	~70	380	2,250
			150	5	~55	400	1,900	150	5	~70	350	2,000
			200	4	~55	380	1,500	200	4	~70	300	1,700
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~55	400	1,350	100	4	~70	330	1,200
			150	4	~55	350	1,100	150	4	~70	300	900
			200	3	~55	300	800	200	3	~70	250	750
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~55	400	1,000	100	4	~70	300	900
			150	4	~55	350	700	150	4	~70	300	800
			200	3.5	~55	300	650	200	3.5	~70	250	600
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~50	200	200	100	3	~60	160	200
			150	3	~50	160	120	150	3	~60	130	120
			200	2.5	~50	130	100	200	2.5	~60	100	100
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~40	100	100	100	2	~50	80	100
			150	2	~40	80	60	150	2	~50	65	60
			200	1.5	~40	65	50	200	1.5	~50	60	50

ℓ : Overhung length, ap : 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.
   (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

■ RECOMMENDED CUTTING CONDITIONS Interrupted Cutting

Work Materials	Inserts	Insert Grades	Tool dia. (mm)									
			125					160				
			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	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~90	300	1,700	100	4	~120	250	1,600
			150	4	~90	270	1,400	150	4	~120	220	1,200
			200	4	~90	250	1,100	200	4	~120	180	900
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~90	300	1,400	100	3	~120	250	1,400
			150	3	~90	270	1,100	150	3	~120	220	1,000
			200	3	~90	250	900	200	3	~120	180	750
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~90	300	1,400	100	3	~120	250	1,400
			150	3	~90	270	1,100	150	3	~120	220	1,000
			200	3	~90	250	900	200	3	~120	180	750
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~90	250	1,150	100	3	~120	200	1,100
			150	3	~90	200	800	150	3	~120	150	800
			200	3	~90	150	550	200	3	~120	120	550
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~60	200	450	100	2	~80	170	450
			150	2	~60	150	320	150	2	~80	150	400
			200	2	~60	125	200	200	2	~80	120	250
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~90	300	2,100	100	5	~120	250	2,000
			150	5	~90	270	1,850	150	5	~120	220	1,750
			200	5	~90	250	1,500	200	5	~120	180	1,450
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~90	250	1,100	100	4	~120	200	1,000
			150	4	~90	230	850	150	4	~120	170	800
			200	3	~90	200	700	200	4	~120	150	600
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~90	250	800	100	4	~120	200	700
			150	4	~90	200	650	150	4	~120	160	600
			200	3	~90	180	500	200	3	~120	150	500
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~75	130	180	100	3	~100	100	160
			150	3	~75	100	110	150	3	~100	80	100
			200	3	~75	80	80	200	3	~100	65	80
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~60	65	100	100	2	~80	50	80
			150	2	~60	50	60	150	2	~80	40	50
			200	2	~60	40	40	200	2	~80	30	40

ℓ : Overhung length, ap : 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.
   (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.

Heavy milling for flat surface & shape machining

Hepta Mill HEP TYPE

RECOMMENDED CUTTING CONDITIONS Interrupted Cutting

Work Materials	Inserts	Insert Grades	Tool dia. (mm) 200 No. of teeth 9N									
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	4	~150	180	1,300					
			150	4	~150	170	1,100					
			200	4	~150	150	850					
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	XDMT080620ZER (XDMW080620ZTR) [XDMW080620ZTR]	JC7560 (JC5040) [JC7560]	100	3	~150	180	1,200					
			150	3	~150	170	900					
			200	3	~150	150	700					
Mold steel HPM7, PX5, KPM30 (1.2311, P20) 30-36HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC7560) [JC5040]	100	3	~150	180	1,200					
			150	3	~150	170	900					
			200	3	~150	150	700					
Mold steel NAK80, HPM1 (1.2311, P21) 38-43HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	3	~150	170	1,000					
			150	3	~150	150	800					
			200	3	~150	100	500					
Hardened steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	XDMT080620ZER (XDMT080620ZER) [XDMW080620ZTR]	JC8118 (JC8015) [JC8118]	100	2	~100	140	400					
			150	2	~100	120	350					
			200	2	~100	100	220					
Grey cast iron FC250, FC300 (GG25, GG30) Hardness 160-260HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	5	~150	180	1,600					
			150	5	~150	170	1,500					
			200	5	~150	150	1,200					
Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Hardness 170-300HB	XDMW080620ZTR (XDMW080620ZTR) [XDMW080620ZTR-S]	JC8015 (JC8118) [JC8015]	100	4	~150	160	900					
			150	4	~150	140	700					
			200	3	~150	120	500					
Stainless steel Austenitic stainless steel SUS304 17 Cr system	XDMT080620ZER (XDMT080620ZER) [XDMT080620ZER-ML]	JC8050 (JC7560) [JC7550]	100	4	~150	160	650					
			150	4	~150	130	500					
			200	3	~150	110	450					
Titanium alloy (Ti-6Al-4V) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC7550 (JC5040) [JC8118]	100	3	~120	80	150					
			150	3	~120	65	90					
			200	3	~120	50	65					
Heat resistant alloy (INCO718) Hardness 35-43 HRC	XDMT080620ZER-ML (XDMT080620ZER) [XDMT080620ZER]	JC8118 (JC8118) [JC8015]	100	2	~100	40	70					
			150	2	~100	30	50					
			200	2	~100	25	30					

ℓ : Overhung length, ap : 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. (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.

High efficiency for flat surface milling

Nega Hepta NHP TYPE

Face Milling

Pocket Milling

Ideal for high-efficiency machining of cast iron, general steel, and stainless steel

Multi-insert front milling cutter

14 Cutting Edges Insert

Shell type φ63～φ400

※ - Partly make to order

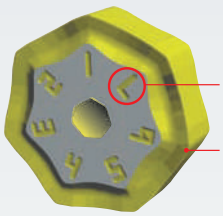
High efficiency machining with multiple inserts

High efficiency for flat surface milling

Nega Hepta NHP TYPE

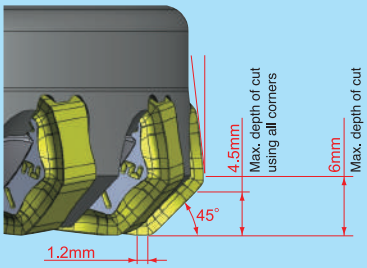
FEATURES

Economical cutter with multi corner insert



The identification number of the insert corner is displayed on both sides.

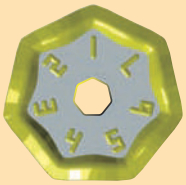
14 corners can be used Heptagon due to double-sided type (Can be used for both left and right)



- 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.

Mulitple insert variations

Added low resistance insert



Cast iron insert
XNMU080610AEN
(Grade: DH111)

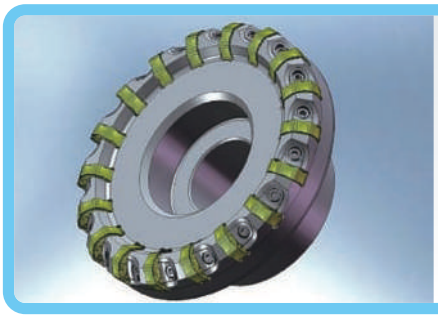
Cast iron steel insert (low resistance type)
XNMU080610AEN-KL
(Grade: JC5118, JC8050)

Steel insert
XNMU080610AER-PM
(Grade: JC5118, JC8050)

Cleaner blade (wiper insert)
XNHU0806AEN-W
(Grade: JC8003)

- In addition to the conventional cast iron inserts, two types of steel inserts and a wiper blade are available. Suitable for a wide range of applications from cast iron, general steel to stainless steel.
- Low resistance -KL type reduces cutting resistance at low depth of cut by 18% compared to the conventional product (-AEN type) (during cast iron machining).

Two types of insert grades are used: the versatile PVD coating <JC5118>, which has improved fracture resistance like the -PM type, and <JC8050>, which has excellent fracture resistance and is used for strong intermittent cutting!

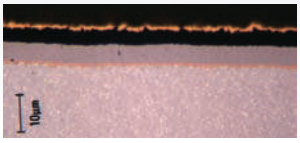


Wide range of cutter body

- Regular type for low power consumption.
- Ultra fine pitch type for high efficient machining.
- From dia. 63mm to 400mm

CVD coating grade (JC608X or DH111)

CVD coating grade for cast iron strong intermittent milling. Alumina layer (α type), which is thicker than conventional products and stable at high temperatures, is used as a coating film on a special base material that has a good balance between wear resistance and fracture resistance, improving wear resistance.
In addition, the residual stress of the CVD film is removed and a special surface treatment is applied to improve the peel resistance of the coating. Along with that, the fracture resistance is further improved.

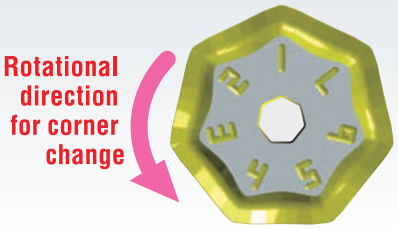


JC608X Area of application	Finishing / light milling		Medium milling	Rough milling
	K01	K10	K20	K30
		JC608X		

High efficiency for flat surface milling

Nega Hepta NHP TYPE

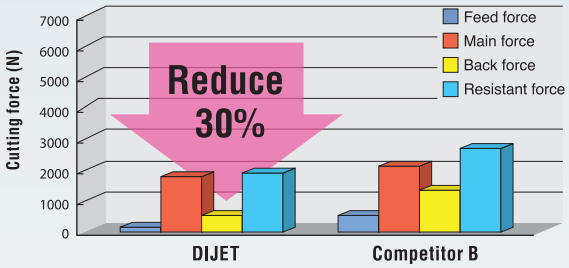
HOW TO USE OF CORNER CHANGE



Recommend to rotate the insert counter-clockwise for corner change

CUTTING PERFORMANCE

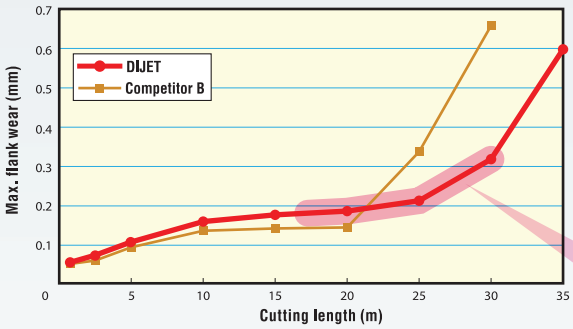
Cutting Force Comparison



φ125, 18 inserts

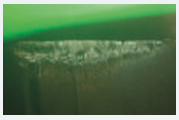
Material：FC300
Cutting conditions：
Vc=200m/min
fz=0.5mm/t
ap=3mm
ae=80mm
Overhung length：=138mm
Down cut, Dry

Tool Life Comparison



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

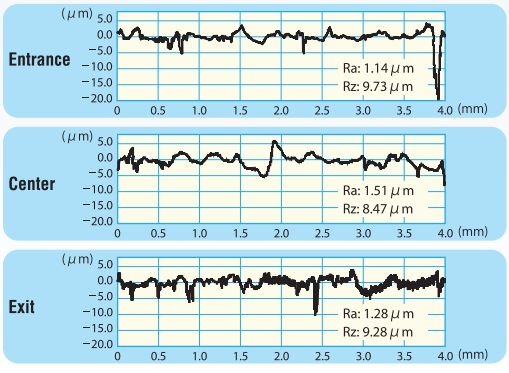
DIJET : 30m



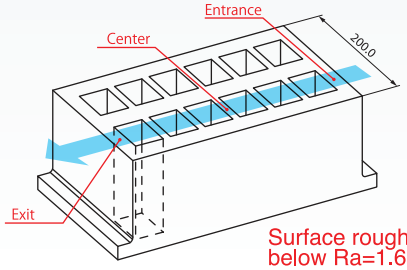
Competitor B : 30m

Inserts got wornout gradually

Surface Roughness



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



Surface roughness : below Ra=1.6μm !

High efficiency for flat surface milling

Nega Hepta NHP TYPE

■ PRECAUTIONS TO USE

⚠ 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 downward ② (Refer Fig. 1)

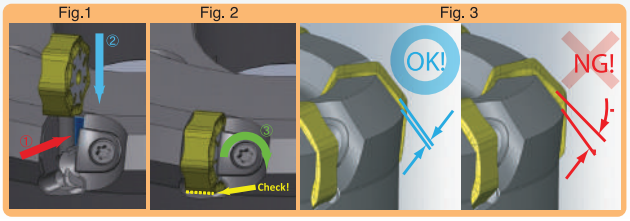
3 Tightening wedge screw

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

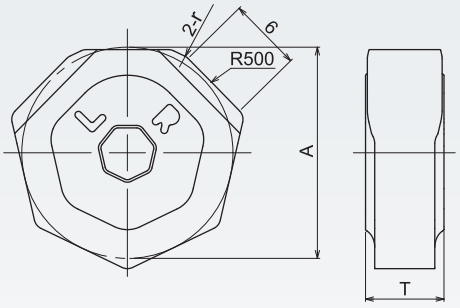
Confirm the insert edge is parallel to insert pocket edge. (Refer Fig.3)

Fig.1 Fig. 2 Fig. 3



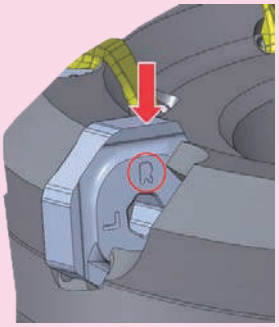
■ ADDITION OF WIPER BLADE (WIPER INSERT)

Use the ε wiper blade (XNHU0806AEN-W). When the feed amount f (mm / rev) exceeds 1.2 mm and the finished surface roughness Rz = 12.5 µm is required.



⚠ How to attach the shaving blade and precautions for use

1. The Negative Hepta blade (XNHU type) uses a double-sided 2-corner type. As shown in the figure on the right, when using the right blade, attach it so that the "R" cutting edge is in front of you.
2. It is recommended that the feed amount f (mm / rev) per rotation does not exceed the wiper width of 6 mm.



High efficiency for flat surface milling

Nega Hepta NHP TYPE

Face Milling Pocket Milling

Fig.1

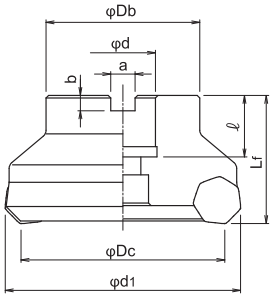
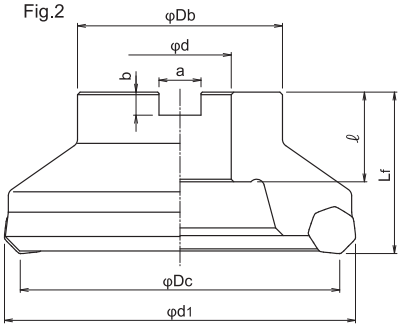


Fig.2



■ BODY / ULTRA FINE PITCH TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Weight (kg)	Fig.
	NHP-8063R-08-22	※	8	**63**	50	60	22	75.4	10.4	6.3	20	1.1	1
	NHP-10080R-08-27	※	10	**80**	50	60	27	92.4	12.4	7	22	1.5	1
	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
Metric Bore	**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
	NHP-44315R-08-60	※	44	**315**	63	250	60	327.4	25.4	14.3	40	22.0	3
	NHP-50355R-08-60	※	50	**355**	63	250	60	367.4	25.4	14.3	40	26.4	5
	NHP-58400R-08-60	※	58	**400**	63	250	60	412.4	25.4	14.3	40	34.0	5

Note) 1. All cutters are supplied without inserts.
2. Refer page E259 for recommended cutting conditions.

High efficiency for flat surface milling

Nega Hepta NHP TYPE

Fig.3

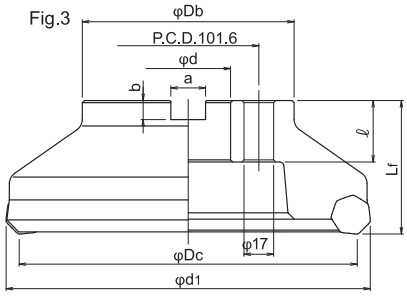


Fig.4

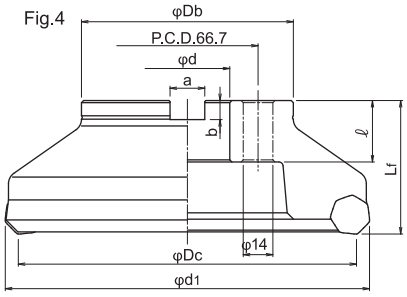
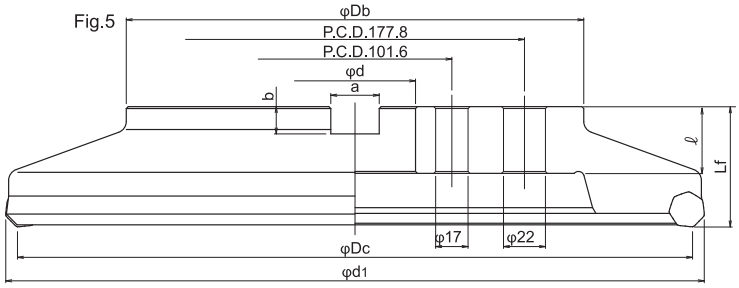


Fig.5



BODY / REGULAR TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Weight (kg)	Fig.
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
	NHP-12200R-08-60	※	12	200	63	140	60	212.4	25.4	14.3	40	7.2	3
	NHP-16250R-08-60	※	16	250	63	160	60	262.4	25.4	14.3	40	12.3	3
	NHP-20315R-08-60	※	20	315	63	250	60	327.4	25.4	14.3	40	21.3	3
	NHP-24355R-08-60	※	24	355	63	250	60	367.4	25.4	14.3	40	25.7	5
	NHP-28400R-08-60	※	28	400	63	250	60	412.4	25.4	14.3	40	33.2	5

Note) 1. All cutters are supplied without inserts. 2. Refer page E259 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 stocked ○: Soon to be deleted ※: Production after order received

High efficiency for flat surface milling

Nega Hepta NHP TYPE

INSERT

Fig.1 XNMU080610AEN (Grey Cast Iron)

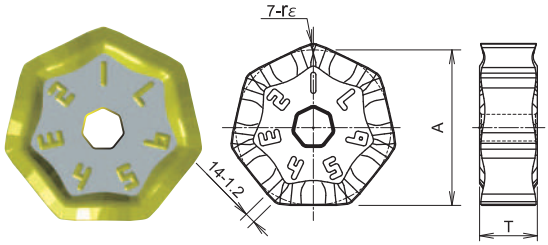


Fig.2 XNMU080610AEN-KL (Grey Cast Iron & Steel. Low cutting force)

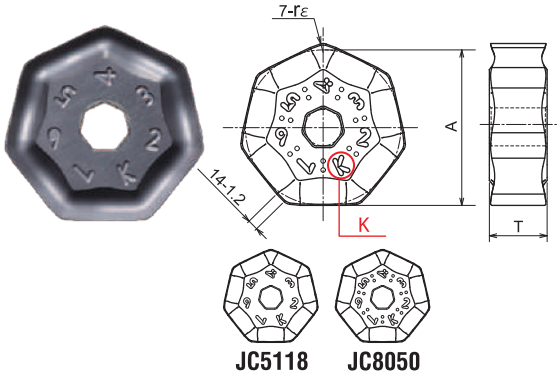


Fig.3 XNMU080610AER-PM (Carbon Steel)

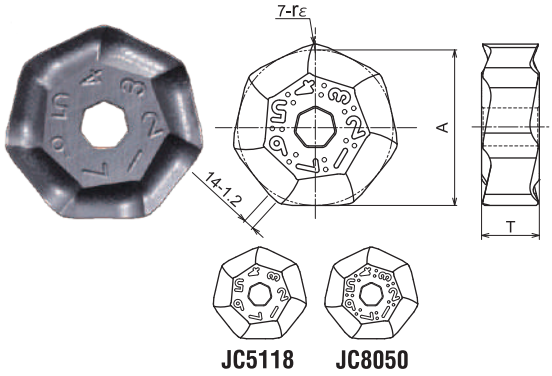
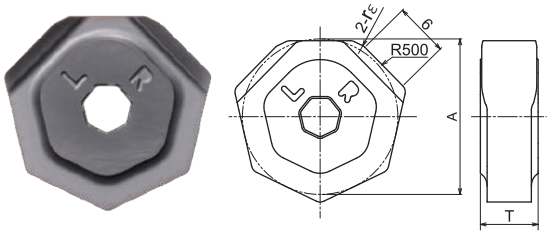


Fig.4 XNHU0806AEN-W (Wiper Edge)



Cat. No.	Tole-rance	Dimensions (mm)			CVD coated	PVD coated					Fig.
		A	T	rε	JC608X	DH111	JC5118	JC8050	DH103	JC8003	
XNMU080610AEN	M	17.5	6.5	1	●	●					1
XNMU080610AEN-KL	M	17.5	6.5	1			●	●			2
XNMU080610AER-PM	M	17.5	6.5	1			●	●			3
XNHU0806AEN-W	H	17.5	6.5	1					◎	○	4

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

High efficiency for flat surface milling

Nega Hepta NHP TYPE

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	Below 3.0	200 (150-250)	0.3 (0.1-1.0)	Vc>200 : JC608X (XNMU080610AEN) ※Vc<200 : JC5118 (XNMU080610AEN-KL)
	XNMU080610AEN-KL	3 - 6		0.3 (0.-0.5)	
Nodular cast iron FCD400 (GGG40) Below300HB	XNMU080610AEN	Below 3.0	150 (120-180)	0.2 (0.1-0.8)	Vc>150 : JC608X (XNMU080610AEN) ※Vc<150 : JC5118 (XNMU080610AEN-KL)
	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 Below250HB	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

Guidelines for selection of milling inserts

Cat. No.	XNMU080610 AEN	XNMU080610 AEN-KL		XNMU080610 AER-PM	
Insert / Work Material	JC608X / DH111	JC5118	JC8050	JC5118	JC8050
Grey cast iron FC300 (GG30) Below 300HB	High speed cutting Vc ≧200 ◎	Low speed cutting Vc ≦200 Less power ○			
Nodular cast iron FCD400 (GGG40) Below300HB	High speed cutting Vc ≧150 ◎	Low speed cutting Vc ≦150 Less power ○			
Carbon steel S50C, S55C (C50, C55) Below 250HB		○ ap≦2.5	Interrupted machining ap≦2.5	◎ 2.0 ≦ap≦3.5	Interrupted machining 2.0 ≦ap≦3.5
Tool & Die steel SKD61, SKD11 (1.2344, 1.2379) Below 250HB		○ ap≦2.5	Interrupted machining ap≦2.5	◎ 2.0 ≦ap≦3.5	Interrupted machining 2.0 ≦ap≦3.5
Mold steel NAK80, HPM1, P21 (1.2311, P21) 30-43HRC		○ ap≦2.5	Interrupted machining ap≦2.5		
Stainless steel SUS304 Below250HB			○ ap≦2.5		◎ 2.0 ≦ap≦3.0

High efficiency for flat surface milling

Nega Hepta NHP TYPE

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	8	10.8	5	6.8
80	10	13.5	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	12	16.2
250	36	48.6	16	21.6
315	44	59.4	20	27.0
355	50	67.5	24	32.4
400	58	78.3	28	37.8

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 :

$$Pc\ (kW) = (ae \times ap \times Vf) / \{1000 \times (Q/Pc')\}$$

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

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	3.2	5	6.8
80	6	3.9	6	8.1
100	8	5.2	8	10.8
125	8	5.2	8	10.8
160	10	6.5	10	13.5
200	12	7.8	12	16.2
250	16	10.3	16	21.6
315	20	12.9	20	27.0
355	24	15.5	24	32.4
400	28	18.0	28	37.8

Power consumption Pc was calculated as Q/Pc'=25 (cm^3/kW) from test data at below cutting condition.

Work Material : S50C
ap=3 (mm) fz=0.2 (mm/t)
ae=0.5Dc (mm) Vc=150 (m/min)

Power consumption calculating formula :

$$Pc\ (kW) = (ae \times ap \times Vf) / \{1000 \times (Q/Pc')\}$$

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

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

High efficient machining tool with edge sharpness and strength.

Increased insert strength

68% stronger than conventional Diemaster (DDM) ISO insert. In addition to conventional insert grades, Tough grade "JC8050" for unfavorable conditions and "JC8118" 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.

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.

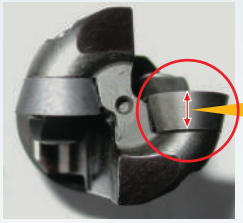
Insert strength comparison

	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

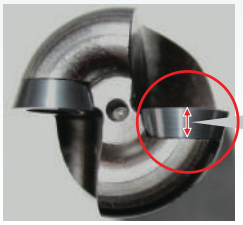
Super Diemaster



Insert thickness: 4.1

Body: SDH-2250-R10-M12
Insert: RDMW1004MOT

ISO Standard Insert



Insert thickness: 3.18

Body: MDH-2250-M12
Insert: RDHX1003MOT

For general & difficult-to-cut materials, flat surface & shape processing

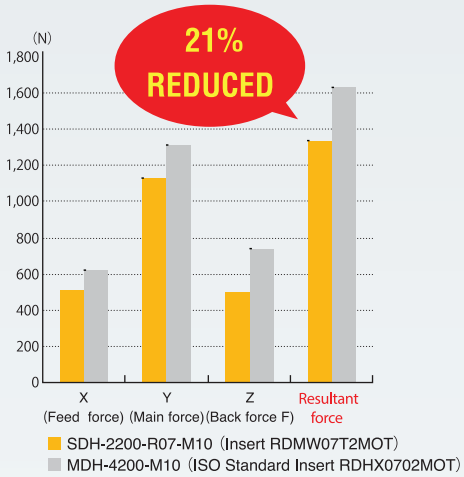
Super Diemaster HDM / SDH TYPE

CUTTING PERFORMANCE

Cutting force comparison

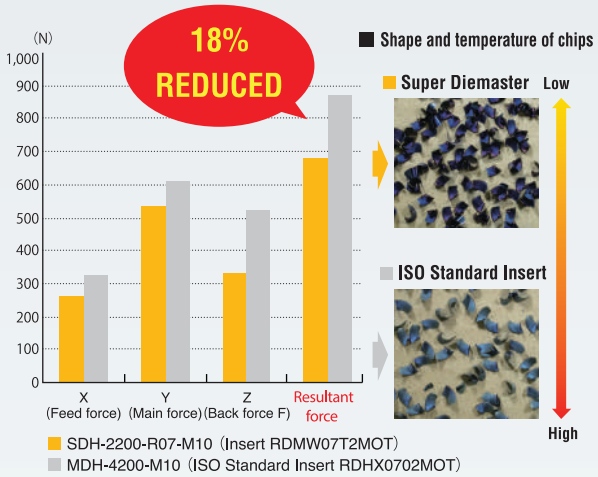
① General machining for hardened die steel

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



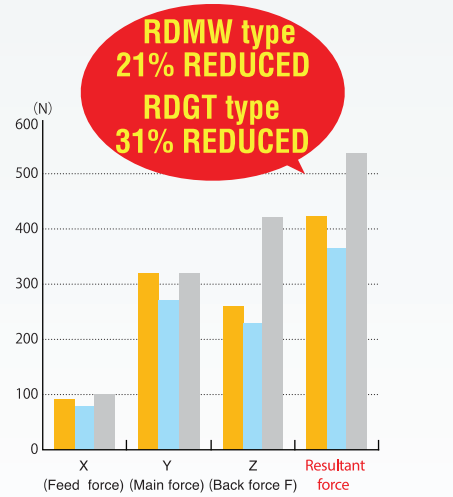
② General machining for die steel

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



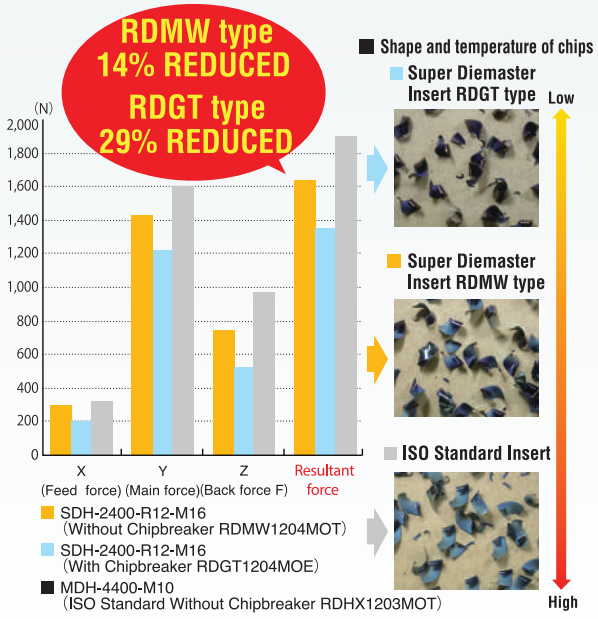
③ High feed machining for hardened die steel

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



④ General machining for die steel

Tool dia. : 40mm, Mat'l : SKD11 (1.2379) HS30
Vc=200m/min, fz=0.31mm/t, ap=1.5mm,
ae=16mm by down cut
Modular Head + MSN Carbide Shank



For general & difficult-to-cut materials, flat surface & shape processing

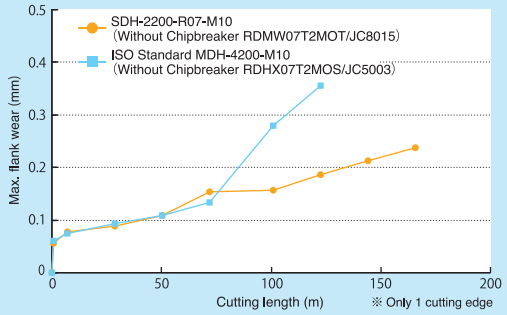
Super Diemaster HDM / SDH TYPE

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,
ap=0.2mm, ae=10mm (Air blow, Down cutting)
Modular Head+MSN Carbide Shank : MSN-M10-40-S20C

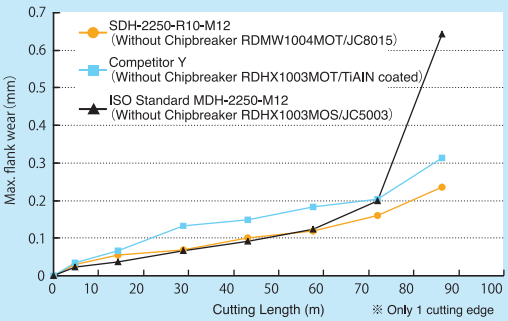


Condition of damaged inserts

	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,
ap=0.2mm, ae=15.5mm (Air blow, Down cutting)
Modular Head+MSN Carbide Shank : MSN-M12-55-S25C

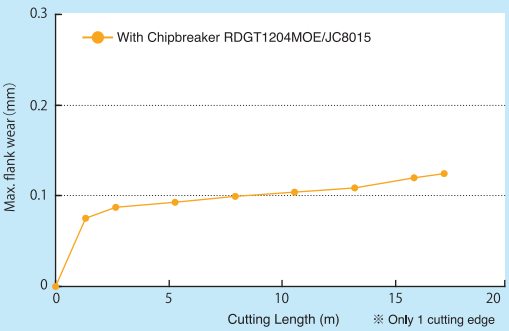


Condition of damaged inserts

	After 72m	After 86.2m
Super Diemaster RDMW1004MOT (JC8015) VB MAX (mm)	0.159	0.235
Competitor Y RDHX1003MOT (TiAlN 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,
ap=0.5mm, ae=12mm (Wet cutting, Down cutting)
Modular Head : SDH-2320-R12-M16+MSN Carbide Shank : MSN-M16-157S-S32C



Condition of damaged inserts

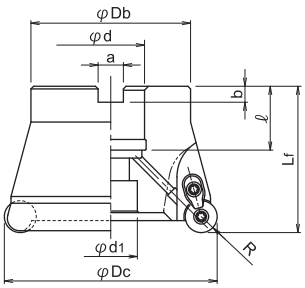
	After 1.32m	After 10.56m	After 17.16m
Super Diemaster RDGT1204MOE (JC8015) VB MAX (mm)	0.075	0.104	0.124

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM TYPE

G-Body Through Coolant Hole

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation



■ BODY / FACE MILL · STANDARD TYPE

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

Note) 1. All cutters are supplied without inserts.
2. Please refer page E272 - E274 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.

■ 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

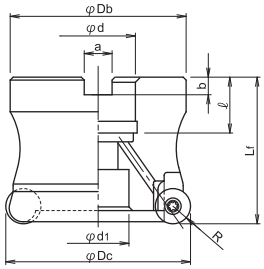
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

G-Body Through Coolant Hole

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation



■ BODY / FACE MILL・FINE PITCH TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf	φDb	φd	φd1	a	b	ℓ	Head cap screw (JIS Standard)	weight (kg)	Inserts
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 E275 - E278 for recommended cutting conditions.

■ 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

■ PARTS / FACE MILL・STANDARD TYPE

Inserts	Clamp Screw	Clamp Set	Wrench (Not included)
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 (Not included)
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

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head SDH TYPE

G-Body Standard Type

Through Coolant Hole

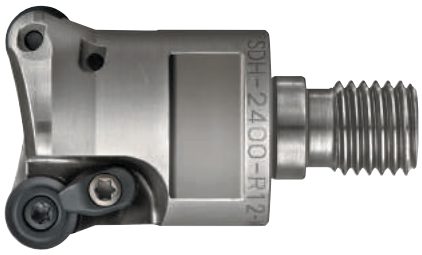


Fig. 1

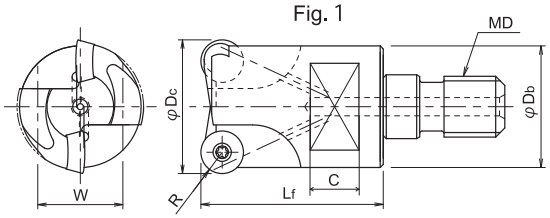
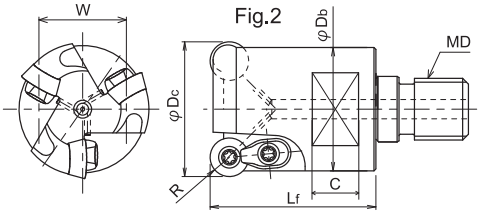


Fig.2



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Clamp Set	Parts: Wrench (Not included)	Fig.
SDH-2150-R07-M8	●	2	15	3.5	23	13.8	M8	8	12	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2160-R07-M8	●	2	16	3.5	23	15	M8	8	12	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2200-R07-M10	●	2	20	3.5	30	18	M10	8	14	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2220-R07-M10	●	2	22	3.5	30	20	M10	8	14	RD○○07T2MO...	TSW-2556H	–	A-08SD	1
SDH-2250-R10-M12	●	2	25	5	35	23	M12	10	17	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2280-R10-M12	●	2	28	5	35	25	M12	10	17	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2300-R10-M16	●	2	30	5	43	28	M16	12	22	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2320-R12-M16	●	2	32	6	43	28	M16	12	22	RD○○1204MO...	DSW-410H	DCM-18	A-15	2
SDH-3320-R10-M16	●	3	32	5	43	28	M16	12	22	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2350-R12-M16	●	2	35	6	43	32	M16	12	22	RD○○1204MO...	DSW-410H	DCM-18	A-15	2
SDH-3350-R10-M16	●	3	35	5	43	32	M16	12	22	RD○○1004MO...	CSW-408H	DCM-18	A-15	2
SDH-2400-R12-M16	●	2	40	6	43	32	M16	13	26	RD○○1204MO...	DSW-410H	DCM-18	A-15	2

Note) 1. Please refer page E279 - E287 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page D16 for recommended tightening torque.
4. In case of using double clamping mechanism type, please refer page D16 "Insert set up installation points of double clamping mechanism type"

Clamp Screw	Recommended Torque (N·m)
TSW-2556H	1.1
CSW-408H	3.6
DSW-410H	3.6

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

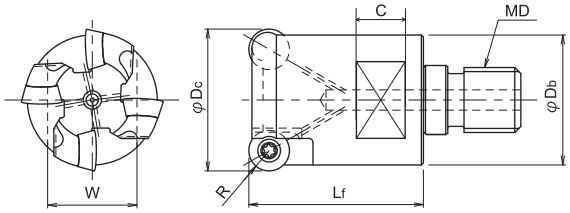
For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head SDH TYPE

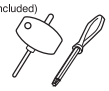
G-Body Fine pitch type

Through Coolant Hole

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench (Not included)
												
SDH-3200-R07-M10	●	3	20	3.5	30	18	M10	8	14	RD○○07T2MO...	TSW-2556H	A-08SD
SDH-3220-R07-M10	●	3	22	3.5	30	20	M10	8	14	RD○○07T2MO...	TSW-2556H	A-08SD
SDH-3250-R07-M12	●	3	25	3.5	35	23	M12	10	17	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-3280-R10-M12	●	3	28	5	35	25	M12	10	17	RD○○1004MO...	CSW-408H	A-15
SDH-3300-R10-M16	●	3	30	5	43	28	M16	12	22	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 E279 - E287 for recommended cutting conditions.
2. All cutters are supplied without inserts.
3. Please refer page D16 for recommended tightening torque.

Clamp Screw	Recommended Torque (N·m)
TSW-2556H	1.1
CSW-408H	3.6
DSW-410H	3.6

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

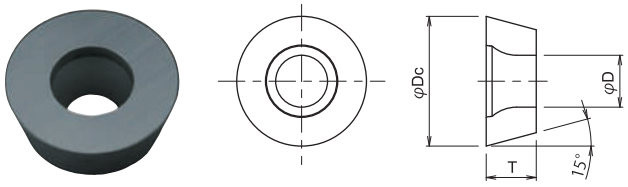
For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / 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
RDMW1606MOT	M	●	●	●	16	6	5

Note) JC8003 has been replaced by DH103

10 Inserts per case.

Low Cutting Force

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

With Chipbreaker
R-honed -MOE
Titanium・Inconel

Fig.1

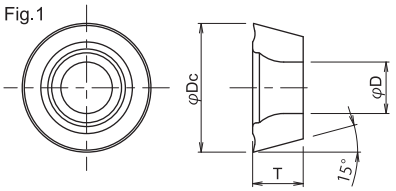
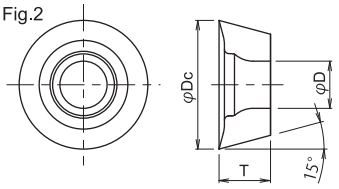


Fig.2



Cat. No.	Tolerance	PVD coated			Dimensions (mm)			Fig.
		JC8118	JC8015	JC8050	φDc	T	φD	
RDGT07T2MOE	G		●	●	7	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		●	●				
RDGT1606MOE	G		●	●	16	6	5	1
RDGT1606MOT	G		●	●				
RDMT07T2MOE	M	●	○	●	7	2.7	2.8	1
RDMT1004MOE	M	●	○	●				1
RDMT1004MOE-ML	M			●	10	4.1	4.4	2
RDMT1004MOT	M	●	○	●				1
RDMT1204MOE	M	●	○	●				1
RDMT1204MOE-ML	M			●	12	4.8	4.4	2
RDMT1204MOT	M	●	○	●				1
RDMT1606MOE	M	●	○	●	16	6	5	1
RDMT1606MOT	M	●	○	●				

Note) JC5118 has been replaced by JC8118.

10 Inserts per case.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

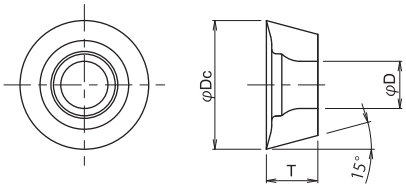
For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

INSERTS

Low Cutting Force

With 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
RDGT1606MOF-AL	G	●	16	6	5

Note) In case of chip clogging remove the clamp set. (DCM-18) (Only in the case of Aluminium Machining) 10 Inserts per case.

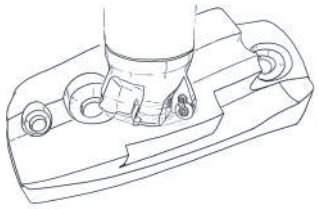
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

CASE STUDIES

1. Forged carbon steel.

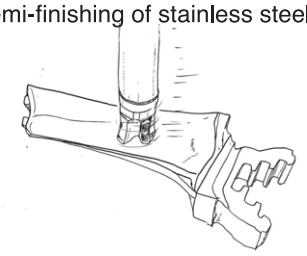


Result

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.

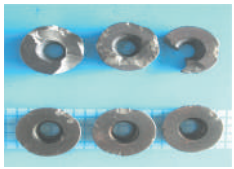


Result

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

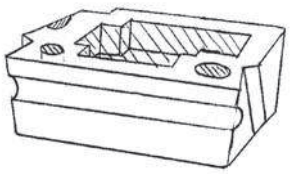
Super Diemaster
Insert thickness
6.0mm

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
	Hardness	62HRC
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.

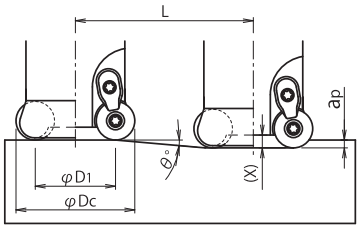
Work	Part name	Die Casting Mold
	Material	SKT 4
	Hardness	36～42 HRC
Tool	Tool No.	HDM-4080-12R
	Insert No.	RDMW1204MOT (JC8015)
Cutting conditions	Cutting Speed	450(min^{-1}), 115(m/min)
	Feed Speed	1,400(mm/min), 3(mm/rev)
	Depth of cut	1.5～2.0(mm)
	Width of cut	50(mm)
	Coolant	Dry
	Machine	Vertical MC

For general & difficult-to-cut materials, flat surface & shape processing

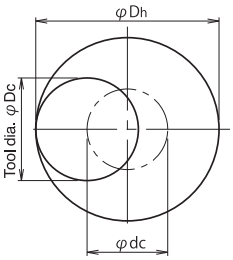
Super Diemaster HDM / SDH TYPE

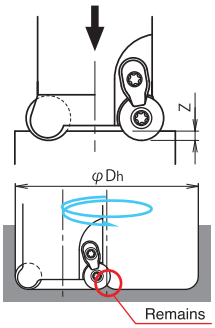
Instructions for profile milling

● Ramping



● Helical interpolation





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

● Depth of cut per one circle should not exceed max. depth of cut ap.
● Down cutting is recommended, so tool pass rotation should be counter-clockwise.
● Do not continue ramping after drilling.
● In case of helical interpolation, remove the core by traverse milling.

Note :
● 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)
15	7 (R3.5)	8	20	28	3°00'	3.5	66.8	0.4	1.0
16	7 (R3.5)	9	22	30	9°00'	3.5	22.1	1.5	2.5
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
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
100	16 (R8)	84	175	198	2°35□	8.0	177.3	4.0	5.0
125	16 (R8)	109	225	248	1°55□	8.0	239.1	4.0	5.0
160	16 (R8)	144	295	318	1°25□	8.0	223.5	4.0	5.0

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

■ 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 JC8118	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 JC8118 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 JC8118	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 JC8118	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	JC8118 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 JC8118	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 35-43 HRC	JC8050 JC8015 JC8118	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 JC8118 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 : 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.

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL · STANDARD TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		63 (R8)				80 (R6)				80 (R8)			
		No. of teeth 4N (Double Clamp)				No. of teeth 4N (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 JC8118	150	4	990	1,110	150	3	770	890	150	4	780	870
		200	3	990	1,290	200	2.7	770	980	200	3	780	990
		250	2	690	1,200	250	2.2	540	710	250	2	550	830
		300	1.5	690	1,210	300	1.6	540	820	300	1.5	550	960
		350	1	590	1,040	350	1	460	700	350	1	470	810
		400	0.5	540	1,360	400	0.5	420	920	400	0.5	430	1,080
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC8118 JC8015 For over 40HRC	150	3.5	950	1,140	150	2.5	740	780	150	3.5	740	890
		200	3	950	1,250	200	2.2	740	970	200	3	740	970
		250	2.5	670	980	250	1.6	520	680	250	2.5	520	730
		300	2	670	1,020	300	1.1	520	930	300	2	520	770
		350	1	570	1,000	350	0.7	440	880	350	1	440	960
		400	0.5	520	1,330	400	0.5	410	900	400	0.5	410	1,050
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC8118	150	4	940	1,090	150	3	730	820	150	4	740	830
		200	3	940	1,240	200	2.7	730	900	200	3	740	970
		250	2	660	970	250	2.2	510	670	250	2	520	770
		300	1.5	660	1,160	300	1.6	510	750	300	1.5	520	910
		350	1	560	980	350	1	440	670	350	1	440	770
		400	0.5	520	1,330	400	0.5	400	900	400	0.5	410	1,050
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC8118	150	4	790	920	150	3	610	710	150	4	610	710
		200	3	790	1,040	200	2.7	610	750	200	3	610	800
		250	2	550	850	250	2.2	430	560	250	2	430	630
		300	1.5	550	960	300	1.6	430	650	300	1.5	430	750
		350	1	470	800	350	1	370	540	350	1	370	630
		400	0.5	430	1,100	400	0.5	340	740	400	0.5	340	870
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8118 JC8015 Without Chipbreaker (DH103) (For over 50HRC)	100	2	660	600	100	1.5	500	480	100	2	510	470
		150	1.8	660	610	150	1.2	500	500	150	1.8	510	490
		200	1.6	460	460	200	1	350	380	200	1.6	360	380
		250	1.2	460	500	250	0.8	350	420	250	1.2	360	390
		300	0.8	400	530	300	0.6	300	460	300	0.8	310	400
		350	0.4	370	470	350	0.3	280	390	350	0.4	280	380
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC8118	150	4	890	1,240	150	3	690	970	150	4	700	980
		200	3	890	1,350	200	2.7	690	1,020	200	3	700	1,060
		250	2	620	1,140	250	2.2	480	730	250	2	490	900
		300	1.5	620	1,310	300	1.6	480	820	300	1.5	490	1,010
		350	1	530	1,180	350	1	410	780	350	1	420	920
		400	0.5	490	1,250	400	0.5	380	830	400	0.5	390	1,000
Titanium alloy 35-43 HRC	JC8050 JC8015 JC8118	150	1.5	340	300	150	1	250	200	150	1.5	260	260
		200	1.3	340	325	200	0.9	250	240	200	1.3	260	200
		250	1.1	240	240	250	0.7	180	190	250	1.1	180	170
		300	0.9	240	250	300	0.5	180	230	300	0.9	180	190
		350	0.6	200	290	350	0.3	150	250	350	0.6	160	215
		400	0.3	190	300	400	0.2	140	280	400	0.3	140	250
Inconel 35-43HRC	JC8015 JC8118 JC8050	150	1.5	170	170	150	1	125	100	150	1.5	130	130
		200	1.3	170	155	200	0.9	125	115	200	1.3	130	120
		250	1.1	120	120	250	0.7	90	100	250	1.1	90	90
		300	0.9	120	130	300	0.5	90	115	300	0.9	90	85
		350	0.6	100	140	350	0.3	75	130	350	0.6	80	105
		400	0.3	95	180	400	0.2	70	140	400	0.3	70	125
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	6	3,500	5,500	150	4.5	2,800	4,400	150	6	2,800	4,400
		200	5	3,500	5,700	200	4	2,800	4,600	200	5	2,800	4,600
		250	4	3,050	5,200	250	3.5	2,350	4,000	250	4	2,350	4,000
		300	3	2,500	5,200	300	2.5	2,000	4,100	300	3	2,000	4,100
		350	2	2,400	4,300	350	1.5	1,900	3,400	350	2	1,900	3,400
		400	1	2,000	3,200	400	1	1,600	2,600	400	1	1,600	2,600

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

■ NOTE

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.

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL · STANDARD TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)															
		80 (R8)				100 (R8)				125 (R8)				160 (R8)			
		No. of teeth 5N				No. of teeth 6N				No. of teeth 8N				No. of teeth 9N			
		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)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	150	4	780	1,050	150	4	620	1,040	150	4	490	820	150	4	380	640
		200	3	780	1,190	200	3	620	1,180	200	3	490	930	200	3	380	720
		250	2	550	1,000	250	2	430	970	250	2	340	770	250	2	270	610
		300	1.5	550	1,150	300	1.5	430	1,120	300	1.5	340	890	300	1.5	270	710
		350	1	470	970	350	1	370	950	350	1	290	750	350	1	230	600
		400	0.5	430	1,300	400	0.5	370	1,390	400	0.5	290	1,090	400	0.5	230	870
Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) 30-43HRC	JC8050 JC8118 JC8015 For over 40HRC	150	3.5	740	1,070	150	3.5	580	1,040	150	3.5	460	830	150	3.5	360	650
		200	3	740	1,160	200	3	580	1,140	200	3	460	900	200	3	360	710
		250	2.5	520	880	250	2.5	400	840	250	2.5	320	670	250	2.5	250	530
		300	2	520	920	300	2	400	880	300	2	320	710	300	2	250	560
		350	1	440	1,150	350	1	350	1,140	350	1	270	880	350	1	220	720
		400	0.5	410	1,260	400	0.5	350	1,300	400	0.5	270	1,040	400	0.5	220	850
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC5040 JC8118	150	4	740	1,070	150	4	580	970	150	4	460	770	150	4	360	610
		200	3	740	1,160	200	3	580	1,140	200	3	460	900	200	3	360	710
		250	2	520	880	250	2	400	880	250	2	320	710	250	2	250	560
		300	1.5	520	920	300	1.5	400	1,050	300	1.5	320	840	300	1.5	250	660
		350	1	440	1,150	350	1	350	910	350	1	270	710	350	1	220	580
		400	0.5	410	1,260	400	0.5	350	1,340	400	0.5	270	1,040	400	0.5	220	850
Stainless steel SUS304 Below 250HB	JC8050 JC8015 JC8118	150	4	610	850	150	4	480	830	150	4	390	680	150	4	300	520
		200	3	610	960	200	3	480	940	200	3	390	770	200	3	300	590
		250	2	430	750	250	2	340	740	250	2	270	590	250	2	210	460
		300	1.5	430	900	300	1.5	340	880	300	1.5	270	710	300	1.5	210	550
		350	1	370	750	350	1	280	710	350	1	230	590	350	1	180	460
		400	0.5	340	1,040	400	0.5	280	1,070	400	0.5	230	880	400	0.5	180	690
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 40-50HRC	JC8118 JC8015 Without Chipbreaker (DH103) (For over 50HRC)	100	2	510	560	100	2	390	530	100	2	310	430	100	2	240	330
		150	1.8	510	590	150	1.8	390	560	150	1.8	310	450	150	1.8	240	350
		200	1.6	360	450	200	1.6	270	420	200	1.6	220	350	200	1.6	170	270
		250	1.2	360	470	250	1.2	270	430	250	1.2	220	360	250	1.2	170	280
		300	0.8	310	480	300	0.8	230	440	300	0.8	180	350	300	0.8	150	290
		350	0.4	280	450	350	0.4	230	460	350	0.4	180	370	350	0.4	150	310
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 JC8118	150	4	700	1,170	150	4	550	1,150	150	4	440	920	150	4	340	710
		200	3	700	1,270	200	3	550	1,240	200	3	440	1,000	200	3	340	770
		250	2	490	1,080	250	2	380	1,040	250	2	310	850	250	2	240	660
		300	1.5	490	1,210	300	1.5	380	1,170	300	1.5	310	960	300	1.5	240	740
		350	1	420	1,100	350	1	330	1,080	350	1	260	850	350	1	200	660
		400	0.5	390	1,200	400	0.5	330	1,260	400	0.5	260	1,000	400	0.5	200	770
Titanium alloy 35-43 HRC	JC8050 JC8015 JC8118	150	1.5	260	310	150	1.5	200	300	150	1.5	150	260	150	1.5	120	180
		200	1.3	260	240	200	1.3	200	230	200	1.3	150	170	200	1.3	120	140
		250	1.1	180	200	250	1.1	140	200	250	1.1	100	140	250	1.1	85	120
		300	0.9	180	230	300	0.9	140	220	300	0.9	100	160	300	0.9	85	135
		350	0.6	160	260	350	0.6	120	240	350	0.6	90	180	350	0.6	70	140
		400	0.3	140	300	400	0.3	120	320	400	0.3	90	240	400	0.3	70	190
Inconel 35-43HRC	JC8015 JC8118 JC8050	150	1.5	130	150	150	1.5	100	150	150	1.5	80	120	150	1.5	60	90
		200	1.3	130	140	200	1.3	100	130	200	1.3	80	110	200	1.3	60	80
		250	1.1	90	110	250	1.1	70	100	250	1.1	55	85	250	1.1	40	60
		300	0.9	90	100	300	0.9	70	100	300	0.9	55	80	300	0.9	40	55
		350	0.6	80	125	350	0.6	60	120	350	0.6	50	100	350	0.6	35	70
		400	0.3	70	150	400	0.3	60	160	400	0.3	50	130	400	0.3	35	90
Aluminium alloy A5052, A7075 50-110HB	FZ05	150	6	2,800	5,300	150	6	2,400	5,600	150	6	1,900	5,900	150	6	1,500	5,250
		200	5	2,800	5,500	200	5	2,400	5,900	200	5	1,900	6,200	200	5	1,500	5,500
		250	4	2,350	4,800	250	4	2,050	5,300	250	4	1,650	5,600	250	4	1,300	5,000
		300	3	2,000	4,900	300	3	1,900	5,900	300	3	1,500	6,200	300	3	1,200	5,600
		350	2	1,900	4,100	350	2	1,750	4,700	350	2	1,400	5,000	350	2	1,100	4,400
		400	1	1,600	3,100	400	1	1,600	3,800	400	1	1,250	4,000	400	1	1,000	3,600

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

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL · FINE PITCH TYPE

Work Materials	Insert Grades	Tool dia. (mm) (Insert type)											
		50/52 (R6) No. of teeth 5N				50/52 (R8) No. of teeth 4N				63/66 (R6) 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	JC8050 JC5040 JC8118	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 JC8118 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 JC8118	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 JC8118	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	JC8118 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 JC8118	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 35-43 HRC	JC8050 JC8015 JC8118	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 JC8118 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, ap : Depth of cut, n : Spindle speed, Vf : Feed speed

■ NOTE

6) In case of Titanium alloy or Inconel, recommend wet cutting

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

■ 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)	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 JC8118	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 JC8118 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 JC8118	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 JC8118	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	JC8118 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 JC8118	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 35-43 HRC	JC8050 JC8015 JC8118	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 JC8118 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, ap : Depth of cut, n : Spindle speed, Vf : Feed speed

■ NOTE

Please refer page E277

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

■ 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		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	JC8015 Without chipbreaker	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		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		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 : 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.
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.

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH 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)	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	1.9	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		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		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, ap : Depth of cut, n : Spindle speed, Vf : Feed speed

■ NOTE

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

For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

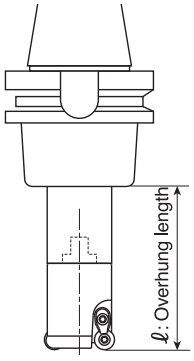
Work Materials	Insert Grades	Tool dia. (Insert size)							
		15/16 (R3.5)				20/22 (R3.5)			
		No. of teeth 2N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	70	1.4	3,500	1,650	70	1.5	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 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 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 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 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 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 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 JC8118 JC8050	70	0.5	620	190	70	0.5	510	160
		120	0.4	560	190	120	0.4	470	160
		160	0.2	520	190	160	0.2	440	160
Aluminium alloy 50-110HB	FZ05	70	2	8,600	4,800	70	2	7,200	4,300
		120	1.7	8,600	4,800	120	1.7	7,200	4,300
		160	1.2	7,000	4,900	160	1.2	5,800	4,300

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

※ For over 50HRC, recommend to use DH103 without chipbreaker

■ 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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SDH type + MSN Carbide Shank Holder

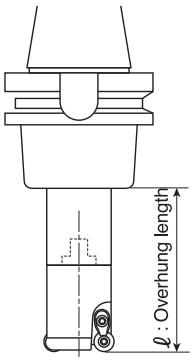
Work Materials	Insert Grades	Tool dia. (Insert size)							
		20/22 (R3.5)				25/28 (R5)			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	70	1.2	3,500	2,900	90	2	2,400	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 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 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 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	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 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 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 JC8118 JC8050	70	0.5	510	240	90	0.5	430	170
		120	0.4	470	240	140	0.4	390	140
		160	0.2	440	240	210	0.2	370	140
Aluminium alloy 50-110HB	FZ05	70	2	7,200	6,400	90	3.5	5,700	3,400
		120	1.7	7,200	6,400	140	2	5,700	3,400
		160	1.2	5,800	4,300	210	1.5	4,500	2,200

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

※ For over 50HRC, recommend to use DH103 without chipbreaker

■ 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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

RECOMMENDED CUTTING CONDITIONS

SDH type + MSN Carbide Shank Holder

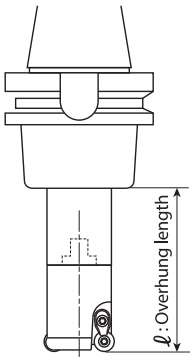
Work Materials	Insert Grades	Tool dia. (Insert size)							
		25 (R3.5) /25 (R5) /28 (R5)				30 (R5) /32 (R6) /35 (R5)			
		No. of teeth 3N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	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 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 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 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	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 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 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 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, ap : Depth of cut, n : Spindle speed, Vf : Feed speed

※ For over 50HRC, recommend to use DH103 without chipbreaker

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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

RECOMMENDED CUTTING CONDITIONS

SDH type + MSN Carbide Shank Holder

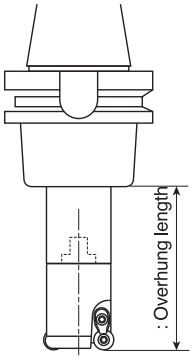
Work Materials	Insert Grades	Tool dia. (Insert size) 32/35 (R5) No. of teeth 3N ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	30 (R5) /35 (R6) No. of teeth 3N ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	100	2.5	2,000	1,600	100	2	2,100	1,900
		150	2	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 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 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 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	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 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 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 JC8118 JC8050	100	0.5	400	250	100	0.5	400	250
		150	0.4	380	230	150	0.4	380	230
		210	0.2	350	200	210	0.2	350	200
Aluminium alloy 50-110HB	FZ05	100	3.5	4,500	4,100	100	3.5	4,500	4,100
		150	2	4,500	4,100	150	2	4,500	4,100
		210	1.5	3,600	2,700	210	1.5	3,600	2,700

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

※ For over 50HRC, recommend to use DH103 without chipbreaker

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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

RECOMMENDED CUTTING CONDITIONS

SDH type + MSN Carbide Shank Holder

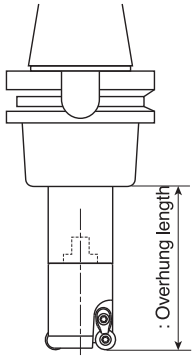
Work Materials	Insert Grades	Tool dia. (Insert size)							
		30/32/35 (R5)				40 (R6)			
		No. of teeth 4N				No. of teeth 2N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	100	2	2,100	2,500	100	2.5	1,550	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 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 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 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	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 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 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 JC8118 JC8050	100	0.5	400	330	100	0.5	290	170
		150	0.4	380	310	150	0.4	270	160
		210	0.2	350	270	210	0.2	250	120
Aluminium alloy 50-110HB	FZ05	100	3.5	4,500	5,400	100	4	4,000	2,400
		150	2	4,500	5,400	150	2.5	4,000	2,400
		210	1.5	3,600	3,600	210	2	3,200	1,600

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

※ For over 50HRC, recommend to use DH103 without chipbreaker

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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

RECOMMENDED CUTTING CONDITIONS

SDH type + MSN Carbide Shank Holder

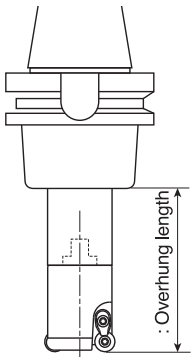
Work Materials	Insert Grades	Tool dia. (Insert size)							
		40 (R6)				42 (R5)			
		No. of teeth 4N				No. of teeth 5N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8050 JC5040 JC8118	100	2	1,900	2,300	100	1.8	1,750	2,600
		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 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 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 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	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 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 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 JC8118 JC8050	100	0.5	290	340	100	0.5	300	310
		150	0.4	270	320	150	0.4	280	290
		210	0.2	250	240	210	0.2	260	250
Aluminium alloy 50-110HB	FZ05	100	4	4,000	4,800	100	3.5	3,800	5,700
		150	2.5	4,000	4,800	150	2	3,800	5,700
		210	2	3,200	3,200	210	1.5	3,000	3,700

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

※ For over 50HRC, recommend to use DH103 without chipbreaker

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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

SDH type + MSN Carbide Shank Holder

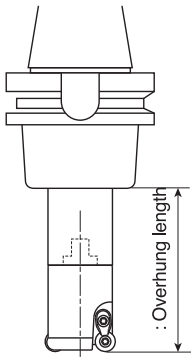
Work Materials	Insert Grades	Tool dia. (Insert size)							
		20/22 (R3.5)				25 (R3.5) /25 (R5) /28 (R5)			
		No. of teeth 3N				No. of teeth 3N			
		ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without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

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

※ For over 50HRC, recommend to use DH103 without chipbreaker

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 ap, n, Vf by 30% on above table.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● SDH type + MSN Carbide Shank Holder

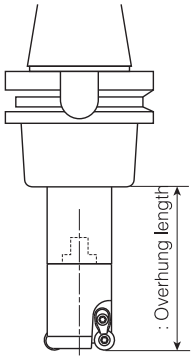
Work Materials	Insert Grades	Tool dia. (Insert size)							
		30 (R5) /35 (R6)				30/32/35 (R5)			
		No. of teeth 3N				No. of teeth 4N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 Recommended to use without chipbreaker	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		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		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, ap : Depth of cut, n : Spindle speed, Vf : Feed speed

※ For over 50HRC, recommend to use DH103 without chipbreaker

■ 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 ap, n, Vf by 30% on above table.
6) In case of Titanium alloy or Inconel, recommended wet cutting.



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster Modular Head HDM / SDH TYPE

■ RECOMMENDED CUTTING CONDITIONS / HIGH SPEED MACHINING

● SDH type + MSN Carbide Shank Holder

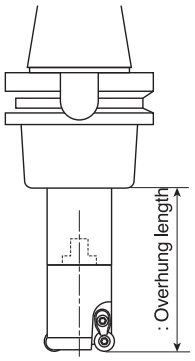
Work Materials	Insert Grades	Tool dia. (Insert size)							
		40 (R6)				42 (R5)			
		No. of teeth 4N				No. of teeth 5N			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB		100	0.3	2,900	3,400	100	0.3	2,800	4,200
		150	0.2	2,700	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	JC8015 Recommended to use without chipbreaker	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		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		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, ap : Depth of cut, n : Spindle speed, Vf : Feed speed

※ For over 50HRC, recommend to use DH103 without chipbreaker

■ NOTE

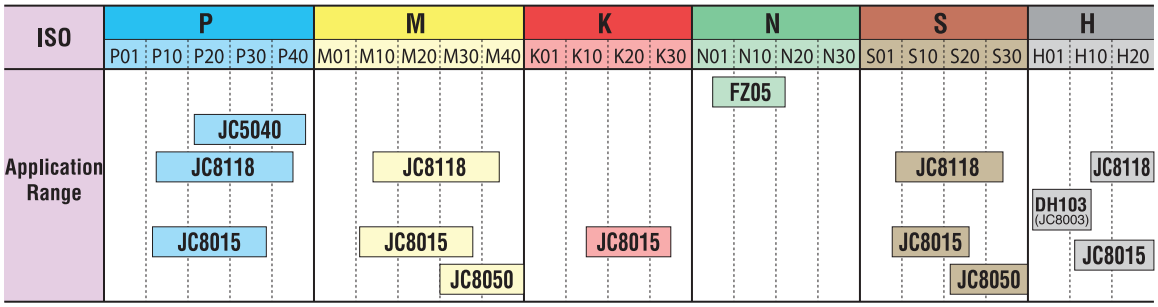
1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) In case chatter occurrs, recommend to reduce depth of cut or feed speed.
3) If machine does not have enough power, recommend to reduce depth of cut first and reduce spindle speed and feed speed.
4) Use air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



For general & difficult-to-cut materials, flat surface & shape processing

Super Diemaster HDM / SDH TYPE

GRADE SELECTION GUIDE



GUIDELINE 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 JC8118	JC5040	JC8118	JC8050	JC8015 JC8118	JC8050	DH103 Over 50HRC JC8015 JC8118	JC8015 JC8118	JC8050	JC8015 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 chip breaker ・RD○T type : with chip breaker
◎: First choice, Good condition ○: Moderate condition ●: Unfavorable condition ☆: Light cutting

GUIDELINE FOR SELECTION OF INSERTS

Work materials	Cast iron Cast steel	Carbon steel Die steel	Mold steel	High hardened steel	Stainless steel	Alumin-ium alloy
Insert grades / Cat.No.	DH103	JC8015	JC8015	DH103	JC8015	FZ05
RDMW○○○○MOT	◎	◎	◎	◎	◎	
RDGT○○○○MOF-AL						◎

・RDMW type : without chip breaker ・RD○T type : with chip breaker
◎: First choice, Good condition ○: Moderate condition ●: Unfavorable condition ☆: Light cutting

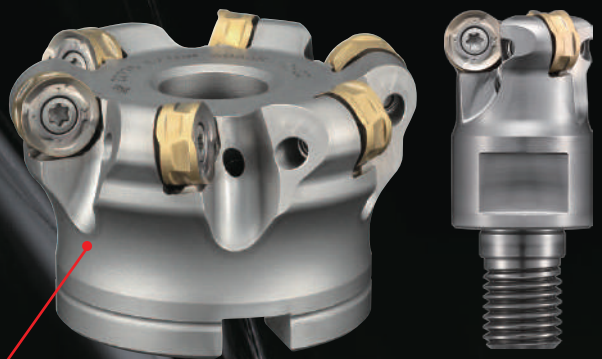
Note :

General, Profile milling of difficult to cut materials

Extreme Diemate Extreme series EXTDM / MTX TYPE

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

Indexable radius cutter for hard-to-cut material.

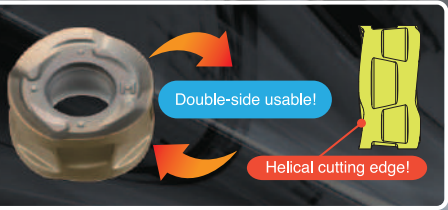


G-Body

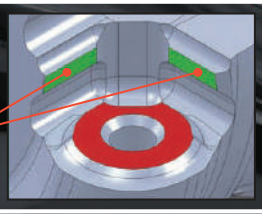
Adopted GN surface-hardening treatment on thermal resistant high strength steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation, improved body durability and tool life by 30% or more. Make it difficult to be damaged even under severe cutting conditions.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

Features

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 fracture: 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.

Through coolant hole: proper coolant / air supply to cutting edges

General, Profile milling of difficult to cut materials

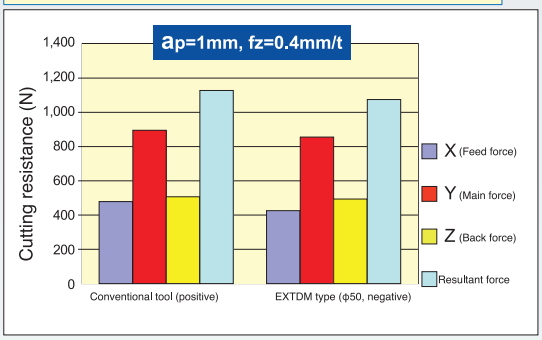
Extreme Diemate Extreme series EXTDM / MTX TYPE

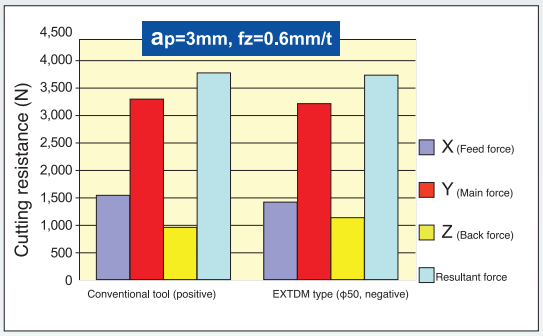
CUTTING PERFORMANCE

Cutting force comparison

Mat'l : S50C C50
Cutting conditions : Vc=180m/min, n=1,146min , ae=30mm
Down cut, Air blow Test by 1 insert
Overhung length.: 120mm
Tool No.: EXTDM-5050R-12-22(φ50) Holder No.: BT50
Insert No. : RNMU1205MOE-MM (JC7560P)

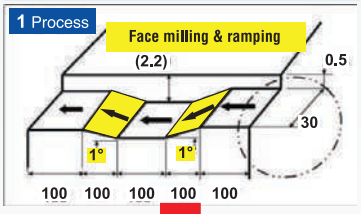
Cutting force of EXTDM is almost the same as the conventional positive cutter.

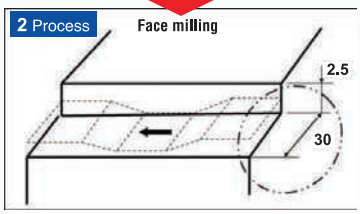


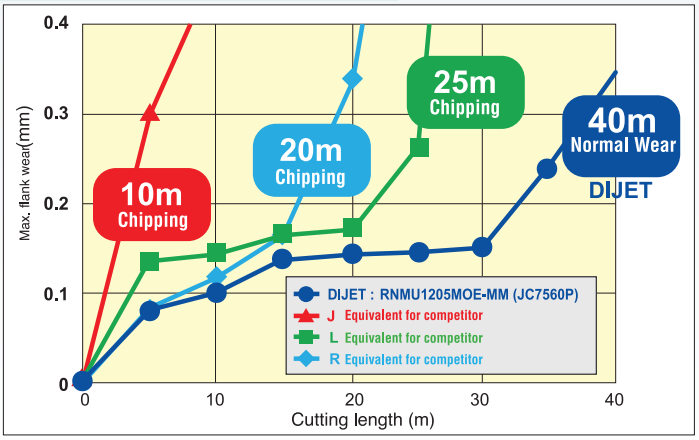


Tool life comparison

Mat'l : (SUS420J2) Stainless steel (Martensitic)
Cutting conditions : Vc=260m/min, n=1,650min , 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(φ50), Insert No. : RNMU1205MOE-MM (JC7560P)







General, Profile milling of difficult to cut materials

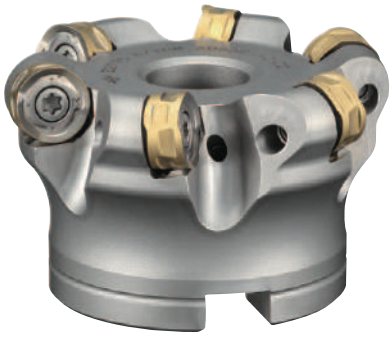
Extreme Diemate

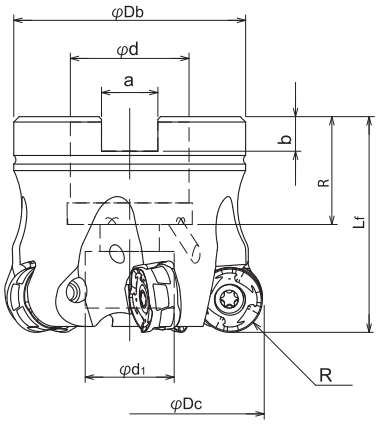
Extreme series

EXTDM TYPE

G-Body

Through Coolant Hole





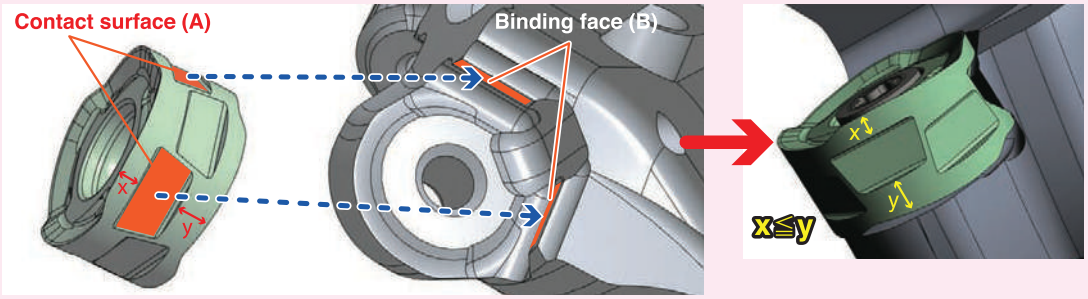
BODY

Bore	Cat. No.	Stock	No. of flutes	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) 1. The insert is not installed in the main body.
2. Please refer page E296 for recommended cutting conditions.
3. Refer to D16 for the recommended tightening torque of the modular head.
4. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

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

Attention to mounting insert



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

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

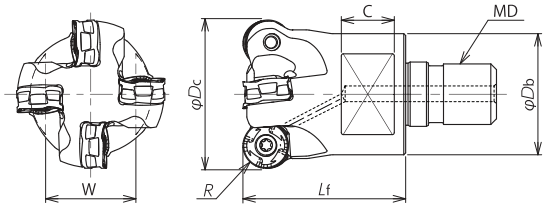
General, Profile milling of difficult to cut materials

Extreme Diemate Modular Head Extreme series MTX TYPE

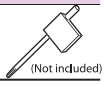
G-Body

Through Coolant Hole

Face Milling | Pocket Milling | Copy Milling | Helical Interpolation



BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	R	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
												 (Not included)
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			

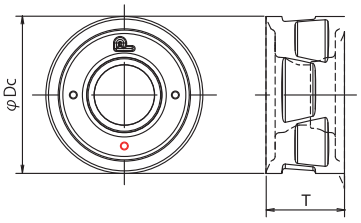
Note) 1. The insert is not installed in the main body.
2. Please refer page E297 for recommended cutting conditions.
3. Refer to D16 for the recommended tightening torque of the modular head.
4. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Clamp Screw	Recommended Torque (N·m)
TSW-410H	3.5

INSERTS

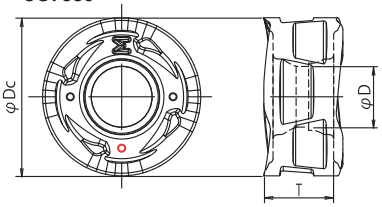
(RNMU-PM)

JC8050

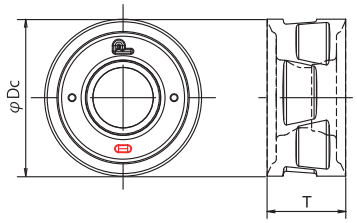


(RNMU-MM)

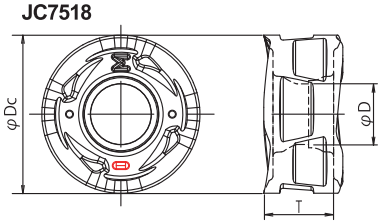
JC7550



JC8118



JC7518



Cat. No.	Tolerance	Total of corners (double-side)	Dimensions (mm) JC8050	JC8118	JC7518	JC7550	PVD coated φDc	T	φD
RNMU1205MOE-MM	M	8			●	●	**12**	5.3	4.6
RNMU1205MOE-PM	M	8	●	●			**12**	5.3	4.6

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

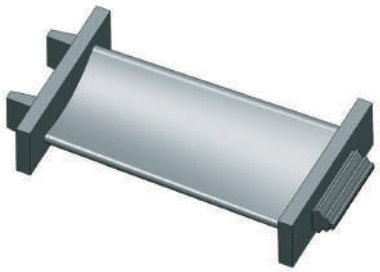
General, Profile milling of difficult to cut materials

Extreme Diemate Extreme series EXTDM / MTX TYPE

CUTTING DATA

1. Roughing of turbine blades

Overhung length: 200mm

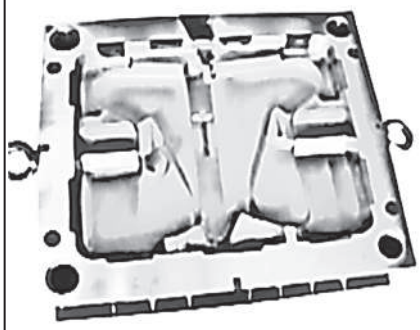


Work	Part name		Turbine blade
	Material		13Cr stainless steel
	Hardness		-
Tool	Tool No.		EXTDM-5050R-12-22
	Insert No.		RNMU1205MOE-PM JC8050
Cutting conditions	Cutting speed	n	750 (min^{-1})
		Vc	118 (m/min)
	Feed speed	Vf	1,600 (mm/min)
		fz	0.43 (mm/t)
	ap(mm)		0.5 to 1 mm
	ae(mm)		40mm
	Coolant		Water-soluble cutting oil
	Machine		5-axis MC

Result: 1 work 45 minutes. 4 workpieces can be machined with little wear and can be continued. The current H company has 4 positive corners, but the EXTDM type can use 8 corners,

2. Roughing of contour lines of press dies

Roughening of contour lines
Overhung length: 200mm



Work	Part name		Press die
	Material		Cold tool steel
	Hardness		-
Tool	Tool No.		EXTDM-5050R-12-22
	Insert No.		RNMU1205MOE-PM JC8050
Cutting conditions	Cutting speed	n	1,000 (min^{-1})
		Vc	157 (m/min)
	Feed speed	Vf	600 (mm/min)
		fz	0.12 (mm/t)
	ap(mm)		1.5mm
	ae(mm)		28mm
	Coolant		Water-soluble cutting oil
	Machine		Vertical MC

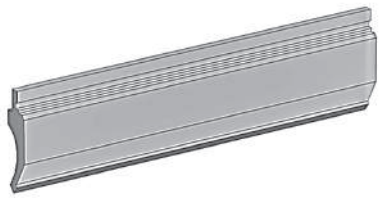
Result: The current E company positive cutter has a large wear and has a life of 1 hour, while the EXTDM type has a life of 2.5 hours.

General, Profile milling of difficult to cut materials

Extreme Diemate Extreme series EXTDM / MTX TYPE

3. Roughing of chromoly steel

Rough machining



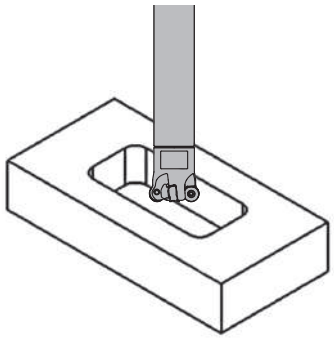
35 x 150 x 500 (mm)
Carved out of the block

Result: The positive cutter made by Company I is defective with one or two workpieces. EXTDM is machined with 3 to 4 pieces with normal wear. Achieves 2-3 times the life per insert corner.

Work	Part name		Pending punch
	Material		SCM440
	Hardness		47HCR
Tool	Tool No.		EXTDM-5050R-12-22
	Insert No.		RNMU1205MOE-PM JC8118
Cutting conditions	Cutting speed	n	1,300 (min^{-1})
		Vc	195 (m/min)
	Feed speed	Vf	650 (mm/min)
		fz	0.1 (mm/t)
	ap(mm)		1mm
	ae(mm)		50mm
	Coolant		dry
	Machine		Vertical MC

4. Flat surface of overlay + pocket machining

Overhung length: 180mm
Work size: □ 500mm



Result: Incase of conventional tool with positive cutter, 2 set of inserts required for 1 job, but in this case with MTX type, for 1 job only one set of insert is required as the inserts can be indexed to use 8 cutting edges per insert

Work	Part name		Resin mold overlay correction
	Material		Overlaying material for stainless steel
	Hardness		-
Tool	Tool No.		MTX-3032-12-M16 MSN-M16-155-S32C
	Insert No.		RNMU1205MOE-PM JC8118
Cutting conditions	Cutting speed	n	500 (min^{-1})
		Vc	50 (m/min)
	Feed speed	Vf	525 (mm/min)
		fz	0.35 (mm/t)
	ap(mm)		0.6mm
	ae(mm)		20mm
	Coolant		Air
	Machine		Vertical MC

General, Profile milling of difficult to cut materials

Extreme Diemate

Extreme series

EXTDM TYPE

RECOMMENDED CUTTING CONDITIONS

Bore type milling cutter

Work Materials	Grades	Insert No.	Tool dia (mm)									
			50/52					63/66				
			No. of teeth 5N					No. of teeth 6N				
			ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNMU-PM	JC8050	~150	1.5	33	1,400	2,450	~150	1.5	42	1,110	2,330
			200	1.0	33	1,210	2,120	200	1.0	42	960	2,020
			300	0.6	33	1,020	1,790	300	0.6	42	810	1,700
Cast steel (GM190, ICD5) Hardness 285 or less	RNMU-PM	JC8050	~150	1.5	33	1,400	2,450	~150	1.5	42	1,110	2,330
			200	1.0	33	1,210	2,120	200	1.0	42	960	2,020
			300	0.6	33	1,020	1,790	300	0.6	42	810	1,700
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNMU-PM	JC8050	~150	1.5	33	1,400	2,450	~150	1.5	42	1,110	2,330
			200	1.0	33	1,210	2,120	200	1.0	42	960	2,020
			300	0.6	33	1,020	1,790	300	0.6	42	810	1,700
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNMU-PM	JC8050	~150	1.2	33	1,020	1,530	~150	1.2	42	810	1,460
			200	0.8	33	860	1,290	200	0.8	42	680	1,220
			300	0.4	33	700	1,050	300	0.4	42	560	1,010
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNMU-PM	JC8118	~150	1.0	33	760	950	~150	1.0	42	610	920
			200	0.6	33	640	800	200	0.6	42	510	770
			300	0.3	33	540	680	300	0.3	42	430	650
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	RNMU-PM	JC8118	~150	1.0	33	570	570	~150	1.0	42	450	540
			200	0.6	33	480	480	200	0.6	42	380	460
			300	0.3	33	410	410	300	0.3	42	330	400
Cast iron (GG25) (FC250) 160-260HB	RNMU-PM	JC8118	~150	1.5	33	1,400	2,450	~150	1.5	42	1,110	2,330
			200	1.2	33	1,210	2,120	200	1.2	42	960	2,020
			300	0.7	33	1,020	1,790	300	0.7	42	810	1,700
Nodular Cast iron (GGG70) 170-300HB	RNMU-PM	JC8118	~150	1.5	33	1,400	2,450	~150	1.5	42	1,110	2,330
			200	1.2	33	1,210	2,120	200	1.2	42	960	2,020
			300	0.7	33	1,020	1,790	300	0.7	42	810	1,700
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	RNMU-MM	JC7550	~150	1.5	33	1,020	1,790	~150	1.5	42	810	1,700
			200	1.0	33	860	1,510	200	1.0	42	680	1,430
			300	0.6	33	700	1,230	300	0.6	42	560	1,180
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNMU-MM	JC7550	~150	1.5	33	1,400	2,450	~150	1.5	42	1,110	2,330
			200	1.0	33	1,210	2,120	200	1.0	42	960	2,020
			300	0.6	33	1,020	1,790	300	0.6	42	810	1,700
Titanium alloy 35-43HRC	RNMU-MM	JC7518	~150	1.0	33	570	510	~150	1.0	42	450	490
			200	0.6	33	480	430	200	0.6	42	380	410
			300	0.3	33	410	370	300	0.3	42	330	360
Inconel 35-43HRC	RNMU-MM	JC7518	~150	1.0	33	320	290	~150	1.0	42	250	270
			200	0.6	33	270	240	200	0.6	42	210	230
			300	0.3	33	220	200	300	0.3	42	180	190

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

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 same 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) If the hardness of the work is 50-55HRC, reduce ap, n, Vf of the above cutting conditions (hardened steel) by 30%.
6) Wet machining titanium alloys and heat-resistant alloys.

General, Profile milling of difficult to cut materials

Extreme Diemate Modular Head Extreme series MTX TYPE

RECOMMENDED CUTTING CONDITIONS

Modular Head MTX Type + Anti Vibration Carbide Shank for Modular Head

Work Materials	Grades	Insert No.	Tool dia (mm)									
			32					40				
			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)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNMU-PM	JC8050	~100	1.5	21	2,190	2,300	~100	1.5	27	1,750	2,450
			150	1.0	21	1,890	1,980	150	1.0	27	1,510	2,110
			210	0.6	21	1,590	1,670	210	0.6	27	1,270	1,780
Cast steel (GM190, ICD5) Hardness 285 or less	RNMU-PM	JC8050	~100	1.5	21	2,190	2,300	~100	1.5	27	1,750	2,450
			150	1.0	21	1,890	1,980	150	1.0	27	1,510	2,110
			210	0.6	21	1,590	1,670	210	0.6	27	1,270	1,780
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNMU-PM	JC8050	~100	1.5	21	2,190	2,300	~100	1.5	27	1,750	2,450
			150	1.0	21	1,890	1,980	150	1.0	27	1,510	2,110
			210	0.6	21	1,590	1,670	210	0.6	27	1,270	1,780
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNMU-PM	JC8050	~100	1.2	21	1,590	1,430	~100	1.2	27	1,270	1,520
			150	0.8	21	1,340	1,210	150	0.8	27	1,070	1,280
			210	0.4	21	1,090	980	210	0.4	27	880	1,060
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNMU-PM	JC8118	~100	1.0	21	1,190	890	~100	1.0	27	950	950
			150	0.6	21	990	740	150	0.6	27	800	800
			210	0.3	21	850	640	210	0.3	27	680	680
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	RNMU-PM	JC8118	~100	1.0	21	900	540	~100	1.0	27	720	580
			150	0.6	21	750	450	150	0.6	27	600	480
			210	0.3	21	650	390	210	0.3	27	520	420
Cast iron (GG25) (FC250) 160-260HB	RNMU-PM	JC8118	~100	1.5	21	2,190	2,300	~100	1.5	27	1,750	2,450
			150	1.2	21	1,890	1,980	150	1.2	27	1,510	2,110
			210	0.7	21	1,590	1,670	210	0.7	27	1,270	1,780
Nodular Cast iron (GGG70) 170-300HB	RNMU-PM	JC8118	~100	1.5	21	2,190	2,300	~100	1.5	27	1,750	2,450
			150	1.2	21	1,890	1,980	150	1.2	27	1,510	2,110
			210	0.7	21	1,590	1,670	210	0.7	27	1,270	1,780
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	RNMU-MM	JC7550	~100	1.5	21	1,590	1,670	~100	1.5	27	1,270	1,780
			150	1.0	21	1,340	1,410	150	1.0	27	1,070	1,500
			210	0.6	21	1,090	1,140	210	0.6	27	880	1,230
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNMU-MM	JC7550	~100	1.5	21	2,190	2,300	~100	1.5	27	1,750	2,450
			150	1.0	21	1,890	1,980	150	1.0	27	1,510	2,110
			210	0.6	21	1,590	1,670	210	0.6	27	1,270	1,780
Titanium alloy 35-43HRC	RNMU-MM	JC7518	~100	1.0	21	900	490	~100	1.0	27	720	520
			150	0.6	21	750	410	150	0.6	27	600	430
			210	0.3	21	650	350	210	0.3	27	520	370
Inconel 35-43HRC	RNMU-MM	JC7518	~100	1.0	21	500	270	~100	1.0	27	400	290
			150	0.6	21	420	230	150	0.6	27	340	240
			210	0.3	21	350	190	210	0.3	27	280	200

ℓ : Overhung length, ap : Depth of cut, n : Spindle speed, Vf : Feed speed, Pc : Net power consumption

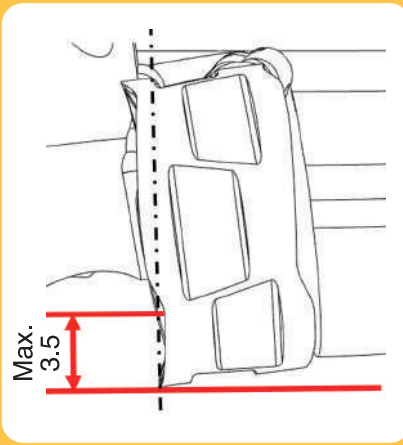
NOTE

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 same 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) If the hardness of the work is 50-55HRC, reduce ap, n, Vf of the above cutting conditions (hardened steel) by 30%.
6) Wet machining titanium alloys and heat-resistant alloys.

General, Profile milling of difficult to cut materials

Extreme Diemate Extreme series EXTDM / MTX TYPE

MM breaker is sharp
Because of the helical cutting edge
Use ap = 3mm or less
It is recommended.



■ Maximum ramping angle

Tool diameter (mm)	Maximum ramping angle
32	0.7°
40	0.8°
50	1°
52	1°
63	0.8°
66	0.8°

■ Guideline for selecting insert grade

Work Materials	Grades	Insert No.	Circuit breaker, grade			
			PM		MM	
			JC8050	JC8118	JC7550	JC7518
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNMU-PM	JC8050	◎	○		
Cast steel (GM190, ICD5) Hardness 285 or less	RNMU-PM	JC8050	◎	○		
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNMU-PM	JC8050	◎	○		
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNMU-PM	JC8050	◎	○		
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNMU-PM	JC8118	○	◎		
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	RNMU-PM	JC8118	○	◎		
Cast iron (GG25) (FC250) 160-260HB	RNMU-PM	JC8118	○	◎		
Nodular Cast iron (GGG70) 170-300HB	RNMU-PM	JC8118	○	◎		
Stainless steel Austenitic (SUS304, 316, 317) 17Cr	RNMU-MM	JC7550			◎	○
Martensitic Stainless steel (SUS403, 420J2, 430)13Cr system	RNMU-MM	JC7550			◎	○
Titanium alloy 35-43HRC	RNMU-MM	JC7518			○	◎
Inconel 35-43HRC	RNMU-MM	JC7518			○	◎

◎: Optimal
○: Suitable

For Side relief milling

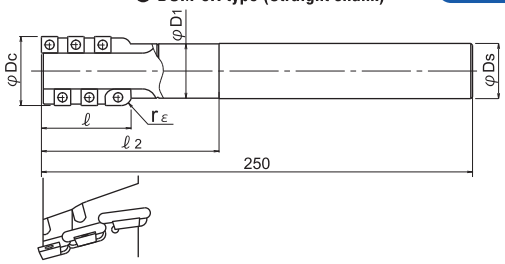
Under Cutter — DUM / DUM-W※ TYPE

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.

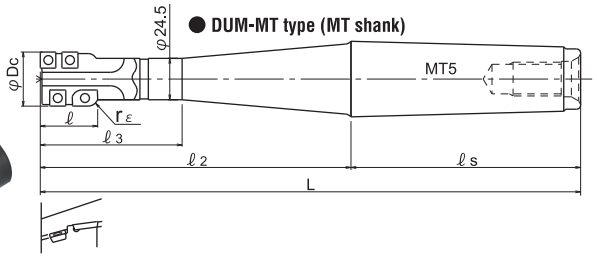
Under milling

DUM-6R type
(Straight shank)

● DUM-6R type (Straight shank)

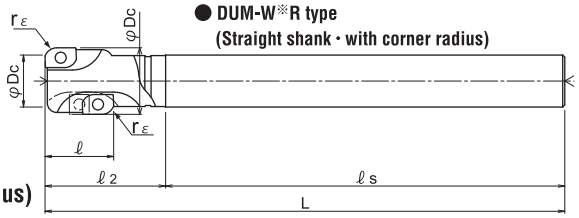


● DUM-MT type (MT shank)



DUM-W※R type
(Straight shank · with corner radius)

● DUM-W※R type
(Straight shank · with corner radius)



■ BODY

Cat. No.	Stock	No. of Applicable Inserts: Insert with corner radius: Bottom Side (R)	No. of Applicable Inserts: Insert with corner radius: Shank Side (L)	No. of Applicable Inserts: Peripheral	Dimensions (mm): φDc	rε	ℓ	ℓ2	ℓs	L	φD1	φDs	Md
DUM-25023S20-W2R	●	1	1	—	25	R2	23.5	53.5	196.5		19.3	20	
DUM32034S25-6R	●		1	3			34	83	167	250	24.5		—
DUM32050S25-6R *C Body (Carbide shank)	●	—	1	5	32		50	—	—		—	25	
DUM320184T-MT5	●		1	3			34	184	136	320	24.5	MT5	M20×2.5
DUM-32033S25-W6R	●	1	1	1			33	58	192		24.5	25	
DUM36038S32-6R	●		1	3	36		38	89	161		31		
DUM36050S32-6R	●		1	5		R6	50	101	149			32	
DUM40040S32-6R	●		2	8	40		40	91	159		31.5		
DUM40052S32-6R	●	—	2	10			52	103	147	250		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		

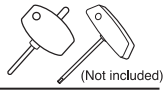
Note) 1. All cutters are supplied without inserts.
2. Please refer page E301 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Side relief milling

Under Cutter DUM / DUM-W※ TYPE

PARTS

Applicable holders	Applicable inserts			Parts	
	Bottom side (R)	Shank side (L)	Peripheral	Clamp screw	Wrench
					 (Not included)
DUM-6R type	—	APGW150360L	SPGA090304 or SPMA090304	DSW-4085	A-15T
DUM-MT5 type					
DUM-W2R type	ZPMT13T320R	ZDMT13T320L	—	DSW-307	A-10
DUM-W6R type	APGW150360R	APGW150360L	SPGA090304 or SPMA090304	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

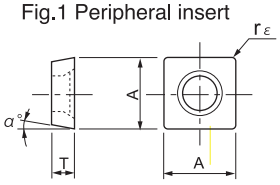


Fig.2 Shank side insert

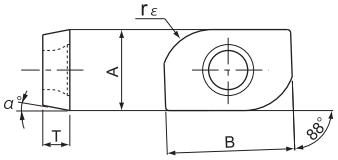


Fig.3 Bottom side insert

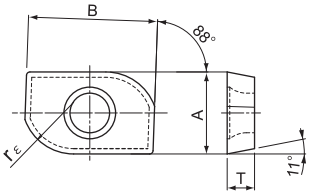


Fig.4 Shank side insert

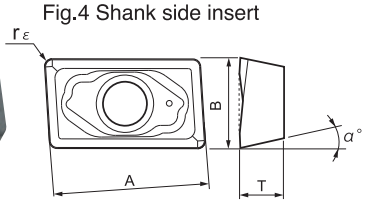
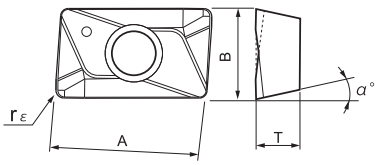


Fig.5 Bottom side insert



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 stocked ○: Soon to be deleted ※: Production after order received

For Side relief milling

Under Cutter DUM / DUM-W※ TYPE

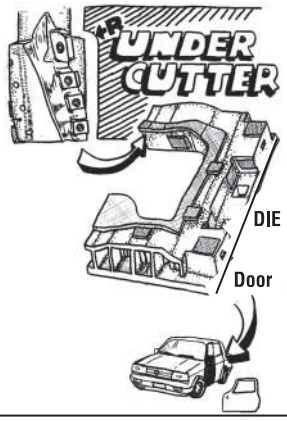
■ RECOMMENDED CUTTING CONDITIONS

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

■ CASE STUDIES

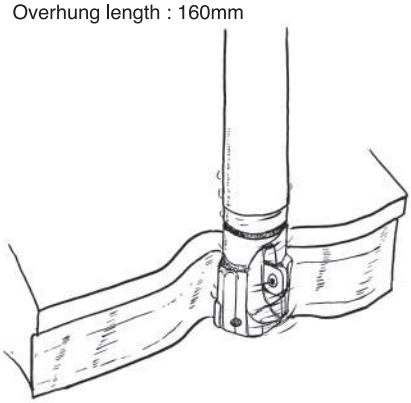
Side relief milling



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

Result Observed smooth cutting and normal wear on the insert after machined 4 dies.

Overhung length : 160mm



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

Result Drastically improved productivity compared with HSS end mill.

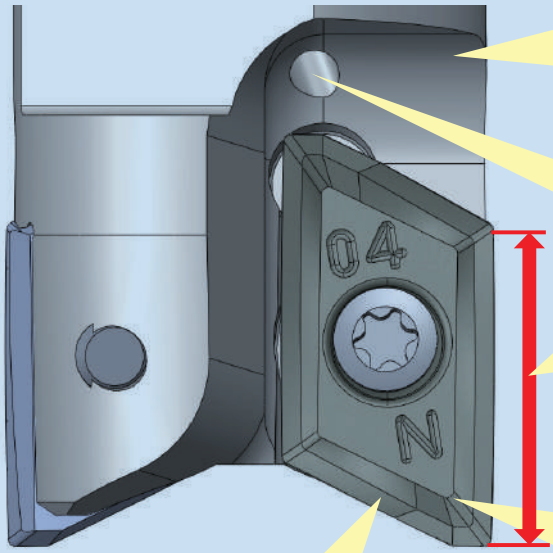
For Finishing and Multi-Functional milling

Aero Chipper ALX / 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.

For Finishing and Multi-Functional milling

Aero Chipper ALX / MAL TYPE

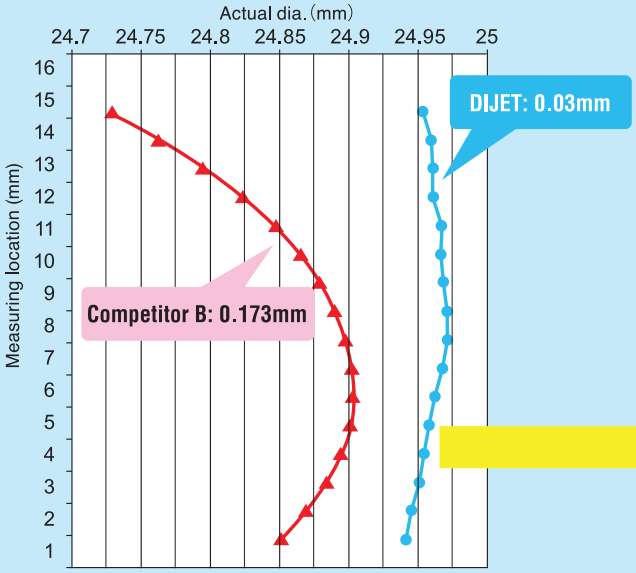
Aerospace Tooling G-Body

■ Cutting performance of Aero Chipper against competitor

Accuracy on cutting edge

High Precision

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

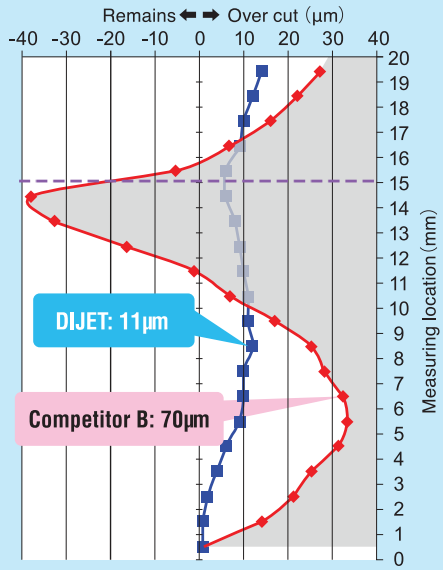


AERO CHIPPER showed much precise dimensions on insert than competitor B's insert
Accuracy on cutting edge DIJET : 0.03mm, Competitor B : 0.173mm

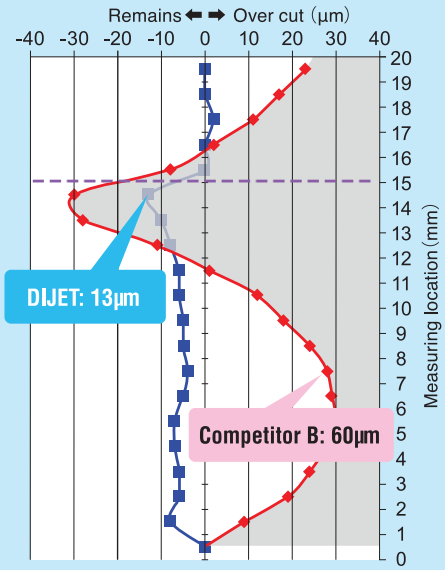
Machining accuracy

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 : 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

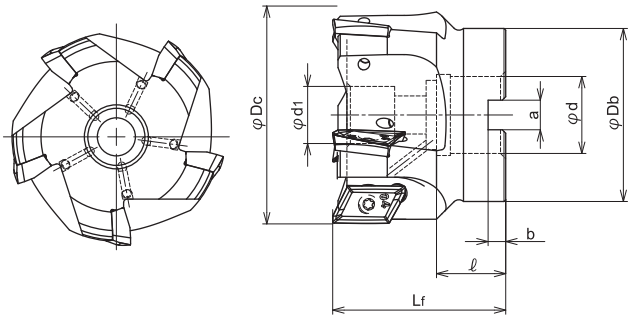
During 15mm cutting length, AERO CHIPPER showed 4 times better accuracy.

For Finishing and Multi-Functional milling

Aero Chipper ALX TYPE

G-Body Through Coolant Hole

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



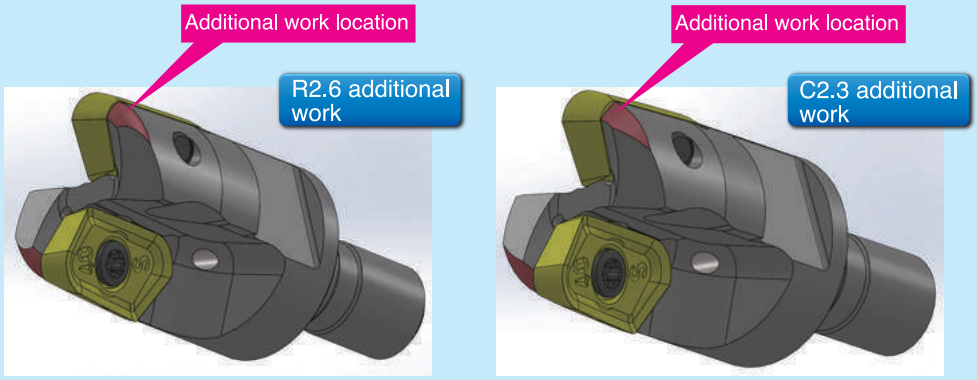
■ BODY / FACE MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	φd	φd1	a	b	ℓ	Weight (kg)	Max. spindle speed (min⁻¹)	Insert	Parts: Clamp Screw	Parts: Wrench
Metric Bore	ALX4050R-22	●	4	50	50	45	22	16.5	10.4	6.3	20	0.4	24,000	XOGT1605 ○○PDER	DSW-4085	A-15T (Not included)
	ALX5063R-22	●	5	63	50	50	22	16.5	10.4	6.3	20	0.6	21,000			

Note) 1. Please refer page E310 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)

Clamp screw	Recommended torque (N·m)
DSW-4085	3.6

■ Insert with corner R4 (model number: XOGT160540PDFR) When using, additional machining points and manpower for the main body



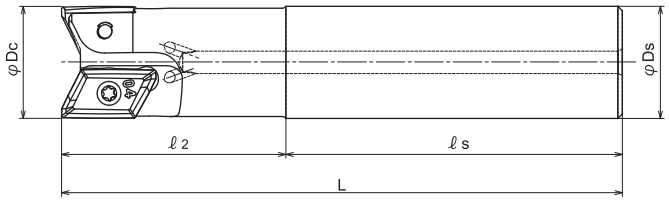
When using an insert with a corner R4, add R2.6 or C2.3 to the corner at the tip of the main body.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing and Multi-Functional milling

Aero Chipper ALX TYPE

G-Body Through Coolant Hole



■ BODY / END MILL TYPE

Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	ℓ2	ℓ	L	φDs	Max. spindle speed (min-1)	Insert	Parts: Clamp Screw	Parts: Wrench
												(Not included)
	ALXM1020S20	●	1	20	35	75	110	20	15,000		DSW-4075	
	ALXM2025S25	●	2	25	50	75	125	25	40,000			
Regular type	ALXM2028S25	●	2	28	50	75	125	25	36,000	XOGT1605○○PD○R	DSW-4085	A-15T
	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 E310 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)

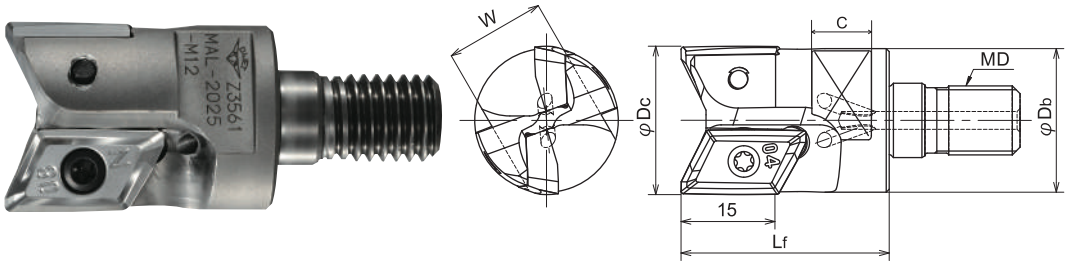
Clamp screw	Recommended torque (N•m)
DSW-4075	3.6
DSW-4085	3.6

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

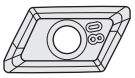
For Finishing and Multi-Functional milling

Aero Chipper Modular Head MAL TYPE

G-Body Through Coolant Hole



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Max. spindle speed (min⁻¹)	Inserts	Parts: Clamp Screw	Parts: Wrench
												(Not included)
MAL-1020-M10	●	1	**20**	35	19.5	M10	9	14	15,000		DSW-4075	
MAL-2025-M12	●	2	**25**	35	24	M12	10	17	40,000			
MAL-2028-M12	●	2	**28**	35	24	M12	10	17	36,000			
MAL-2030-M16	●	2	**30**	43	28	M16	12	22	34,000	XOGT1605◯◯	DSW-4085	A-15
MAL-2032-M16	●	2	**32**	43	29	M16	12	22	33,000	PD◯R		
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 E311 - E313 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)

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

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

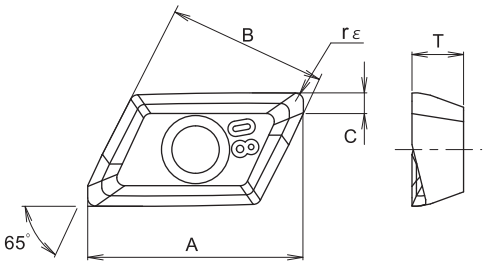
For Finishing and Multi-Functional milling

Aero Chipper ALX / 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	●	
XOGT160540PDFR	G	19.2	16.35	4.3	5	4	◎	
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		●
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 stocked ○: Soon to be deleted ※: Production after order received

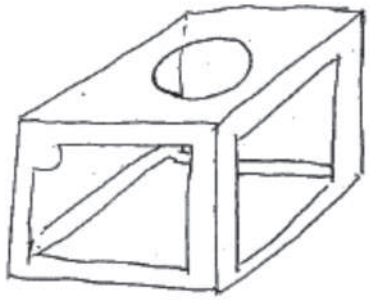
For Finishing and Multi-Functional milling

Aero Chipper ALX / MAL TYPE

CASE STUDIES

1.Pocket milling for Aluminium alloy

Work size : 580×600×760

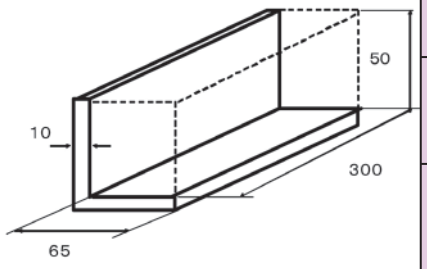


Work	Part name	Test piece
	Material	A5052
	Hardness	—
Tool	Tool No.	ALX4050R-22
	Grade	XOGT160504PDFR (FZ05)
Cutting conditions	Vc, (n)	1,885m/min (12,000min^{-1})
	Vf, (fz)	9,000mm/min (0.19mm/t)
	ap(mm)	5mm
	ae(mm)	50mm
	Coolant	Water soluble (External)
	Machine	Horizontal MC

Result: Metal removal rate was maximum Q=2,250cc/min. Low spindle load and good surface roughness.

2.Titanium alloy (Thin shape work)

Overhung length : 100mm



Work	Part name	Aircraft parts
	Material	Ti-6Al-4V
	Hardness	41HRC
Tool	Tool No.	ALX5063R
	Grade	XOGT160508PDER (JC5118)
Cutting conditions	Vc, (n)	40m/min (200min^{-1})
	Vf, (fz)	100mm/min (0.1mm/t)
	ap(mm)	8mm
	ae(mm)	40mm
	Coolant	Water soluble (External)
	Machine	Vertical MC

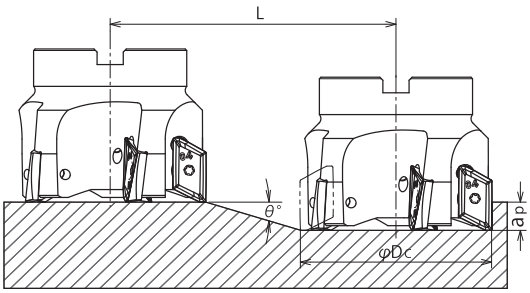
Result: Metal removal rate was maximum Q=32cc/min. No chattering on such thin shape work.

For Finishing and Multi-Functional milling

Aero Chipper ALX / MAL TYPE

INSTRUCTIONS FOR PROFILE MILLING

Ramping

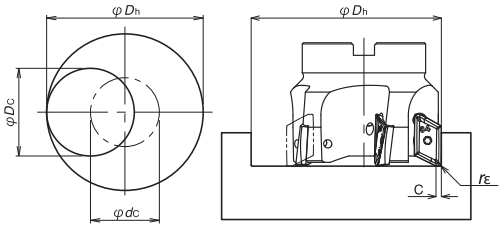


Tool dia. (mm)	Aluminium alloy		Stainless steel		Titanium alloy		Max. depth of cut (mm)
	Max. ramping angle (°)	Total cutting length(mm)	Max. ramping angle (°)	Total cutting length(mm)	Max. ramping angle (°)	Total cutting length(mm)	
φDc	θ°	L	θ°	L	θ°	L	ap
20	16	28	10	45	10	45	8
25	11	41	9	51	9	51	8
28	9	51	7	65	7	65	8
30	8	57	6	76	6	76	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 B139)
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, recommend wet cutting.

Helical Interpolation



- Calculation of tool pass dia.

$$\phi dc = \phi Dh - \phi Dc$$

Tool pass dia. Bore dia. Tool dia.

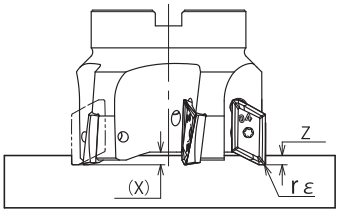
  - Max. bore dia. φDh= (φDc−rε−0.3)×2
  - Min. bore dia. φDh= (φDc−C+0.3)×2
- Depth of cut per one circuit should not exceed max. depth of cut ap
- Down cutting is recommended, so tool pass rotation should be counterclockwise.

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	35.8	38.6	15	9	9
25	45.8	48.6	13	11	11
28	51.8	54.6	12	10	10
30	55.8	58.6	11	10	10
32	59.8	62.6	11	10	10
35	65.8	68.6	11	11	11
40	75.8	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 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 B139).
3) In case of Titanium alloy and Stainless steel, feed per tooth up to 0.05mm 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
R4	1.5

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.

For Finishing and Multi-Functional milling

Aero Chipper ALX TYPE

■ RECOMMENDED CUTTING CONDITIONS

● FACE MILL TYPE

Work Materials	Insert Grades	Tool dia. (mm)									
		50					63				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	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 : Overhung length, ap : Axial depth of cut, ae : Width of cut, n : Spindle speed, Vf : Feed speed

Note) 1. The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2. In case chatter occurrs, recommend to reduce depth of cut or spindle speed.
3. In case of full slotting, recommend to reduce spindle speed and feed speed by 70% 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			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (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 Below 250HB	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
Titanium alloy 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			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (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 Below 250HB	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

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

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

For Finishing and Multi-Functional milling

Aero Chipper Modular Head MAL TYPE

■ RECOMMENDED CUTTING CONDITIONS / NARROW SHOULDER MILLING

● MAL type + MSN Carbide Shank Holder

Work Materials	Insert Grades	Tool dia. (mm)														
		20					25					28				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	75	10	4	14,000	840	90	15	5	12,000	4,800	90	12	5.6	11,000	2,640
		125	3	4	14,000	700	140	8	5	12,000	2,400	140	6	5.6	11,000	1,320
		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)														
		30					32					35				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	10	6	10,100	3,030	100	10	6.4	9,500	2,850	100	10	7	9,000	4,500
		150	6	6	10,100	1,620	150	6	6.4	9,500	1,520	150	5	7	9,000	2,700
		200	4	6	8,500	850	200	4	6.4	8,000	800	200	4	7	7,200	1,152
Stainless steel Below 250HB	JC5118	90	5	6	1,600	320	90	5	6.4	1,500	300	100	4	7	1,355	270
		120	3	6	1,300	130	120	3	6.4	1,200	120	150	3	7	1,100	110
Titanium alloy 35-43HRC	JC5118	90	10	6	640	130	90	10	6.4	600	120	100	10	7	545	109
		120	6	6	640	100	120	6	6.4	600	96	150	6	7	545	76

Work Materials	Insert Grades	Tool dia. (mm)														
		40														
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)										
Aluminium alloy 50-110HB	FZ05	100	12	8	7,800	5,850										
		150	8	8	7,800	3,510										
		200	5	8	6,400	1,920										
Stainless steel Below 250HB	JC5118	100	4	8	1,200	360										
		150	2	8	950	143										
Titanium alloy 35-43HRC	JC5118	100	12	8	480	144										
		150	6	8	480	101										

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

■ NOTE

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

For Finishing and Multi-Functional milling

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

Work Materials	Insert Grades	Tool dia. (mm)														
		30					32					35				
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	7	21	10,100	3,030	100	7	22	9,500	2,850	100	8	25	9,000	3,600
		150	4	21	10,100	1,620	150	4	22	9,500	1,520	150	5	25	9,000	1,800
		200	2	21	8,530	850	200	2	22	8,000	800	200	3	25	7,200	1,000
Stainless steel Below 250HB	JC5118	90	3	21	1,600	260	90	3	22	1,500	240	100	2	25	1,355	217
		120	1	21	1,280	130	120	1	22	1,200	120	150	1	25	1,100	110
Titanium alloy 35-43HRC	JC5118	90	7	21	640	100	90	7	22	600	96	100	8	25	545	87
		120	3	21	640	64	120	3	22	600	60	150	4	25	545	55

Work Materials	Insert Grades	Tool dia. (mm)														
		40														
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)										
Aluminium alloy 50-110HB	FZ05	100	8	28	7,800	5,850										
		150	6	28	7,800	2,800										
		200	4	28	6,400	1,500										
Stainless steel Below 250HB	JC5118	100	2	28	1,200	288										
		150	1	28	950	114										
Titanium alloy 35-43HRC	JC5118	100	8	28	480	115										
		150	3	28	480	72										

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

■ NOTE

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

For Finishing and Multi-Functional milling

Aero Chipper Modular Head ALX / MAL TYPE

■ RECOMMENDED CUTTING CONDITIONS / SLOTTING

● MAL type + MSN Carbide Shank Holder

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

Work Materials	Insert Grades	Tool dia. (mm)											
		30				32				35			
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy 50-110HB	FZ05	100	6	10,100	4,040	100	6	9,500	3,800	100	6	9,000	3,600
		150	3	10,100	2,020	150	3	9,500	1,900	150	4	9,000	1,800
		200	2	8,500	1,360	200	2	8,000	1,280	200	2	7,200	1,150
Stainless steel Below 250HB	JC5118	90	2	1,600	260	90	2	1,500	240	100	2	1,355	217
		120	1	1,280	130	120	1	1,200	120	120	1	1,100	110
Titanium alloy 35-43HRC	JC5118	90	8	530	85	90	8	500	80	100	8	450	72
		120	4	530	64	120	4	500	60	120	4	450	54

Work Materials	Insert Grades	Tool dia. (mm)											
		40											
		ℓ (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)								
Aluminium alloy 50-110HB	FZ05	100	8	7,800	4,680								
		150	5	7,800	3,510								
		200	3	6,400	1,920								
Stainless steel Below 250HB	JC5118	100	2	1,200	288								
		150	1	950	114								
Titanium alloy 35-43HRC	JC5118	100	8	400	96								
		150	4	400	72								

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

■ NOTE

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

For General Purpose, Face Milling, Shoulder Milling

Dijet Mill 45 / 90 — SSE45 / SSD90 TYPE

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～φ250)

Face Milling

SSD90 type
- Entering angle : 90°
- For Shoulder Milling (φ50～φ200)

Face Milling Shoulder Milling

- Adopted ultra-rigid G-Body G-Body
- Carbide shim gives longer tool life of cutter body
- For SSE45 Ultra Fine Pitch type is available

SSE45 Type

G-Body

- Entering angle : 45°
- For Face Milling

SSD90 Type

G-Body

- Entering angle : 90°
- For Shoulder Milling

For General Purpose, Face Milling, Shoulder Milling

Dijet Mill 45 SSE45 TYPE

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.

Face Milling

G-Body

Ultra-rigid body gives longer tool life.

1. Adopted ultra-rigid and improved body durability "G-Body". And also 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.

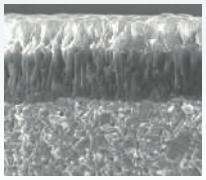
G-Body

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.

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-AR2O3 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



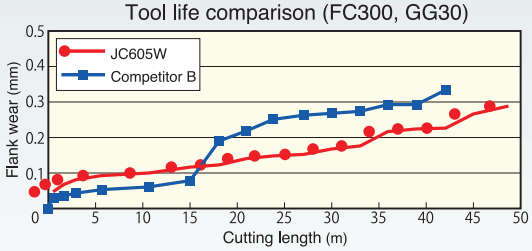
- α-AR2O3 layer with improved oxidation resistance and smooth surface treatment
- Ti(C,N) layer with improved chipping resistance
- Substrate gives excellent wear and chipping resistance

Applicable range of JC605W

Type	Finishing or light cutting		Medium cutting	Heavy cutting
ISO code	K01	K10	K20	K30
Wear-resistance ↑ / Chipping-resistance ↓	JC605W			

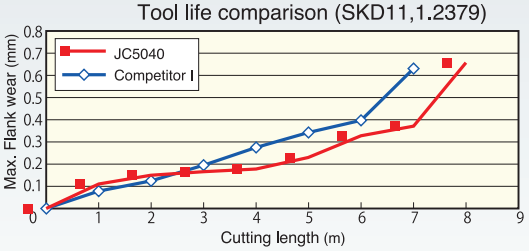
CUTTING PERFORMANCE

Tool life comparison (FC300, GG30)



Materialk : 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)

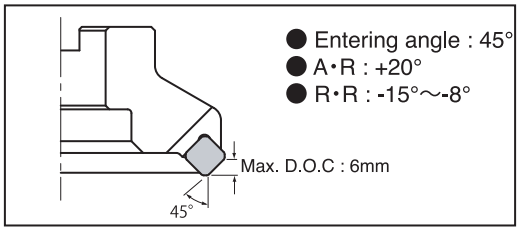


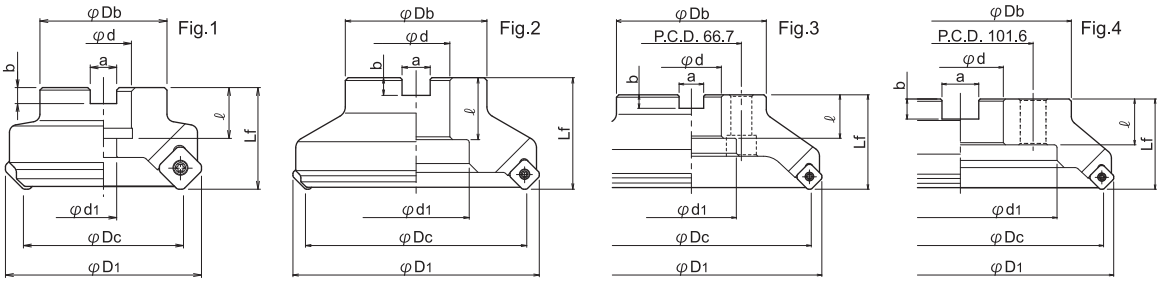
Material : SKD11 (1.2379),
Insert No. : SEMT13T3AGSN-PM (JC5040)
Tool dia. : ϕ100mm
Cutting conditions : Vc=120m/min, n=382min-1,
f=0.2mm/rev (1N), ap=2mm, ae=76mm,
Shoulder milling, Down cut, Air blow

For General Purpose, Face Milling, Shoulder Milling

Dijet Mill 45 — SSE45 TYPE

G-Body





■ BODY

Bore	Type	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	φD1	φDb	Lf	φd	φd1	a	b	ℓ	Weight (kg)	Fig.
Metric Bore	Fine pitch	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
	Ultra fine pitch	SSE45-5050R-22	●	5	50	63	45	40	22	10.4	10.4	6.3	20	0.4	1
		SSE45-6063R-22	●	6	63	76.1	50	40	22	10.4	10.4	6.3	20	0.6	1
		SSE45-8080R-27	●	8	80	93.1	56	50	27	13.5	12.4	7	22	1.1	1
		SSE45-10100R-32	●	10	100	113.3	70	50	32	17.5	14.4	8	25	1.6	1
		SSE45-12125R-40	●	12	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 E318 for recommended cutting conditions.

●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For General Purpose, Face Milling, Shoulder Milling

Dijet Mill 45 SSE45 TYPE

INSERTS

Fig.1

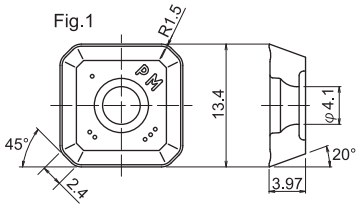


Fig.2

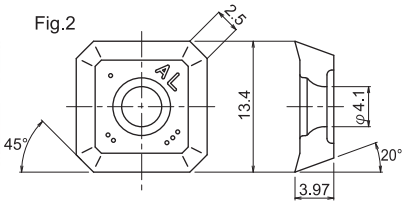
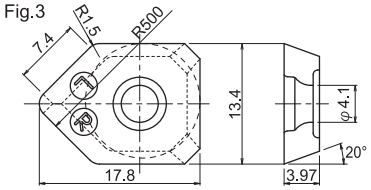


Fig.3

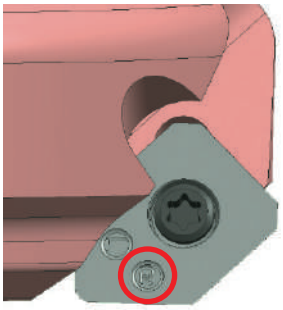


Cat. No.	Tole-rance	PVD coated				CVD coated	Uncoated	Fig.
		JC5040	DH103	JC8015	JC8050	JC605W	FZ05	
SEMT13T3AGSN-PM	M	●		●	●			1
SEMT13T3AGSN-KM	M					●		1
SEGT13T3AGFN-AL	G						●	2
XEHW13T3AGSN-W(Wiper insert)	H		●					3

10 inserts per case.

Clamp screw	Recommended torque (N·m)
TSW-3512H	3.0
SSW-535	6.5

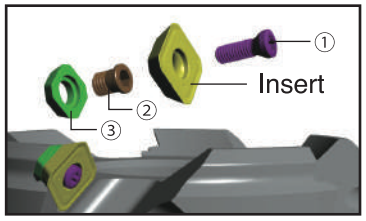
ATTENTION TO USING WIPER INSERT



- In case of feed per rev fz≧2mm/rev and surface roughness is required, we recommend 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 stocked ○: Soon to be deleted ※: Production after order received

For General Purpose, Face Milling, Shoulder Milling

Dijet Mill 45 — SSE45 TYPE

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)	204m/min, (260min^{-1})
	Vf, (fz)	728mm/min, (0.2mm/t)
	ap(mm)	2.5×2mm
	ae(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 unfavorable conditions, insert grade JC8050 is recommended.

For General Purpose, Face Milling, Shoulder Milling

Dijet Mill 90 SSD90 TYPE

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 ultra-rigid "G-Body" improved body durability .
   And also adopted carbide shim prevents body damage and improves security in case if insert is broken.

G-Body

SSD90 gives wide application for cast iron, general steel and hardened steel.

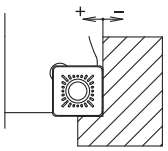
JC5040 is suitable for general steel, JC605W for cast iron, JC8015 for nodular cast iron and hardened steel and tough grade JC8050 for unfavorable conditions.

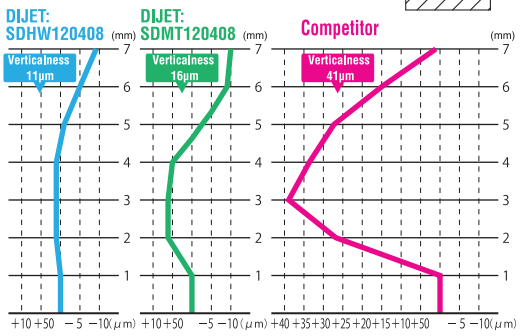
G-Body Special surface-hardening treatment on thermal heat resistant high speed steel gives high hardness over 65HRC and secure insert pocket and holder against thermal deformation. This G-body is anti-vibration & highly tough. This results into increased tool life by 30% or more compared with general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

CUTTING PERFORMANCE

1. Verticalness comparison

Material : S50C (C50)
Cutting conditions :
Vc=120m/min, fz=0.15mm/t,
ap=8mm, ae=2.5mm

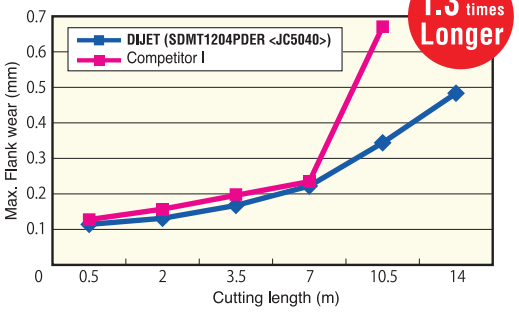




Theoretical verticalness of SSD90 : 11μm (11mm width), 8μm (3mm width)

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

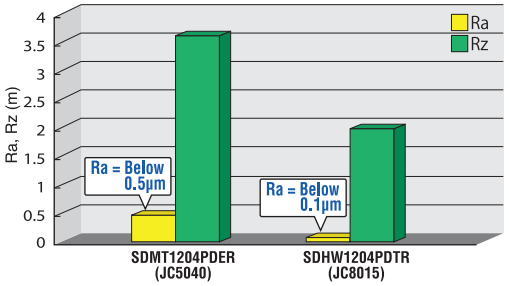


SSD90 tool achieved 1.3 times longer tool life.

3. Surface roughness comparison

Material : SKD61 (1.2344) Raw material
Cutting conditions : Vc=200m/min, fz=0.15mm/t,
ap=2mm, ae=43mm

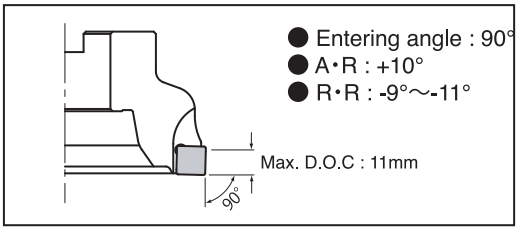
SDMT insert (M class) achieved below Ra=0.5μm.
SDHW insert (H class) achieved better surface roughness below Ra=0.1mm.

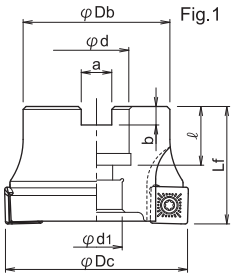


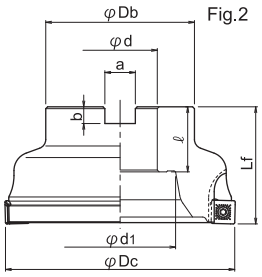
For General Purpose, Face Milling, Shoulder Milling

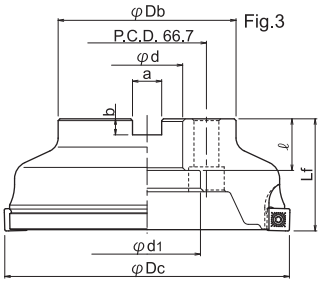
Dijet Mill 90 SSD90 TYPE

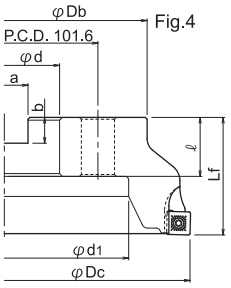
G-Body











■ BODY

Bore	Cat. No.	Stock	No. of flutes	Dimensions (mm) φDc	φDb	Lf	φd	φd1	a	b	ℓ	Weight (kg)	Fig.
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
	SSD90-12160R-40	※	12	160	100	63	40	60	16.4	9	29	4.5	3
	SSD90-16200R-60	※	16	200	155	63	60	135	25.7	14	32	7.5	4

Note) All cutters are supplied without inserts.

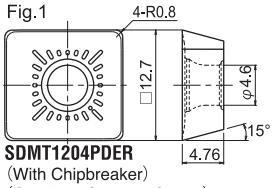
● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For General Purpose, Face Milling, Shoulder Milling

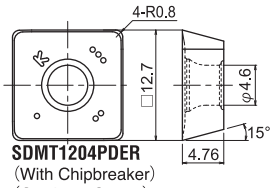
Dijet Mill 90 SSD90 TYPE

INSERTS

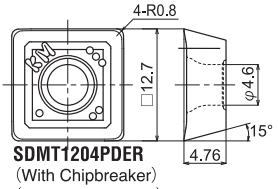
Fig.1



SDMT1204PDER
(With Chipbreaker)
(Grade：JC8050, JC5040)

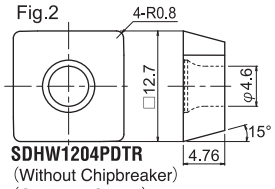


SDMT1204PDER
(With Chipbreaker)
(Grade：JC8015)



SDMT1204PDER
(With Chipbreaker)
(Grade： JC605W)

Fig.2



SDHW1204PDTR
(Without Chipbreaker)
(Grade：JC8015)

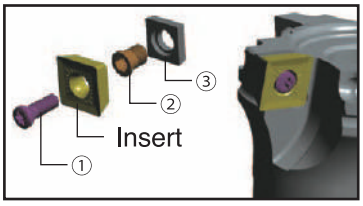
Clamp screw	Recommended torque (N·m)
TSW-3512H	2.1
SSW-535	6.5

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 unfavorable conditions, insert grade JC8050 is recommended.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball Neo SWBX / MSWX TYPE

Swing Ball NEO
Indexable Ball Nose End Mill
SWBX/MSWX

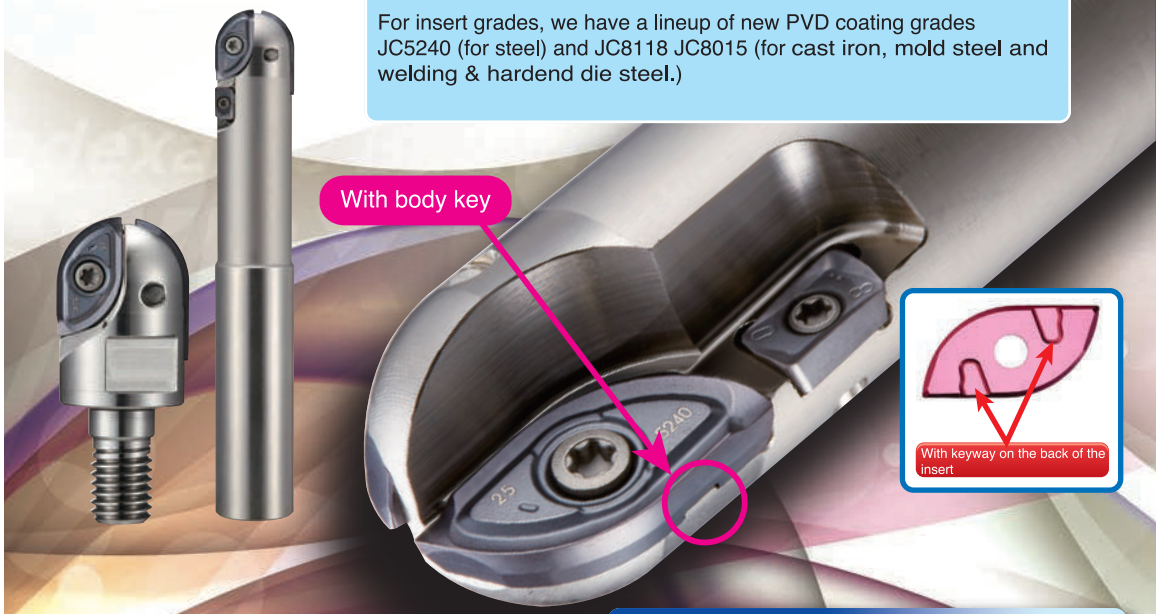
Shoulder Milling | Copy Milling | Slotting

Features

By providing a convex key with a unique shape on the main body (patent pending), the insert can be firmly fixed, and stable roughing and overlay machining are possible in the three-dimensional shape machining of dies. Blade / secondary blade shape (type with key groove).

By suppressing the movement of the insert and stabilizing the insert mounting repeatability, it can be applied not only in rough machining but also in the semi-finishing machining area.

For insert grades, we have a lineup of new PVD coating grades JC5240 (for steel) and JC8118 JC8015 (for cast iron, mold steel and welding & hardend die steel.)



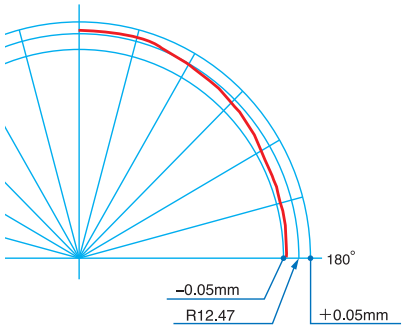
Insert grade

For steel → JC5240

For cast iron, mold steel and welding & hardend die steel. → JC8118 JC8015

Insert with breaker for low cutting force (-HM/-HS type) adopted 2 insert grades: coated grade "JC5240" for steel improved both fracture toughness and wear resistance. "JC8118" can be widely applied such as general & mold steel and cast iron. Strong edge type Insert (-MMW/-MSW type) adopted "JC8118"&"JC8015" is possible to machine welding & hardened die steel (50-60HRC).

Radius form accuracy for rotation



Insert No. :
SWBX225HM / HS (Insert for ϕ25 (R12.5))
Measured value: R12.463

For Roughing and Shape Milling

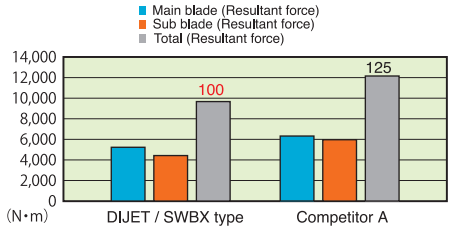
Swing Ball Neo SWBX / MSWX TYPE

CUTTING PERFORMANCE

Cutting force comparison

1. Low cutting depth

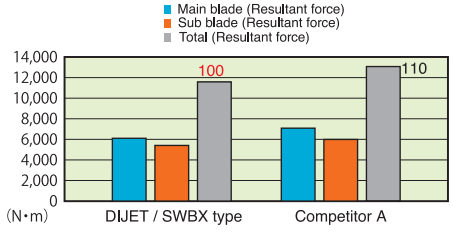
Material : SKD 11 1.2379, D2 (raw)
Tool dia. : ϕ25mm
n=2,548min^{-1} , V_c=200m/min, V_f=1,019mm/min, f=0.4mm/rev,
a_p=8mm, a_e=7mm, Down cut, dry



* When SWBX type is 100

2. High cutting depth

Material : SKD 11 1.2379, D2 (raw)
Tool dia. : ϕ25mm
n=2,548min^{-1} , V_c=200m/min, V_f=764mm/min, f=0.3mm/rev,
a_p=12.5mm, a_e=5mm, Down cut, dry



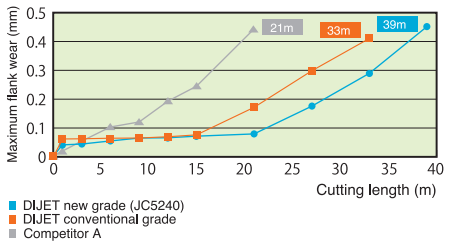
* When SWBX type is 100

In case of low cutting depth, SWBX type insert reduced 25% cutting force compared with competitor A. In case of high cutting depth reduced 10% cutting force.

Tool life comparison

1. SKD 11 1.2379, D2 (raw)

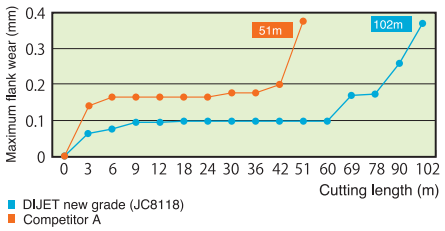
Material : SKD 11 1.2379, D2 (raw)
Tool dia. : ϕ20mm Overhung length : 50mm
Insert : SWBX220HM/HS (JC5240),
n=3,000min^{-1} , V_c=188m/min, V_f=750mm/min, f=0.25mm/rev,
a_p=5mm, a_e=4mm, Down cut, dry



SWBX type insert improved tool life by 1.8 times compared with competitor A, and 1.2 times compared with conventional grade.

2. SUS304 (Stainless steel)

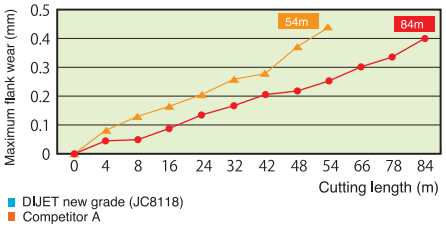
Material : SUS304 (Stainless steel)
Tool dia. : ϕ16mm Overhung length : 50mm
Insert : SWBX216HM/HS (JC8118)
n=3,980min^{-1} , V_c=200m/min, V_f=2,388mm/min, f=0.6mm/rev,
a_p=1mm, a_e=1.6mm, Down & Up cut, wet



SWBX type insert improved tool life by 2 times compared with competitor A.

3. SKD 11 1.2379, D2 (Welding, 60HRC)

Material : SKD 11 1.2379, D2 (welding, 60HRC)
Tool dia. : ϕ25mm
Insert : SWBX225MMW/MSW (JC8118)
n=1,898min^{-1} , V_c=149m/min, V_f=759mm/min, f=0.4mm/rev,
a_p=0.5mm,a_e=0.7mm, Down & Up cut, dry

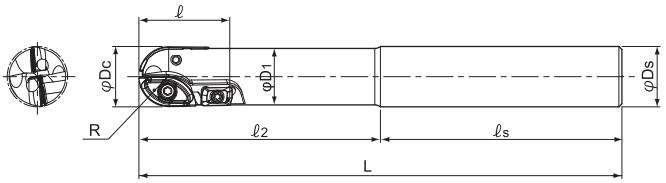


SWBX type insert improved tool life by 1.6 times compared with competitor A.

For Roughing and Shape Milling

Swing Ball Neo

SWBX TYPE



Cat No.	Stock	No. of Inserts			Dimensions (mm)							
		Main blade	Sub Blade	Peripheral Insert	R	φDc	ℓ	ℓ2	ℓs	L	φD1	φDs
SWBX-16050-S16	●	1	1		8	16	15	50	80	130	15	16
SWBX-20080-S20	●	1	1	1	10	20	29	80	80	160	18.7	20
SWBX-20120-S20	●	1	1	1	10	20	29	120	80	200	18.7	20
SWBX-25080-S25	●	1	1	1	12.5	25	33	80	80	160	23.5	25
SWBX-25120-S25	●	1	1	1	12.5	25	33	120	80	200	23.5	25
SWBX-30120-S32	●	1	1	1	15	30	38	120	80	200	28.8	32
SWBX-30170-S32	●	1	1	1	15	30	38	170	80	250	29	32

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
3. Please refer page E329 - E332 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball Neo SWBX TYPE

Fig.1 (Main blade, low resistance type)

Fig.2 (for main blade and overlay machining)

Fig.3 (Secondary blade, low resistance type)

Fig.4 (for secondary blade / overlay machining)

Fig.5 (Outer blade)

(Continued from the previous page)

Cat No.	No. of Inserts			Parts			
				Clamp screw		Wrench	
	Main blade	Sub Blade	Peripheral Blade	For main & sub	For peripheral	For main & sub	For peripheral
						(Not included)	
SWBX-16050-S16	SWBX216HM SWBX216MMW	SWBX216HS SWBX216MSW		DSW-2563H		A-08SD	
SWBX-20080-S20	SWBX220HM SWBX220MMW	SWBX220HS SWBX220MSW	ZPMT100308ZER-PL	DSW-307H	TSW-2556H	A-10	A-08
SWBX-20120-S20	SWBX220HM SWBX220MMW	SWBX220HS SWBX220MSW	ZPMT100308ZER-PL	DSW-307H	TSW-2556H	A-10	A-08
SWBX-25080-S25	SWBX225HM SWBX225MMW	SWBX225HS SWBX225MSW	ZPMT100308ZER-PL	TSW-410H	TSW-2556H	A-15	A-08
SWBX-25120-S25	SWBX225HM SWBX225MMW	SWBX225HS SWBX225MSW	ZPMT100308ZER-PL	TSW-410H	TSW-2556H	A-15	A-08
SWBX-30120-S32	SWBX230HM SWBX230MMW	SWBX230HS SWBX230MSW	ZPMT100308ZER-PL	DSW-511H	DSW-2563H	A-20	A-08SD
SWBX-30170-S32	SWBX230HM SWBX230MMW	SWBX230HS SWBX230MSW	ZPMT100308ZER-PL	DSW-511H	DSW-2563H	A-20	A-08SD

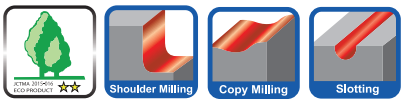
Clamp Screw	Recommended Torque (N·m)
DSW-2563H	1.1
DSW-307H	2.1
TSW-410H	3.5
DSW-511H	6.1
TSW-2556H	1.1

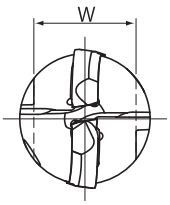
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

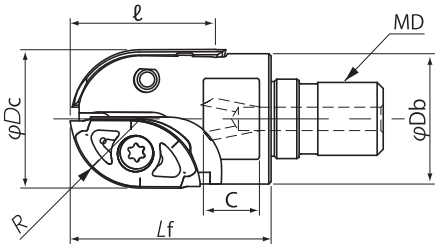
For Roughing and Shape Milling

Swing Ball Neo Modular Head MSWX TYPE

Through Coolant Hole







Cat No.	Stock	No. of Inserts		Dimensions (mm)								No. of Inserts		Parts	
		Main blade	Sub Blade	R	φDc	ℓ	Lf	φDb	MD	C	W	Main blade	Sub Blade	Clamp screw	Wrench (Not included)
MSWX-1615-M8	●	1	1	8	16	15	23	15	M8	8	12	SWBX216HM SWBX216MMW	SWBX216HS SWBX216MSW	DSW-2563H	A-08SD
MSWX-2022-M10	●	1	1	10	20	22	30	18.7	M10	10	14	SWBX220HM SWBX220MMW	SWBX220HS SWBX220MSW	DSW-307H	A-10
MSWX-2525-M12	●	1	1	12.5	25	25	35	23.5	M12	11	19	SWBX225HM SWBX225MMW	SWBX225HS SWBX225MSW	TSW-410H	A-15
MSWX-3031-M16	●	1	1	15	30	31	43	27.9	M16	12	22	SWBX230HM SWBX230MMW	SWBX230HS SWBX230MSW	DSW-511H	A-20

Note) 1. All cutters are supplied without inserts.
2. All cutters are supplied without wrench & MOLY.
3. Please refer page E333 - E334 for recommended cutting conditions.

Clamp Screw	Recommended Torque (N·m)
DSW-2563H	1.1
DSW-307H	2.1
TSW-410H	3.5
DSW-511H	6.1

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball Neo SWBX / MSWX TYPE

INSERTS

Fig.1 (Main blade, low resistance type)

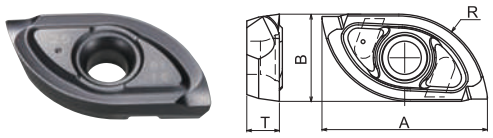


Fig.2 (for main blade and overlay machining)

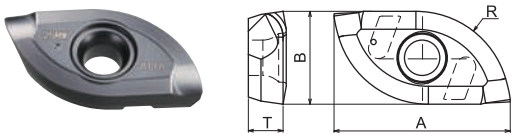


Fig.3 (Secondary blade, low resistance type)

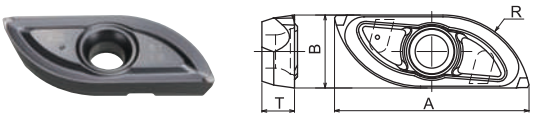


Fig.4 (for secondary blade / overlay machining)

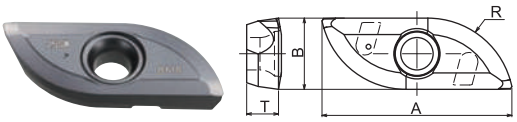
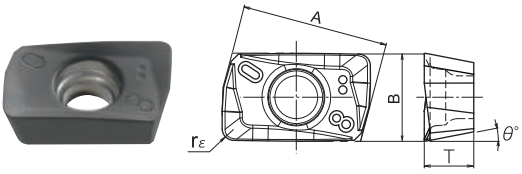


Fig.5 (Outer blade)



Cat No.	Type	PVD Coated			Dimensions (mm)					Fig.
		JC5240	JC8118	JC8015	R	A	B	T	r	
SWBX216HM	Main blade, low resistance type	●	●		8	15	7.9	3.3	–	1
SWBX216MMW	For main blade and overlay machining		●		8	15	7.9	3.3	–	2
SWBX216HS	Secondary blade, low resistance type	●	●		8	16.1	6.6	3.3	–	3
SWBX216MSW	For secondary blade and overlay machining		●		8	16.1	6.6	3.3	–	4
SWBX220HM	Main blade, low resistance type	●	●		10	18.8	9.9	3.9	–	1
SWBX220MMW	For main blade and overlay machining		●		10	18.8	9.9	3.9	–	2
SWBX220HS	Secondary blade, low resistance type	●	●		10	22.9	8.8	3.9	–	3
SWBX220MSW	For secondary blade and overlay machining		●		10	22.9	8.8	3.9	–	4
SWBX225HM	Main blade, low resistance type	●	●		12.5	22.3	12.4	4.6	–	1
SWBX225MMW	For main blade and overlay machining		●		12.5	22.3	12.4	4.6	–	2
SWBX225HS	Secondary blade, low resistance type	●	●		12.5	26.3	10.5	4.6	–	3
SWBX225MSW	For secondary blade and overlay machining		●		12.5	26.3	10.5	4.6	–	4
SWBX230HM	Main blade, low resistance type	●	●		15	27.9	14.7	6	–	1
SWBX230MMW	For main blade and overlay machining			●	15	27.9	14.7	6	–	2
SWBX230HS	Secondary blade, low resistance type	●	●		15	32.8	12.3	6	–	3
SWBX230MSW	For secondary blade and overlay machining			●	15	32.8	12.3	6	–	4
ZPMT100308ZER-PL	Outer blade		●		–	10	6	3.4	0.8	5

10 inserts per case.

Note) 1. Refer to pages E329 - E332 for recommended cutting conditions and page E333 for form errors during grooving.
2. Be sure to use the same type and the same grade of the main blade and secondary blade in combination.

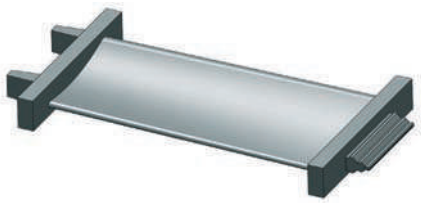
● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For Roughing and Shape Milling

Swing Ball Neo SWBX / MSWX TYPE

CASE STUDIES

1. Turbine blade machining example

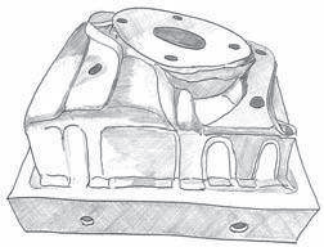


Protruding : 50mm

Work	Part name	Turbine blade
	Material	Stainless steel (equivalent to SUS420J1)
	Hardness	—
Tool	Tool No.	Arbor: MSN-M8-40-S16C Modular Head: MSWX-1615-M8
	Grade	SW BX216HM / HS (JC8118)
Cutting conditions	Rotation speed, cutting speed	n=2,300min^{-1} (Vc=115m/min)
	Feed speed	Vf=1,051mm/min (f=0.46mm/rev)
	ap(mm)	1mm
	ae(mm)	1mm
	Coolant	Water-soluble cutting oil
	Machine	Vertical MC

Result: There is no chatter and the processed surface is also good. Achieved triple from 100 to 300. Half the processing time and life compared to the current products made by other companies

2. Press die machining example

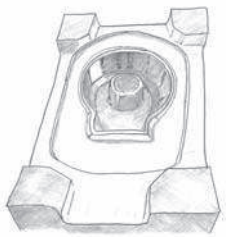


Protruding : 65mm

Work	Part name	Press die
	Material	Equivalent to SKD11
	Hardness	59HRC
Tool	Tool No.	Arbor: MSN-M10-40-S20C Modular Head: MSWX-2022-M10 Equivalent to SKD11
	Grade	SW BX220MMW / MSW (JC8118)
Cutting conditions	Rotation speed, cutting speed	n=2,500min^{-1} (Vc=157m/min)
	Feed speed	Vf=1,500mm/min (f=0.6mm/rev)
	ap(mm)	0.4mm
	ae(mm)	0.4mm
	Coolant	Coolant
	Machine	Vertical MC (HSK63)

Result: Can be used continuously with less wear. Cutting length about 2km, 17.5 hours machining

3. Forging mold machining example

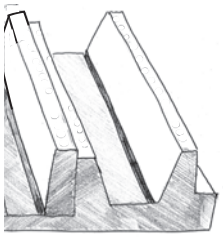


Protruding : 80mm

Work	Part name	Forging mold
	Material	SKT4
	Hardness	42HRC
Tool	Tool No.	SWBX-25080-S25
	Grade	SWBX225MMW/MSW(JC8118)
Cutting conditions	Rotation speed, cutting speed	n=1,850min^{-1} (Vc=145m/min)
	Feed speed	Vf=900mm/min (f=0.49mm/rev)
	ap(mm)	Rough 2mm, finish 1mm
	ae(mm)	Rough 4mm, finish 1mm
	Coolant	Air blow
	Machine	Vertical MC

Result: The processed surface is also good without chattering. Roughing and finishing for a total of 20 hours.

4. Example of overlay machining



Protruding : 120mm

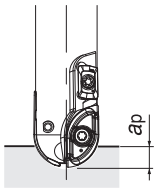
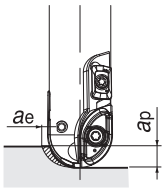
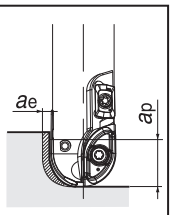
Work	Part name	Press die
	Material	SKD11 + buildup (MoCr system)
	Hardness	60HRC+55HRC
Tool	Tool No.	SWBX-30120-S32
	Grade	SWBX230MMW/MSW(JC8015)
Cutting conditions	Rotation speed, cutting speed	n=3,000min^{-1} (Vc=283m/min)
	Feed speed	Vf=1,800mm/min (f=0.6mm/rev)
	ap(mm)	1mm
	ae(mm)	1mm
	Coolant	Air blow
	Machine	Vertical MC

Result: Stable with normal wear without chipping. The overlay is processed for 1 hour.

For Roughing and Shape Milling

Swing Ball Neo SWBX TYPE

■ φ16mm Swing Ball Neo Recommended Cutting Conditions

Type of Machining							
Work Materials	Model No.	Insert Grades	Cutting conditions	Slotting	Shoulder milling (Shallow)		Shoulder milling (Deep)
Carbon steel S50C, S55C (C50, C55) Below 250HB	HM/HS	JC5240 (JC8118)	n (min-1)	4,000	4,000	4,000	3,400
			Vf (mm/min)	560	1,000	800	680
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Cast steel (GM 190, IDC5) Hardness 285HB or less	HM/HS	JC5240 (JC8118)	n (min-1)	3,800	3,800	3,800	3,400
			Vf (mm/min)	530	950	760	680
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	HM/HS	JC5240 (JC8118)	n (min-1)	3,400	3,400	3,400	2,900
			Vf (mm/min)	680	740	680	640
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	HM/HS	JC8118	n (min-1)	3,400	3,400	3,400	3,200
			Vf (mm/min)	680	740	680	640
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	HM/HS	JC8118	n (min-1)	3,000	3000	3000	2,800
			Vf (mm/min)	430	600	600	640
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	MMW/MSW (HM/HS)	JC8118	n (min-1)	2,200	2,200	2,200	—
			Vf (mm/min)	260	440	330	—
			ap (mm)	2	2	6	—
			ae (mm)	—	2	1	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	MMW/MSW	JC8118	n (min-1)	1,200	1,700	—	—
			Vf (mm/min)	150	400	—	—
			ap (mm)	1	~1	—	—
			ae (mm)	—	2	—	—
Gray cast iron (FC250) Hardness 160-260HB	HM/HS (MMW/MSW)	JC8118	n (min-1)	3,800	3,800	3,800	2,800
			Vf (mm/min)	950	1,400	1300	700
			ap (mm)	4	4	8	12
			ae (mm)	—	5	4	1
Cast Iron Ductile (FCD700) Hardness 170-300HB	HM/HS	JC5240 (JC8118)	n (min-1)	3,800	3,800	3,800	3,400
			Vf (mm/min)	530	950	760	680
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	HM/HS	JC8118	n (min-1)	3,400	3,400	3,400	3,200
			Vf (mm/min)	680	740	680	640
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr	HM/HS	JC8118	n (min-1)	4,000	4,000	4,000	3,400
			Vf (mm/min)	560	1,000	800	680
			ap (mm)	4	4	8	12
			ae (mm)	—	3	4	1

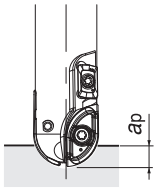
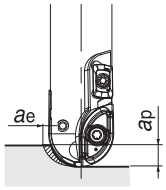
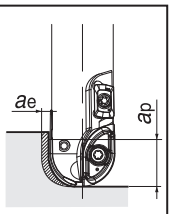
n : Spindle speed, Vf : Feed speed, ap : Depth of cut, ae : Pick feed

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

For Roughing and Shape Milling

Swing Ball Neo SWBX / MSWX TYPE

■ φ20mm Swing Ball Neo Recommended Cutting Conditions

Type of Machining							
Work Materials	Model No.	Insert Grades	Cutting conditions	Slotting	Shoulder milling (Shallow)		Shoulder milling (Deep)
Carbon steel S50C, S55C (C50, C55) Below 250HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	3,180	3,180	3,180	2,680
			Vf (mm/min)	890	1,000	800	570
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Cast steel (GM 190, IDC5) Hardness 285HB or less	HM/HS	JC5240 (JC8118)	n (min⁻¹)	3,020	3,020	3,020	2,700
			Vf (mm/min)	820	920	760	540
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,700	2,700	2,700	2,390
			Vf (mm/min)	680	810	630	480
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	HM/HS	JC8118	n (min⁻¹)	3,020	3,020	3,020	2,700
			Vf (mm/min)	450	650	600	540
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	HM/HS	JC8118	n (min⁻¹)	2,700	2,700	2,700	2,400
			Vf (mm/min)	400	580	530	480
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	MMW/MSW (HM/HS)	JC8118	n (min⁻¹)	1,750	1,750	1,750	—
			Vf (mm/min)	350	400	320	—
			ap (mm)	~2	~2	~4	—
			ae (mm)	—	3	4	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	MMW/MSW	JC8118	n (min⁻¹)	1,400	1,400	—	—
			Vf (mm/min)	280	350	—	—
			ap (mm)	~1	~1	—	—
			ae (mm)	—	3	—	—
Gray cast iron (FC250) Hardness 160-260HB	HM/HS (MMW/MSW)	JC8118	n (min⁻¹)	3,180	3,180	3,180	2,860
			Vf (mm/min)	1,160	1,300	1,040	740
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Cast Iron Ductile (FCD700) Hardness 170-300HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	3,020	3,020	3,020	2,700
			Vf (mm/min)	820	920	760	540
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	HM/HS	JC8118	n (min⁻¹)	3,020	3,020	3,020	2,700
			Vf (mm/min)	450	650	600	540
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr	HM/HS	JC8118	n (min⁻¹)	3,180	3,180	3,180	2,680
			Vf (mm/min)	890	1,000	800	570
			ap (mm)	5	5	10	16
			ae (mm)	—	4	5	2

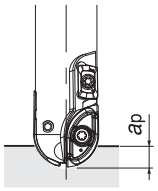
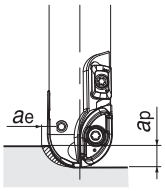
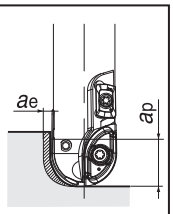
n : Spindle speed, Vf : Feed speed, ap : Depth of cut, ae : Pick feed

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

For Roughing and Shape Milling

Swing Ball Neo SWBX TYPE

■ φ25mm Swing Ball Neo Recommended Cutting Conditions

Type of Machining							
Work Materials	Model No.	Insert Grades	Cutting conditions	Slotting	Shoulder milling (Shallow)		Shoulder milling (Deep)
Carbon steel S50C, S55C (C50, C55) Below 250HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,550	2,550	2,550	2,290
			Vf (mm/min)	760	890	690	500
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Cast steel (GM 190, IDC5) Hardness 285HB or less	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,400	2,400	2,400	2,160
			Vf (mm/min)	720	840	640	480
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,160	2,160	2,160	1,910
			Vf (mm/min)	590	690	540	420
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	HM/HS	JC8118	n (min⁻¹)	2,400	2,400	2,400	2,160
			Vf (mm/min)	480	530	480	430
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	HM/HS	JC8118	n (min⁻¹)	2,100	2,100	2,100	1,900
			Vf (mm/min)	420	460	420	380
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	MMW/MSW (HM/HS)	JC8118	n (min⁻¹)	1,600	1,600	1,600	—
			Vf (mm/min)	350	400	350	—
			ap (mm)	~3	~3	~5	—
			ae (mm)	—	4	5	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	MMW/MSW	JC8118	n (min⁻¹)	1,400	1,400	—	—
			Vf (mm/min)	280	350	—	—
			ap (mm)	~2	~ 2	—	—
			ae (mm)	—	4	—	—
Gray cast iron (FC250) Hardness 160-260HB	HM/HS (MMW/MSW)	JC8118	n (min⁻¹)	2,550	2,550	2,550	2,290
			Vf (mm/min)	1,000	1,150	900	650
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Cast Iron Ductile (FCD700) Hardness 170-300HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,400	2,400	2,400	2,160
			Vf (mm/min)	720	840	640	480
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	HM/HS	JC8118	n (min⁻¹)	2,400	2,400	2,400	2,160
			Vf (mm/min)	480	530	480	430
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr	HM/HS	JC8118	n (min⁻¹)	2,550	2,550	2,550	2,290
			Vf (mm/min)	760	890	690	500
			ap (mm)	6	6	12.5	20
			ae (mm)	—	5	6.5	3

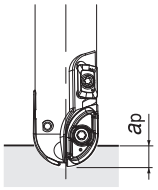
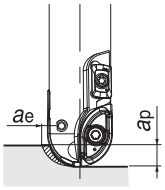
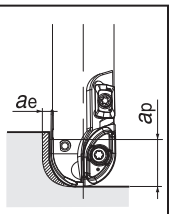
n : Spindle speed, Vf : Feed speed, ap : Depth of cut, ae : Pick feed

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

For Roughing and Shape Milling

Swing Ball Neo SWBX TYPE

■ φ30mm Swing Ball Neo Recommended Cutting Conditions

Type of Machining							
Work Materials	Model No.	Insert Grades	Cutting conditions	Slotting	Shoulder milling (Shallow)		Shoulder milling (Deep)
Carbon steel S50C, S55C (C50, C55) Below 250HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,300	2,300	2,300	1,800
			Vf (mm/min)	800	1,020	770	450
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Cast steel (GM 190, IDC5) Hardness 285HB or less	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,090	2,090	2,090	1,670
			Vf (mm/min)	720	920	700	420
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	1,950	1,950	1,950	1,560
			Vf (mm/min)	630	810	600	390
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	3
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	HM/HS	JC8118	n (min⁻¹)	2,060	2,060	2,060	1,650
			Vf (mm/min)	310	600	400	330
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	HM/HS	JC8118	n (min⁻¹)	1,800	1,800	1,800	1,500
			Vf (mm/min)	270	540	350	290
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	MMW/MSW (HM/HS)	JC8015 (JC8118)	n (min⁻¹)	1,600	1,600	1,600	—
			Vf (mm/min)	400	480	400	—
			ap (mm)	～4	～4	～6.5	—
			ae (mm)	—	5	8	—
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	MMW/MSW	JC8015	n (min⁻¹)	1,400	1,400	—	—
			Vf (mm/min)	280	350	—	—
			ap (mm)	～3	～3	—	—
			ae (mm)	—	5	—	—
Gray cast iron (FC250) Hardness 160-260HB	HM/HS (MMW/MSW)	JC8118 (JC8015)	n (min⁻¹)	2,300	2,300	2,300	1,840
			Vf (mm/min)	1,140	1,380	1,020	640
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Cast Iron Ductile (FCD700) Hardness 170-300HB	HM/HS	JC5240 (JC8118)	n (min⁻¹)	2,090	2,090	2,090	1,670
			Vf (mm/min)	720	920	700	420
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	HM/HS	JC8118	n (min⁻¹)	2,060	2,060	2,060	1,650
			Vf (mm/min)	310	600	400	330
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr	HM/HS	JC8118	n (min⁻¹)	2,300	2,300	2,300	1,800
			Vf (mm/min)	800	1,020	770	450
			ap (mm)	10	10	16	28
			ae (mm)	—	6	9	6

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

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

For Roughing and Shape Milling

Swing Ball Neo Modular Head MSWX TYPE

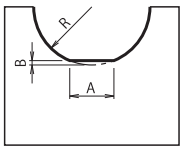
Recommended Cutting Conditions

Modular Head MSWX Anti Vibration type + All Carbide Shank Arbor for Modular Head

Work Materials	Model No.	Insert Grades	Dimensions (mm)														
			16					20					25				
			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	HM/HS	JC5240 (JC8118)	50	1.1	1.0	4,200	2,900	70	1.3	1.3	4,800	3,360	90	1.3	1.3	3,800	2,700
			100	0.7	0.7	4,200	2,900	120	0.8	0.8	4,800	3,360	140	0.8	0.8	3,800	2,700
			150	0.3	0.3	3,600	2,520	190	0.3	0.4	4,000	2,800	210	0.3	0.5	3,200	2,200
Cast steel (GM 190, IDC5) Hardness 285HB or less	HM/HS	JC8118 (JC5240)	50	1.1	1.0	4,000	2,800	70	1.3	1.3	4,000	2,800	90	1.3	1.3	3,200	2,240
			100	0.7	0.7	4,000	2,800	120	0.8	0.8	4,000	2,800	140	0.8	0.8	3,200	2,240
			150	0.3	0.3	3,400	2,380	190	0.3	0.4	3,600	2,500	210	0.3	0.5	2,800	1,960
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	HM/HS	JC5240 (JC8118)	50	1.1	1.0	4,000	2,800	70	1.3	1.3	4,000	2,800	90	1.3	1.3	3,200	2,240
			100	0.7	0.7	4,000	2,800	120	0.8	0.8	4,000	2,800	140	0.8	0.8	3,200	2,240
			150	0.3	0.3	3,400	2,400	190	0.3	0.4	3,600	2,500	210	0.3	0.5	2,800	1,960
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	HM/HS	JC8118	50	1.1	1.0	3,600	2,100	70	1.3	1.3	2,800	1,700	90	1.3	1.3	2,300	1,400
			100	0.7	0.7	3,600	2,100	120	0.8	0.8	2,800	1,700	140	0.8	0.8	2,300	1,400
			150	0.3	0.3	3,000	1,800	190	0.3	0.4	2,400	1,400	210	0.3	0.5	2,000	1,200
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	HM/HS	JC8118	50	1.1	1.0	3,600	2,100	70	1.3	1.3	2,800	1,700	90	1.3	1.3	2,300	1,400
			100	0.7	0.7	3,600	2,100	120	0.8	0.8	2,800	1,700	140	0.8	0.8	2,300	1,400
			150	0.3	0.3	3,000	1,800	190	0.3	0.4	2,400	1,400	210	0.3	0.5	2,000	1,200
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	MMW/ MSW (HM/HS)	JC8118	50	0.8	0.8	3,000	1,800	70	0.8	0.9	2,400	1,200	90	1.0	1.0	1,900	1,140
			100	0.6	0.6	2,800	1,400	120	0.6	0.7	2,200	1,100	140	0.8	0.8	1,800	900
			150	0.2	0.2	2,300	920	190	0.2	0.3	1,900	760	210	0.3	0.5	1,500	600
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	MMW/ MSW	JC8118	50	0.5	0.5	2,400	1,200	70	0.5	0.5	1,900	950	90	0.5	0.7	1,500	750
			100	0.3	0.3	2,200	880	120	0.3	0.4	1,800	800	140	0.3	0.5	1,400	560
			150	0.1	0.2	2,000	800	190	0.1	0.2	1,600	640	210	0.1	0.3	1,300	520
Gray cast iron (FC250) Hardness 160-260HB	HM/ HS (MMW/MSW)	JC8118	50	1.3	1.3	4,000	2,800	70	1.5	1.5	3,200	2,200	90	1.5	1.5	2,600	1,800
			100	1.0	1.0	4,000	2,800	120	1.0	1.0	3,200	2,200	140	1.0	1.0	2,600	1,800
			150	0.5	0.4	3,400	2,400	190	0.5	0.4	2,700	1,900	210	0.5	0.5	1,900	1,300
Cast Iron Ductile (FCD700) Hardness 170-300HB	HM/HS	JC8118 (JC5240)	50	1.1	1.0	4,000	2,800	70	1.3	1.3	4,000	2,800	90	1.3	1.3	3,200	2,240
			100	0.7	0.7	4,000	2,800	120	0.8	0.8	4,000	2,800	140	0.8	0.8	3,200	2,240
			150	0.3	0.3	3,400	2,380	190	0.3	0.4	3,600	2,500	210	0.3	0.5	2,800	1,960
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	HM/HS	JC8118	50	1.1	1.0	3,600	2,100	70	1.3	1.3	2,800	1,700	90	1.3	1.3	2,300	1,400
			100	0.7	0.7	3,600	2,100	120	0.8	0.8	2,800	1,700	140	0.8	0.8	2,300	1,400
			150	0.3	0.3	3,000	1,800	190	0.3	0.4	2,400	1,400	210	0.3	0.5	2,000	1,200
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr	HM/HS	JC8118	50	1.1	1.0	4,200	2,900	70	1.3	1.3	4,800	3,360	90	1.3	1.3	3,800	2,700
			100	0.7	0.7	4,200	2,900	120	0.8	0.8	4,800	3,360	140	0.8	0.8	3,800	2,700
			150	0.3	0.3	3,600	2,520	190	0.3	0.4	4,000	2,800	210	0.3	0.5	3,200	2,200

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

Swing Ball Neo Grooving Form



Note) A shape error as shown above will occur at the tip.

● SWBX type

R	A	B
8	0.5	0.01
10	1.2	0.02
12.5	1.4	0.02
15	1.7	0.03

For Roughing and Shape Milling

Swing Ball Neo Modular Head MSWX TYPE

Recommended Cutting Conditions

Modular Head MSWX Anti Vibration type + All Carbide Shank Arbor for Modular Head

Work Materials	Model No.	Insert Grades	Dimensions (mm) 30 ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	HM/HS	JC5240 (JC8118)	100	1.5	1.5	3,000	2,100
			150	1.0	1.0	3,000	2,100
			210	0.3	0.7	2,650	1,860
Cast steel (GM 190, IDC5) Hardness 285HB or less	HM/HS	JC8118 (JC5240)	100	1.5	1.5	2,600	1,820
			150	1.0	1.0	2,600	1,820
			210	0.3	0.7	2,300	1,600
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	HM/HS	JC5240 (JC8118)	100	1.5	1.5	2,600	1,820
			150	1.0	1.0	2,600	1,820
			210	0.3	0.7	2,300	1,600
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	HM/HS	JC8118	100	1.5	1.5	1,900	1,100
			150	1.0	1.0	1,900	1,100
			210	0.3	0.7	1,600	1,000
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	HM/HS	JC8118	100	1.5	1.5	1,900	1,100
			150	1.0	1.0	1,900	1,100
			210	0.3	0.7	1,600	1,000
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	MMW/ MSW (HM/HS)	JC8015 (JC8118)	100	1.0	1.2	1,600	960
			150	0.8	1.0	1,500	750
			210	0.3	0.8	1,300	520
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	MMW/ MSW	JC8015	100	0.6	0.8	1,300	650
			150	0.3	0.7	1,200	480
			210	0.1	0.5	1,100	440
Gray cast iron (FC250) Hardness 160-260HB	HM/ HS (MMW/MSW)	JC8118 (JC8015)	100	1.5	1.5	2,200	1,500
			150	1.0	1.0	2,200	1,500
			210	0.5	0.7	1,800	1,200
Cast Iron Ductile (FCD700) Hardness 170-300HB	HM/HS	JC8118 (JC5240)	100	1.5	1.5	2,600	1,820
			150	1.0	1.0	2,600	1,820
			210	0.3	0.7	2,300	1,600
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	HM/HS	JC8118	100	1.5	1.5	1,900	1,100
			150	1.0	1.0	1,900	1,100
			210	0.3	0.7	1,600	1,000
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr	HM/HS	JC8118	100	1.5	1.5	3,000	2,100
			150	1.0	1.0	3,000	2,100
			210	0.3	0.7	2,650	1,860

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

Swing ball Neo Plunge maximum plunge depth and feed

Work material	Maximum value	Tool diameter : ϕDc (mm) 16	20	25	30
Material FC, FCD, GM Cast iron	ap(mm)	3	4	5	10
	f (mm/rev)	0.25	0.30	0.40	0.40
Carbon steel, alloy steel, tool steel	ap(mm)	2	3	4	8
	f (mm/rev)	0.2	0.25	0.30	0.30

ap : Cutting depth f : Feed amount

For Roughing and Shape Milling

Swing Ball SWB / MSW TYPE

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

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. Body variety is the best in the world.

Added 50 types on existing 58 types for die and mold making operations. Extended Swing Ball series to 108 types.

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.

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 & chip ejection are improved by adopting notches on the cutting edge.

■ CUTTING PERFORMANCES

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

■ 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)				

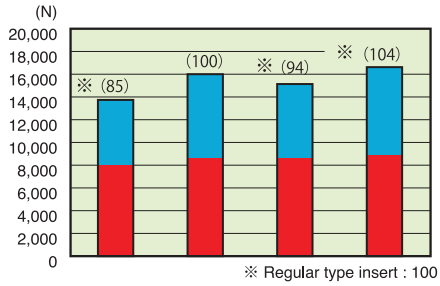
Not completely breaking chips by notch

For Roughing and Shape Milling

Swing Ball SWB / MSW 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

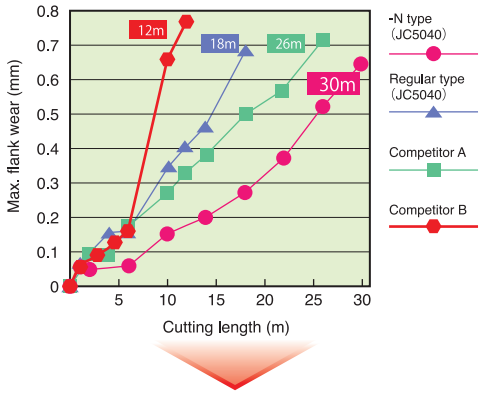


	-N type	Regular type	Competitor A	Competitor B
Main blade	5,890	7,525	6,454	7,783
Sub blade	7,901	8,524	8,671	8,925

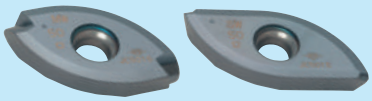
Compared with regular type insert, -N type insert (for low cutting forces) reduced cutting force by 15%.

● 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



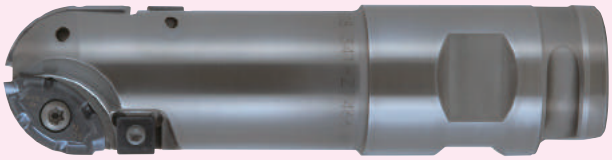
② Insert for welded & hardened steel (-W type)

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

For Roughing and Shape Milling

Swing Ball SWB TYPE

Swing ball SWB50 type (tool diameter Φ50) Insert installation procedure

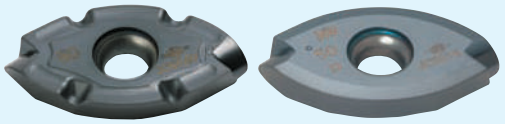


1) Clean the insert pocket with air before installing the insert.
2) Apply an appropriate amount (a small amount is acceptable) of anti-welding agent (MOLY * sold separately) to the threaded part of the clamp screw.
3) Fit the main insert / secondary insert insert into the pocket, and lightly press around 60°-70° from the tip of the insert R part.
   Tighten the clamp screw with a wrench. Also, for the outer blade insert, tighten the screw without touching it.

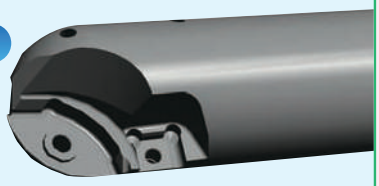
* Refer to the table below for the recommended tightening torque.

4) After tightening, check that there is no gap between the insert and the insert pocket.

Main insert

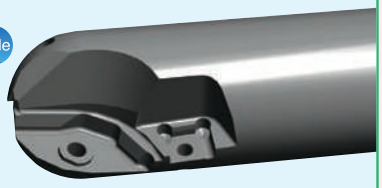


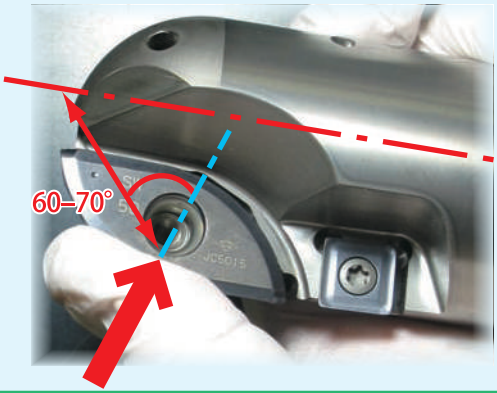
Main blade insert



Secondary insert

Secondary insert side





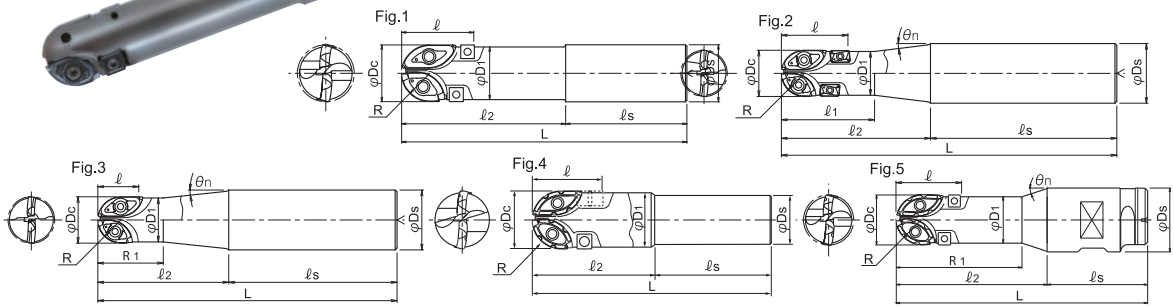
Clamp screw model number	Recommended torque (N・m)	Drive size
HSW-614H (Main blade / For secondary blade)	7.5	T-30
CSW-510 (For outer peripheral blade)	5.5	T-20

Note) 1. The clamp screw is a consumable item, so replace it regularly.
However, if any deformation of the screw is confirmed, replace the screw immediately.
2. The tip of the wrench will be damaged, so it is recommended to replace it as soon as possible.

For Roughing and Shape Milling

Swing Ball SWB TYPE

G-Body



BODY

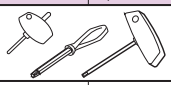
Type	Cat. No.	Stock	No. of inserts			Dimensions (mm)											Fig.
			Main Blade	Sub Blade	Peripheral Blade	R	φDc	ℓ	ℓ2	ℓS	L	ℓ1	φD1	θn	φDs	Md	
Straight Shank	SWBS3242S32-G	●	1	1	2	16	32	44	60	120	180	—	29.9	—	32	—	1
	SWBM3242S32-G	●	1	1	2			44	60	160	220	—	29.9	—	32	—	1
	SWBS4050S42	●	1	1	2			50	120	80	200	—	36.9	—	42	—	1
	SWBM4050S42	●	1	1	2	20	40	50	150	100	250	120	36.9	2°30'	42	—	2
	SWBS4035S42	●	1	1	—			35	120	80	200	—	36.9	—	42	—	3
	SWBS5060S42	●	1	1	2	25	50	60	100	100	200	—	46.8	—	42	—	4
	SWBM5060S42	●	1	1	2			60	100	150	250	—	46.8	—	42	—	4
Combination Shank	SWBS4050C508	●	1	1	2	20	40	50	120	80	200	100	36.9	18°	50.8	—	5
	SWBM4050C508	●	1	1	2			50	170	80	250	150	36.9	18°	50.8	—	5
	SWBS5060C508	●	1	1	2	25	50	60	120	80	200	—	46.8	—	50.8	—	5
	SWBM5060C508	●	1	1	2			60	170	80	250	—	46.8	—	50.8	—	5

Note)1) All cutters are supplied without inserts

2) Please refer page E347 - E349 for recommended cutting conditions and refer page E347 for machined form.

3) Please refer page E344 for selection of inserts.

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
							
φ32	TSW-511	ESW-206	A-20	A-08SD	SWB232HM-G SWB232MMW-G (For overlay processing)	SWB232HS-G SWB232MSW-G (For overlay processing)	ZCMT100308R
φ40	TSW-614H	ESW-406	A-25	A-15	SWB240HMN SWB240MMW (For overlay processing)	SWB240HSN SWB240MSW (For overlay processing)	SPGA090304 SPMA090304
φ50	HSW-614H	CSW-510	A-30	A-20	SWB250HMN-N (Low resistance type) SWB250MMW (For overlay processing)	SWB250HSN-N (Low resistance type) SWB250MSW (For overlay processing)	IM-SP43GS

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)
TSW-511	5.5
TSW-614H	7.5
HSW-614H	7.5
ESW-206	0.9
ESW-406	3.1
CSW-510	5.5

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball SWB TYPE

Straight shank type

Fig.2

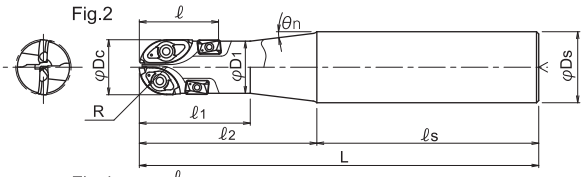


Fig.3

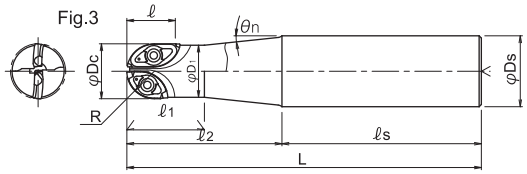


Fig.4

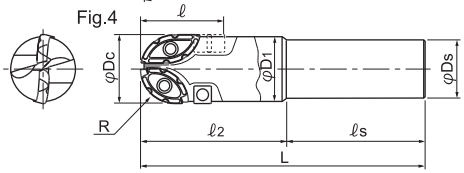


Fig.6

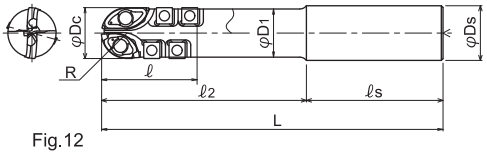
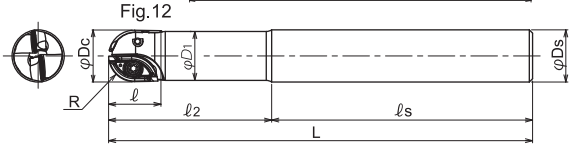


Fig.12



■ BODY

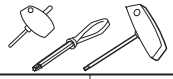
Type	Cat. No.	Stock	No. of inserts			Dimensions (mm)										Fig.
			Main Blade	Sub Blade	Peripheral Blade	R	φDc	ℓ	ℓ2	ℓs	L	ℓ1	φD1	θn	φDs	Md	
Straight Shank	SWBL3242S32-G	●	1	1	2	16	32	44	60	190	250	—	29.9	—	32	—	2
	SWBE3242S32-G	●	1	1	2			44	60	240	300	—	29.9	—	32	—	2
	SWBSS4050S42	●	1	1	2	20	40	50	80	80	160	—	36.9	—	42	—	2
	SWBL4050S42	●	1	1	2			50	200	100	300	150	36.9	1°30'	42	—	2
	SWBE4050S42	●	1	1	2			50	200	150	350	150	36.9	1°30'	42	—	2
	SWBM4035S42	●	1	1	—			35	170	80	250	120	36.9	2°	42	—	3
	SWBL5060S42	●	1	1	2	25	50	60	150	150	300	—	46.8	—	42	—	4
	SWBE5060S42	●	1	1	2			60	150	200	350	—	46.8	—	42	—	4

Note)1) All cutters are supplied without inserts

2) Please refer page E347 - E349 for recommended cutting conditions and refer page E347 for machined form.

3) Please refer page E344 for selection of inserts.

■ 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
							
φ32	TSW-511	ESW-206	A-20	A-08SD	SWB232HM-G SWB232MMW-G (For overlay processing)	SWB232HS-G SWB232MSW-G (For overlay processing)	ZCMT100308R
φ40	TSW-614H	ESW-406	A-25	A-15	SWB240HMN SWB240MMW (For overlay processing)	SWB240HSN SWB240MSW (For overlay processing)	SPGA090304 SPMA090304
φ50	HSW-614H	CSW-510	A-30	A-20	SWB250HMN-N (Low resistance type) SWB250MMW (For overlay processing)	SWB250HSN-N (Low resistance type) SWB250MSW (For overlay processing)	IM-SP43GS

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)
TSW-511	5.5
TSW-614H	7.5
HSW-614H	7.5
ESW-206	0.9
ESW-406	3.1
CSW-510	5.5

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball SWB TYPE

Long Shank Type / Combination Shank Type

Fig.7

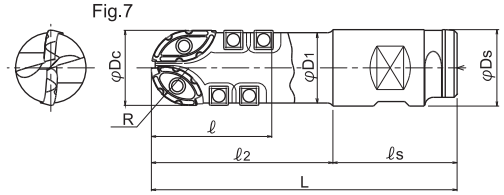
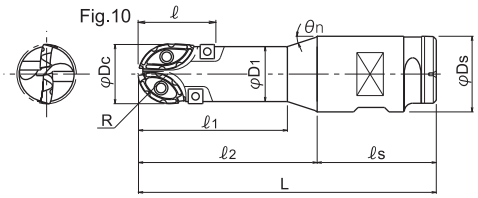


Fig.10



■ BODY

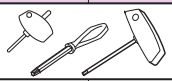
Type	Cat. No.	Stock	No. of inserts			Dimensions (mm)										Fig.
			Main Blade	Sub Blade	Peripheral Blade	R	φDc	ℓ	ℓ2	ℓs	L	ℓ1	φD1	θn	φDs	Md	
	SWBSS4050C508	●	1	1	2	20	40	50	80	80	160	60	36.9	18°	50.8	—	10
	SWBMS4050C508	●	1	1	2			50	140	80	220	120	36.9	18°	50.8	—	10
	SWBL4050C508	●	1	1	2			50	220	80	300	170	36.9	6°	50.8	—	10
Combination Shank	SWBE4050C508	●	1	1	2			50	270	80	350	170	36.9	3°	50.8	—	10
	SWBS5080C508	●	1	1	4			80	120	80	200	—	46.8	—	50.8	—	7
	SWBM5080C508	●	1	1	4			80	170	80	250	—	46.8	—	50.8	—	7
	SWBL5080C508	●	1	1	4			80	220	80	300	—	46.8	—	50.8	—	7
	SWBSS5060C508	●	1	1	2	25	50	60	80	80	160	—	46.8	—	50.8	—	10
	SWBMS5060C508	●	1	1	2			60	140	80	220	—	46.8	—	50.8	—	10
	SWBL5060C508	●	1	1	2			60	220	80	300	—	46.8	—	50.8	—	10
	SWBE5060C508	●	1	1	2			60	270	80	350	—	46.8	—	50.8	—	10

Note)1) All cutters are supplied without inserts

2) Please refer page E347 - E349 for recommended cutting conditions and refer page E347 for machined form.

3) Please refer page E344 for selection of inserts.

■ 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
							
φ40	TSW-614H	ESW-406	A-25	A-15	SWB240HMN SWB240MMW (For overlay processing)	SWB240HSN SWB240MSW (For overlay processing)	SPGA090304 SPMA090304
φ50	HSW-614H	CSW-510	A-30	A-20	SWB250HMN-N (Low resistance type) SWB250MMW (For overlay processing)	SWB250HSN-N (Low resistance type) SWB250MSW (For overlay processing)	IM-SP43GS

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)
TSW-511	5.5
TSW-614H	7.5
HSW-614H	7.5
ESW-206	0.9
ESW-406	3.1
CSW-510	5.5

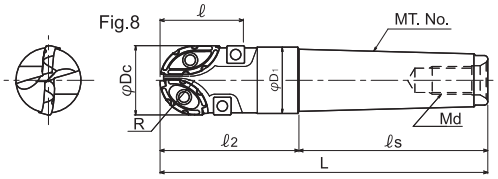
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball SWB TYPE

MT Shank Type / Weldon Shank Type / BT Shank Type

Fig.8



For SWB-40090-MT5

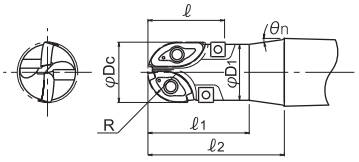


Fig.9

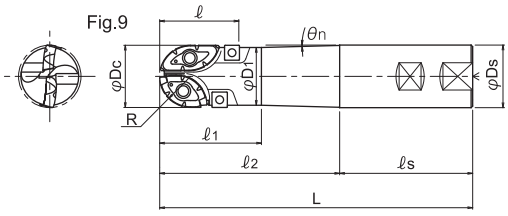
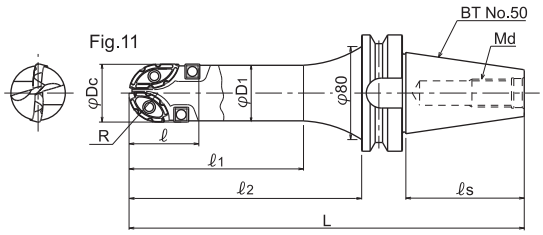


Fig.11



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	
MT Shank	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
Weldon Shank	SWB-32070-W32-G	●	1	1	2	16	32	44	70	80	150	—	30.4	—	W32	—	9
	SWB-32090-W32-G	●	1	1	2			44	90	80	170	—	30.4	—	W32	—	9
	SWB-32115-W40-G	●	1	1	2			44	115	85	200	50	29.9	4°10'	W40	—	9
	SWB-32165-W40-G	●	1	1	2			44	165	85	250	50	29.9	2°20'	W40	—	9
	SWB-40090-W40	●	1	1	2	20	40	50	90	85	175	—	36.9	—	W40	—	9
	SWB-40115-W40	●	1	1	2			50	115	85	200	65	36.9	1°30'	W40	—	9
	SWB-50100-W50	●	1	1	2	25	50	60	100	100	200	—	46.8	—	W50	—	9
	SWB-50150-W50	●	1	1	2			60	150	100	250	—	46.8	—	W50	—	9
BT Shank	SWB-50200-BT50	●	1	1	2	25	50	60	200	101.8	339.8	150	46.8	—	BT50	M24×3	11
	SWB-50250-BT50	●	1	1	2			60	250	101.8	389.8	200	46.8	—	BT50	M24×3	11

Note)1) All cutters are supplied without inserts

2) Please refer page E347 - E349 for recommended cutting conditions and refer page E347 for machined form.

3) Please refer page E344 for selection of inserts.

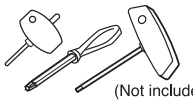
4) The main body and insert for tool diameters ϕ16 to Φ30 have been switched to Swing Ball Neo (SWBX / MSWX type, see page E322).

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball SWB / MSW 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
			 (Not included)				
ϕ32	TSW-511	ESW-206	A-20	A-08SD	SWB232HM-G SWB232MMW-G (For overlay processing)	SWB232HS-G SWB232MSW-G (For overlay processing)	ZCMT100308R
ϕ40	TSW-614H	ESW-406	A-25	A-15	SWB240HMN SWB240MMW (For overlay processing)	SWB240HSN SWB240MSW (For overlay processing)	SPGA090304 SPMA090304
ϕ50	HSW-614H	CSW-510	A-30	A-20	SWB250HMN-N (Low resistance type) SWB250MMW (For overlay processing)	SWB250HSN-N (Low resistance type) SWB250MSW (For overlay processing)	IM-SP43GS

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)
TSW-511	5.5
TSW-614H	7.5
HSW-614H	7.5
ESW-206	0.9
ESW-406	3.1
CSW-510	5.5

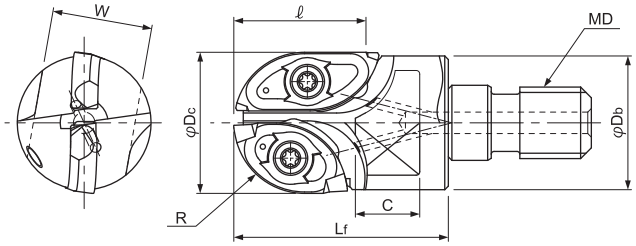
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball MSW TYPE

G-Body Through Coolant Hole

Clamp Screw	Recommended Torque (N·m)
TSW-511	5.5



■ BODY

Cat. No.	Stock	No. of flutes	Dimensions (mm) R	φDc	ℓ	Lf	φDb	MD	C	W	Inserts	Parts Clamp Screw	Wrench
MSW-3225-M16	●	2	16	**32**	29.5	43	29.9	M16	12.5	22	Main blade : SWB232HM-G/MMW-G Secondary blade : SWB232HS-G/MSW-G	TSW-511	A-20

Note)1) All cutters are supplied without inserts

2) Please refer page E350 for recommended cutting conditions and refer page E347 for machined form.

3) Please refer page E344 for selection of inserts.

4) The main body and insert for tool diameters ϕ16 to Φ30 have been switched to Swing Ball Neo (SWBX / MSWX type, see page E322).

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

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)

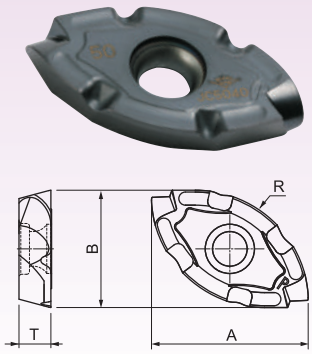


Fig.2 (Sub blade for low cutting forces)

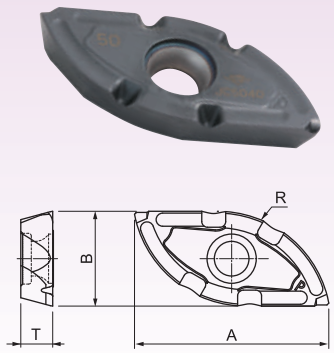


Fig.3 (Main blade)

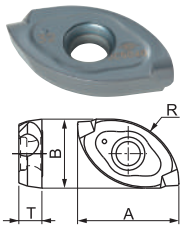


Fig.4 (Main blade)

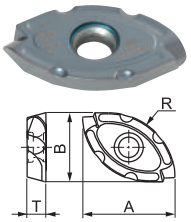


Fig.5 (Sub blade)

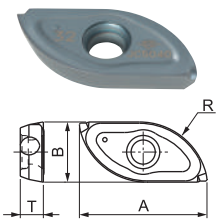


Fig.6 (Sub blade)

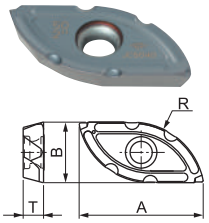


Fig.7 (Main blade for welded & hardened steel)

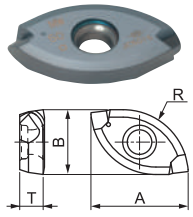


Fig.8 (Sub blade for welded & hardened steel)

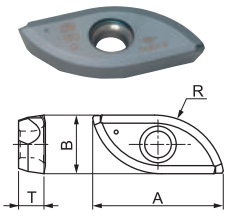


Fig.9 (Peripheral blade)

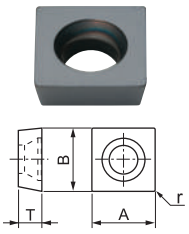


Fig.10 (Peripheral blade)

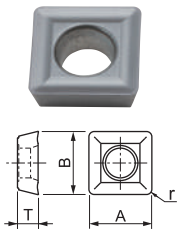
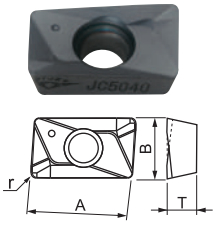


Fig.11 (Peripheral blade)



For Roughing and Shape Milling

Swing Ball SWB TYPE

■ INSERTS

Cat. No.	Type	PVD coated					Dimensions (mm)					Fig.
		JC5015	JC5118	JC8015	JC8050	JC5040	R	A	B	T	r	
SWB232HM-G	Main blade			●		●	16	26	16	5.35	—	3
SWB232MMW-G				●				26	16	5.35	—	7
SWB232HS-G	Sub blade			●		●		31.7	13.9	5.35	—	5
SWB232MSW-G				●				31.7	13.9	5.35	—	8
SWB240HMN	Main blade			●		●	20	30.4	20.8	6.85	—	4
SWB240MMW				●				30.4	20.8	6.85	—	7
SWB240HSN	Sub blade			●		●		37.5	16.3	6.85	—	6
SWB240MSW				●				37.5	16.3	6.85	—	8
SWB250HMN-N	Main blade			●		●	25	34.4	25.7	7	—	1
SWB250MMW				●				34.4	25.7	7	—	7
SWB250HSN-N	Sub blade			●		●		42.6	20.8	7	—	2
SWB250MSW				●				42.6	20.8	7	—	8
SPGA090304	Peripheral blade					●	—	9.525	9.525	3.18	0.4	9
SPMA090304		●		●				9.525	9.525	3.18	0.4	9
IM-SP43GS			●		●	●		12.70	12.70	4.76	0.8	10
ZCMT100308R		●				●		10.4	6.35	3.4	0.8	11

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

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.

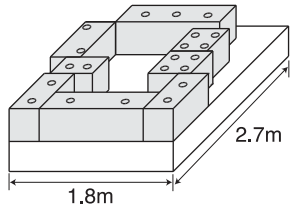
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball SWB TYPE

CASE STUDIES

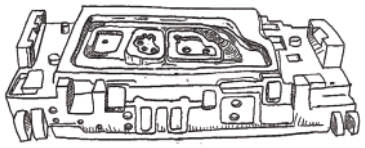
1.High feed machining.



Work	Part name	Stamping die
	Material	SX105V (Tool steel) (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

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

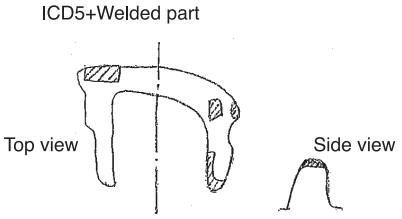
2.Improved tool life by JC8015 (Two times longer life)



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

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.

3.Machining welded part



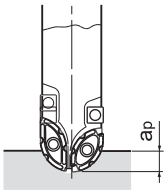
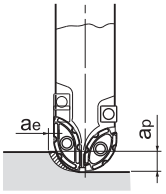
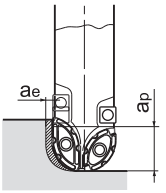
Work	Part name	Stamping die
	Material	Cast steel (ICD5)+ welded part
	Hardness	58HRC
Tool	Tool No.	SWBS5060C508
	Grade	SWB250MMW, SWB250MSW, JC8015
Cutting conditions	Vc, (n)	1,215 (min^{-1}), 191 (m/min)
	Vf, (fz)	420 (mm/min)
	ap(mm)	1～3 (mm)
	ae(mm)	6 (mm)
	Coolant	Dry cut
	Machine	Double column MC

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

For Roughing and Shape Milling

Swing Ball SWB TYPE

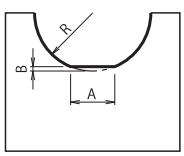
RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ50mm

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
		Vf (mm/min)	720	1,000	680	420
		ap (mm)	15	10	25	40
		ae (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
		Vf (mm/min)	650	900	600	380
		ap (mm)	15	10	25	40
		ae (mm)	—	10	15	10
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min⁻¹)	1,250	1,250	1,250	1,000
		Vf (mm/min)	550	750	500	300
		ap (mm)	15	10	25	40
		ae (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	—
		Vf (mm/min)	420	540	400	—
		ap (mm)	~6	~5	~8	—
		ae (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	—	—
		Vf (mm/min)	360	400	—	—
		ap (mm)	~3	~3	—	—
		ae (mm)	—	6	—	—
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min⁻¹)	1,500	1,500	1,500	1,200
		Vf (mm/min)	970	1,400	900	480
		ap (mm)	15	10	25	40
		ae (mm)	—	10	15	10
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min⁻¹)	1,300	1,300	1,300	1,050
		Vf (mm/min)	700	1,000	650	370
		ap (mm)	15	10	25	40
		ae (mm)	—	10	15	10

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

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

Swing Ball Machined Form



Note) A shape error as shown above will occur at the tip.

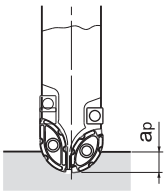
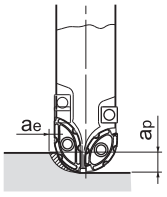
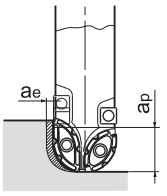
● SWB type

R	A	B
16	3.4	0.09
20	4.3	0.12
25	5.2	0.14

For Roughing and Shape Milling

Swing Ball SWB TYPE

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
		Vf (mm/min)	800	1,070	740	480
		ap (mm)	12	10	20	35
		ae (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
		Vf (mm/min)	720	960	670	420
		ap (mm)	12	10	20	35
		ae (mm)	—	8	12	8
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min⁻¹)	1,560	1,560	1,560	1,250
		Vf (mm/min)	620	810	560	350
		ap (mm)	12	10	20	35
		ae (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	—
		Vf (mm/min)	420	540	420	—
		ap (mm)	~5	~4	~6.5	—
		ae (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	—	—
		Vf (mm/min)	300	350	—	—
		ap (mm)	~3	~3	—	—
		ae (mm)	—	5	—	—
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min⁻¹)	1,850	1,850	1,850	1,500
		Vf (mm/min)	1,100	1,500	1,000	570
		ap (mm)	12	10	20	35
		ae (mm)	—	8	12	8
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min⁻¹)	1,650	1,650	1,650	1,320
		Vf (mm/min)	830	1,100	760	450
		ap (mm)	12	10	20	35
		ae (mm)	—	8	12	8

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

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

Swing ball Plunge maximum plunge depth and feed

Work material	Maximum value	Tool diameter : ϕDc (mm)				
		20	25	30, 32	40	50
Material FC, FCD, GM Cast iron	ap(mm)	4	5	10	15	15
	f (mm/rev)	0.30	0.40	0.40	0.40	0.40
Carbon steel, alloy steel, tool steel	ap(mm)	3	4	8	10	10
	f (mm/rev)	0.25	0.30	0.30	0.30	0.30

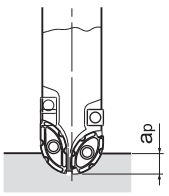
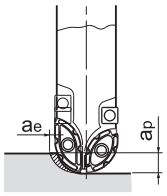
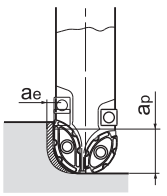
ap : Cutting depth f : Feed amount

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Roughing and Shape Milling

Swing Ball SWB TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SWING BALL φ30mm & 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
		Vf (mm/min)	800	1,020	770	450
		ap (mm)	10	10	16	28
		ae (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
		Vf (mm/min)	720	920	700	420
		ap (mm)	10	10	16	28
		ae (mm)	—	6	9	6
Die steel SKD11, SX105V (1.2379) 150-255HRC	JC5040	n (min⁻¹)	1,950	1,950	1,950	1,560
		Vf (mm/min)	630	810	600	390
		ap (mm)	10	10	16	28
		ae (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	—
		Vf (mm/min)	400	480	400	—
		ap (mm)	~4	~4	~6.5	—
		ae (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	—	—
		Vf (mm/min)	280	350	—	—
		ap (mm)	~3	~3	—	—
		ae (mm)	—	5	—	—
Grey cast iron FC250 (GG25) 160-260HB	JC8015	n (min⁻¹)	2,300	2,300	2,300	1,840
		Vf (mm/min)	1,140	1,380	1,020	640
		ap (mm)	10	10	16	28
		ae (mm)	—	6	9	6
Nodular cast iron FCD700, GM241 (GGG70) 170-300HB	JC8015	n (min⁻¹)	2,060	2,060	2,060	1,650
		Vf (mm/min)	890	1,130	820	500
		ap (mm)	10	10	16	28
		ae (mm)	—	6	9	6

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

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

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For Roughing and Shape Milling

Swing Ball Modular Head MSW TYPE

RECOMMENDED CUTTING CONDITIONS

Modular Head MSW Anti Vibration Type + All Carbide Shank Arbor for Modular Head

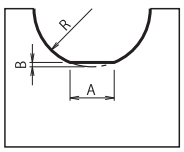
Work Materials	Insert Grades	Tool dia. (mm)									
		32									
		No. of teeth 2N									
		ℓ (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)					
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC5040	100	1.5	1.5	3,000	2,100					
		150	1.0	1.0	3,000	2,100					
		210	0.3	0.7	2,650	1,860					
Cast steel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

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 occuring, recommend to reduce the depth of cut ap or feed speed.

Swing Ball Machine Form



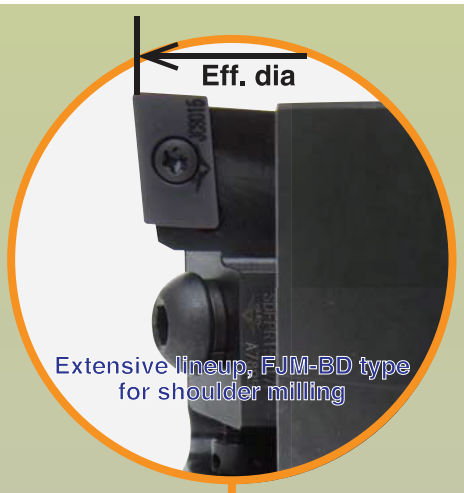
Note) A shape error as shown above will occur at the tip.

● SWB type

R	A	B
16	3.4	0.09

Super finish for face milling and corner milling

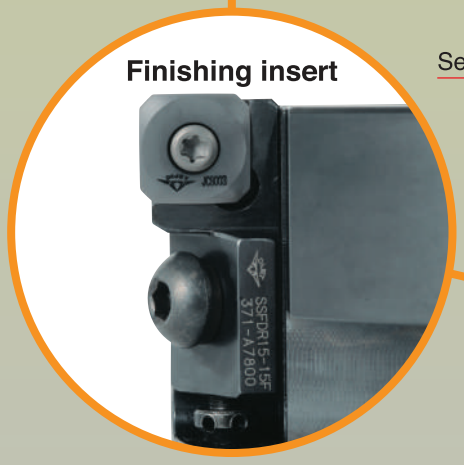
Finish Jet Mill FJM TYPE

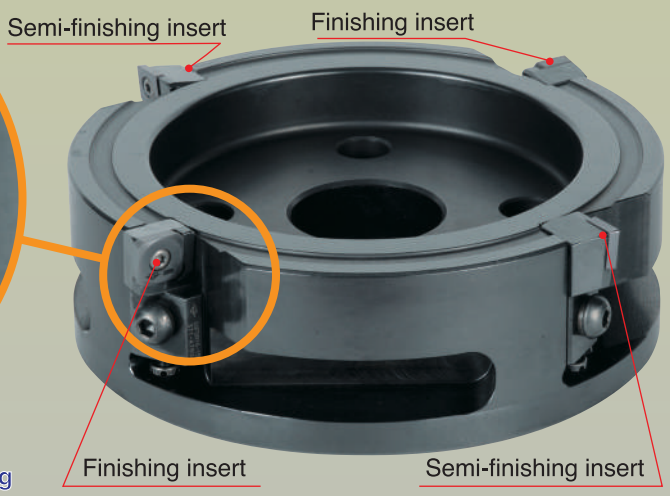


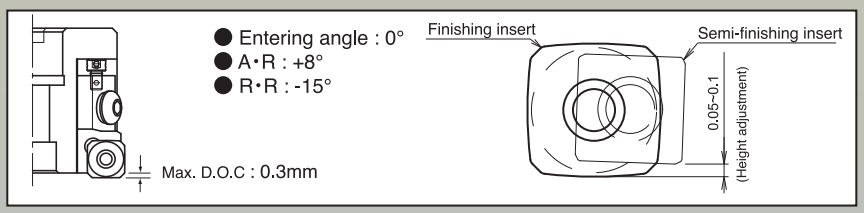
In case of using FJM type (2 finishing & roughing inserts), Max. ap = 0.3mm

Roughing ⇒ Semi-Finishing ⇒ Finishing

Consolidate to one process of semi-finishing & super finishing.







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.

Super finish for face milling and corner milling

Finish Jet Mill — FJM TYPE

BODY (METRIC BORE)

Cat. No.	Stock	No. of Inserts	Dimensions (mm)										Weight (kg)	Fig.
			φDc	φDe (Eff. dia.)	φDb	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

Cat. No.	Stock	No. of Inserts	Dimensions (mm)										Weight (kg)	Fig.
			φDc	φDe (Eff. dia.)	φDb	Lf	φd	φd1	φd2	a	b	R		
FJM-4080R-27-F4	●	4N Finishing	80	65	71	63	27	20	14.3	12.4	7	22	1.7	1
FJM-4100R-32-F4	●	4N Finishing	100	85	90	63	32	26	17	14.4	8	32	2.7	1
FJM-4125R-40-F4	●	4N Finishing	125	110	114	63	40	60	—	16.4	9	40	3.9	2
FJM-4160R-40-F4	●	4N Finishing	160	145	148	63	40	75	—	16.4	9	40	6.1	2
FJM-4200R-60-F4	●	4N Finishing	200	185	186	63	60	134	—	25.7	14	40	8.6	3
FJM-4250R-60-F4	●	4N Finishing	250	235	237	63	60	182	—	25.7	14	40	14.8	3

Note) 1. All cutters are supplied without inserts.
2. Please refer page E356 for recommended cutting conditions.

CUTTING DATA

Result

1) No step over marks or no step over with competitor's cutter it was 0.05mm to 0.1mm
2) Die size 1500mm x 1000 mm completed just in 20mins but with competitor's cutter it use to take 1.5 hrs.

Work	Part name	Forging Die	
	Material	Hyper Steel / Cr7 VL / H13	
	Hardness	45 to 48 HRC	
Tool	Tool No.	FJM-4160R-40	
	Insert	SDHW1504ADEN-F1 DH103	SPHW1203ZPTR JC8015
Cutting conditions	Vc (n)	n=125m/min (250min)$^{-1}$	
	Vf	Vf=400 (1.6mm/rev)	
	ap(mm)	0.3mm	
	ae(mm)	100mm	
	Coolant	Dry	
	Machine	HMC BT-50	

●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Super finish for face milling and corner milling

Finish Jet Mill FJM TYPE

INSERTS

SDHW1504ADFN-W1

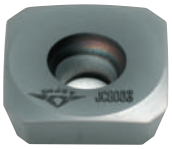
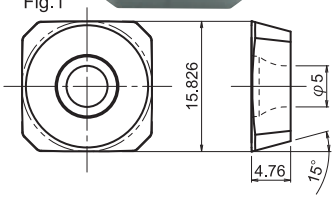
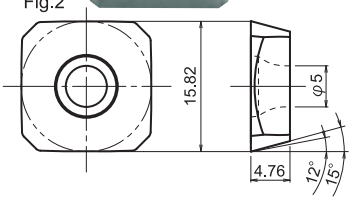


Fig.1



SDHW1504ADE(F)N-W2

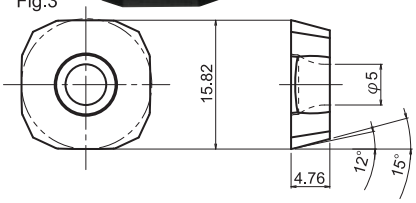
Fig.2



SDHW1504ADEN-F1

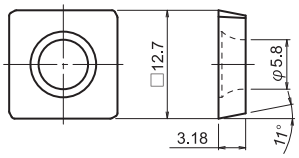
30% less cutting force

Fig.3



SPHW1203ZPTR

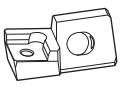
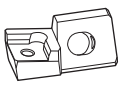
Fig.4

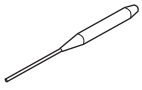
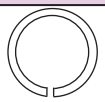


Cat. No.	PVD coated		Cermet	Tole-rance	Fig.	Application
	DH103	JC8015	CX75			
SDHW1504ADFN-W1 (finishing insert)	●			H	1	Cast iron・Cast steel
SDHW1504ADFN-W2 (finishing insert)			●	H	2	Carbon steel・Alloy steel
SDHW1504ADEN-W2 (finishing insert)	●			H	2	Mold steel・Die steel
SDHW1504ADEN-F1 (finishing insert for low rigid work)	●		●	H	3	JC8003… (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.

PARTS

Clamp screw	Wrench	Cartridge for finishing insert	Cartridge for semi-finishing insert	Set bolt for cartridge
Recommended torque 6.0N・m	(Not included)			
DSW-4510H	A-20 (φ80～φ200) A-20L (φ250)	SSFDR15-15F	SSFPR15-12R	BBH-825

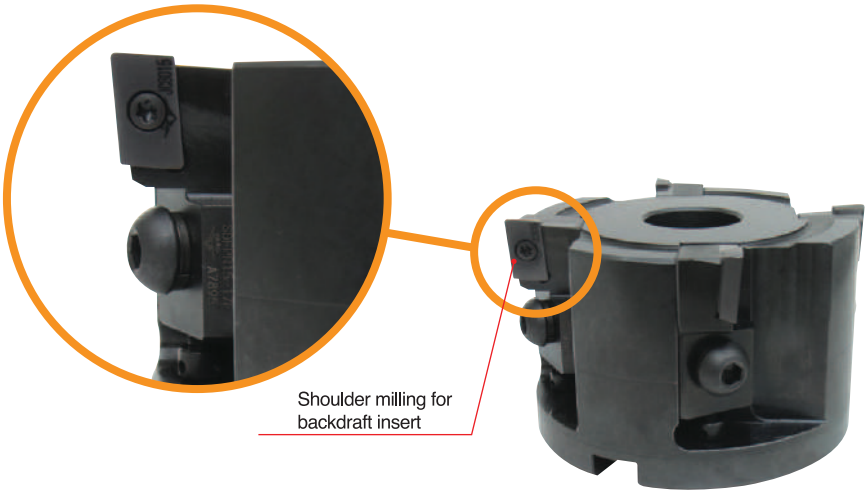
Wrench for cartridge	Wrench for axial adjust screw	Axial adjust screw	Spring washer
			
LW-050	AD-2080	ADS-513	SBZ-8

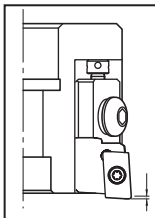
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Super finish for face milling and corner milling

Finish Jet Mill FJM-BD TYPE

● Shoulder milling





max ap : 03.mm
Corner angle : 0°
A•R: +5°
R•R: -15°

Fig.1

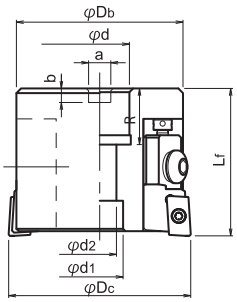


Fig.2

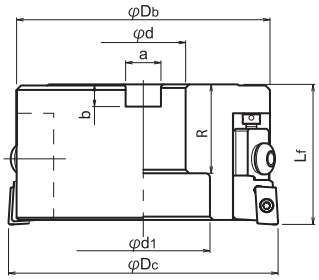
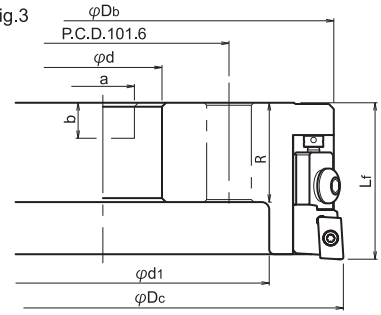


Fig.3



■ Metric bore

Cat. No.	Stock	No. of Inserts	Dimensions (mm)									Weight (kg)	Fig.
			φDc	φDb	Lf	φd	φd1	φd2	a	b	R		
FJM-4080R-27-BD	●	4	80.5	71	63	27	20	14.3	12.4	7	22	1.7	1
FJM-4100R-32-BD	●	4	100.5	90	63	32	26	17	14.4	8	32	2.7	1
FJM-4125R-40-BD	●	4	125.5	114	63	40	60	—	16.4	9	40	3.9	2
FJM-4160R-40-BD	●	4	160.5	148	63	40	75	—	16.4	9	40	6.1	2
FJM-4200R-60-BD	●	4	200.5	186	63	60	134	—	25.7	14	40	8.6	3
FJM-4250R-60-BD	●	4	250.5	237	63	60	182	—	25.7	14	40	14.8	3

Note) 1. All cutters are supplied without inserts.
2. Please refer page E358 for recommended cutting conditions.

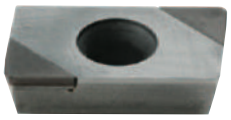
● : Standard stock items ☐ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

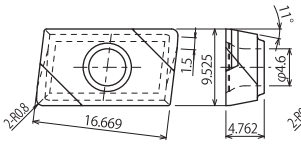
Super finish for face milling and corner milling

Finish Jet Mill FJM-BD TYPE

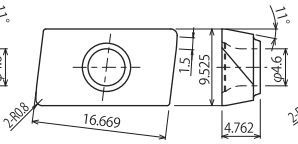
Inserts (FJM-BD type)

For bottom face finishing
DBD170408 (JBN500)

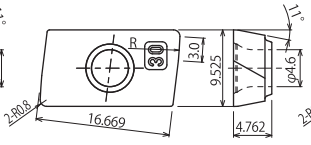




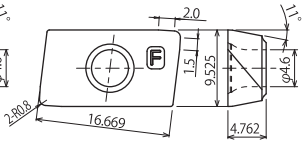
For bottom face finishing
DBD170408 (JC8015, CX90)



For bottom face finishing & better surface roughness
DBD170408-30 (JC8003, CX75)



For side & bottom face finishing at once
DBD170408-F (JC8003, CX75)

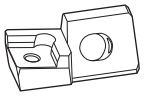
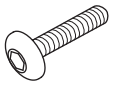


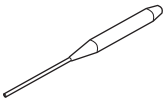
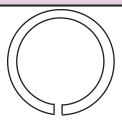
Cat no.	PVD coated		CBN Insert	Cermet	
	DH103	JC8015	JBN500	CX75	CX90
DBD170408		●	●		●
DBD170408-30	●			●	
DBD170408-F	●			●	

10 inserts per case, but grade JBN500 insert is packed in 1 piece per case.

Note)In case of using DBD170408-30 insert, do not mix with DBD170408 insert. Use only DBD170408-30 insert.
※ In case of using DBD170408-30 insert, effective diameter becomes 3.1mm smaller than Dc
※ In case of using DBD170408-F insert, effective diameter becomes 0.24mm smaller than Dc.

PARTS

Clamp screw	Wrench	Cartridge	Set bolt for cartridge
Recommended torque 3.6N・m			
DSW-4085H	A-15T	SDFPR15-17F	BBH-825

Wrench for cartridge	Wrench for axial adjust screw	Axial adjust screw	Spring washer
			
LW-050	AD-2080	ADS-513	SBZ-8

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

Super finish for face milling and corner milling

Finish Jet Mill FJM TYPE

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)	DH103	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)	DH103	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)	DH103	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)	DH103	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)	DH103	40～60	0.3～0.7	up to 0.1mm	up to 0.7De

RECOMMENDED CUTTING CONDITIONS (At 4N finishing cutting edge)

	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	6～10	up to 0.1mm	up to 0.8De
	Medium carbon steel S50C (C50) Below 255HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	CX75	200～250	6～10	up to 0.1mm	up to 0.8De
	Alloy & Die steel SCM440, SKD11 (1.7223, 1.2379) Below 255HB	SDHW1504ADFN-W2 (SDHW1504ADEN-F1)	CX75	100～150	6～10	up to 0.1mm	up to 0.8De
M	Stainless steel SUS304, 316 Below 250HB	SDHW1504ADEN-W2 (SDHW1504ADEN-F1)	DH103	80～120	6～10	up to 0.1mm	up to 0.8De
K	Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	SDHW1504ADFN-W1 (SDHW1504ADEN-F1)	DH103	130～200	6～12	up to 0.1mm	up to 0.8De
	Nodular cast iron FCD500, FCD700 (GGG50 GGG70) Below 300HB	SDHW1504ADFN-W1 (SDHW1504ADEN-F1)	DH103	110～180	6～12	up to 0.1mm	up to 0.8De

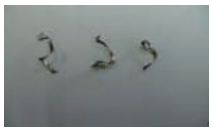
Vc : Cutting speed, f : Feed rate, ap : Depth of cut, ae : Width of cut

Super finish for face milling and corner milling

Finish Jet Mill FJM TYPE

CHIP SHAPE COMPARISON

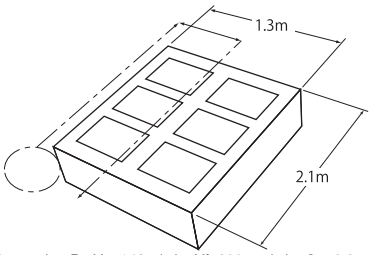
Work material : S15C, Tool dia. : φ200mm, Vc=300m/min, f=4mm/rev, ae=137mm

	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 machined by FJM.

CASE STUDIES

Work size : 2.1m×1. 3m
Step between finishing insert and semi-finishing insert : 0.1mm

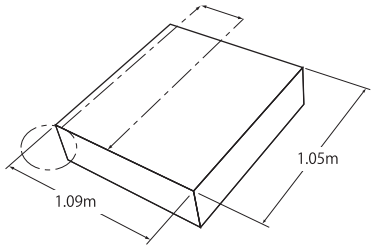


Competitor B : Vc=146m/min, Vf=800mm/min, ap=0.3mm
Step between finishing insert and semi-finishing insert : 0.1mm

Result FJM obtained same surface roughness with 80% faster feed speed than competitor B.

Work	Part name	Stamping die
	Material	FC250
	Hardness	–
Tool	Tool No.	FJM-4200R
	Grade	SDHW1504ADFN-W1 (DH103) (1N) + SPHW1203ZPTR (JC8015) (1N)
Cutting conditions	Vc, (n)	183m/min (292min^{-1})
	Vf, (fz)	1,460mm/min (5mm/rev)
	ap(mm)	0.3mm
	ae(mm)	180mm
	Coolant	Dry
	Machine	Double column MC

Work size : 1050mm×1090mm×60mm



Competitor B : Vc=126m/min, Vf=400mm/min, ap=0.3mm

Result FJM improved machining efficiency by 2.6 times and surface roughness comapred 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, (fz)	1,050mm/min (3.2mm/rev)
	ap(mm)	0.2mm
	ae(mm)	180mm
	Coolant	Dry
	Machine	Double column MC

Super finish for face milling and corner milling

Finish Jet Mill — FJM-BD TYPE

RECOMMENDED CUTTING CONDITIONS (At Shoulder cutting insert FJM-BD)

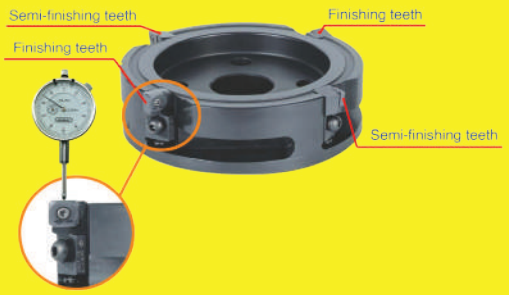
	Work Materials	Inserts	Insert Grades	Vc (m/min)	f (mm/rev)	ap (mm)	ae (mm)
P	Low carbon & Mild steel S20C, SS400 (C20) Below 255HB	DBD170408 (DBD170408-30) DBD170408-F	CX75 (CX90)	250～300	0.6～1.0	up to 0.3mm	up to 0.7Dc
P	Medium carbon steel S50C (C50) Below 255HB	DBD170408 (DBD170408-30) DBD170408-F	CX75 (CX90)	200～250	0.6～1.0	up to 0.3mm	up to 0.7Dc
P	Alloy & Die steel SCM440, SKD11 (1.7223, 1.2379) Below 255HB	DBD170408 (DBD170408-30) DBD170408-F	CX75 (CX90)	150～200	0.6～1.0	up to 0.3mm	up to 0.7Dc
M	Stainless steel SUS304, 316 Below 250HB	DBD170408 (DBD170408-30) DBD170408-F	DH103 (JC8015)	150～200	0.6～0.8	up to 0.2mm	up to 0.7Dc
K	Grey cast iron FC250, FC300 (GG25, GG30) Below 300HB	DBD170408 (DBD170408-30) DBD170408-F	DH103 (JC8015)	130～200	0.6～1.0	up to 0.3mm	up to 0.7Dc
K			JBN500	500～1000	0.4～0.8	up to 0.2mm	up to 0.7Dc
K	Nodular cast iron FCD500, FCD700 (GGG50, GGG70) Below 300HB	DBD170408 (DBD170408-30) DBD170408-F	DH103 (JC8015)	110～180	0.6～1.0	up to 0.3mm	up to 0.7Dc
K			JBN500	500～1000	0.4～0.6	up to 0.2mm	up to 0.7Dc
H	Mold steel HPM7, PX5, NAK80, P20 (1.2311, P20) Below 30-40HRC	DBD170408 (DBD170408-30) DBD170408-F	DH103 (JC8015)	100～150	0.6～0.8	up to 0.2mm	up to 0.7Dc

Vc : Cutting speed, f : Feed rate, ap : Depth of cut, ae : Width of cut

Note) 1. Use water soluble coolant for stainless steel machining
2. We recommend DBD170408-30, For high feed cutting or improve surface roughness.

FJM Cutter Setting Instructions :

1. FJM cutters is a combination of 2 types of inserts
   A) Semi Finishing Insert (SPHW1203....) &
   B) Semi Finishing Insert (SDHW1504....)
2. Please refer following pictures
   A) Finishing inserts always remain up and we recommend 0.05 to 0.08mm. (Cutter is mounted on the presettor or surface plate)
   B) Semi Finishing inserts always remain out on the diameter. (Basic principle while taking redial cut on VMC, Roughing inserts touches / cuts the components to be machined and it leaves very uniform material for finishing insert.



3. For good finishing results kindly ensure
   A) Face runout on finishing inserts is ok, as it is wiper type insert kindly adjust the plunger dial in the middle of finishing insert as it has radius for wiper effect.
   B) Gap between finishing & Semi finishing inserts should be maintained 0.05 to 0.08mm only for better results.
   C) For adjusting this gap or face runout adjustable cartridges are provided on the cutter.

For inclined surface / side finish machining / For shoulder milling

High Efficient 5 - Axis machining

QM Series

DIJET TOOLS

for high efficient 5-axis machining

For inclined surface / side finish machining / For shoulder milling

High Efficient 5 - Axis machining

QM Series

Lineup

Tulip S-Heads
STLP type

1. Radius on tapered edge: R1500mm
   Form accuracy: below +/- 10μm
2. Possible high efficient machining by adopting 4 flutes
3. New PVD coated grade DH115, applications from hard-to-cut materials to high hardened materials

Mirror Barrel
KRM type

1. High precision indexable barrel tools for finishing with large R-shaped side cutting edge
2. Achieves high precision and high efficient finishing on tapered walls and bottom face
3. Uses standard Mirror Radius modular head

High precision QM MAX
MQT type

1. High precision QM Max
2. High efficient finishing on tapered walls with 3-axis maching
3. Precision finishing with XPHW/XPHT inserts

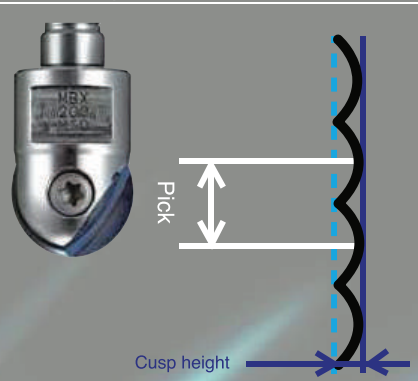
For inclined surface / side finish machining / For shoulder milling

High Efficient 5 - Axis machining

QM Series

Concept

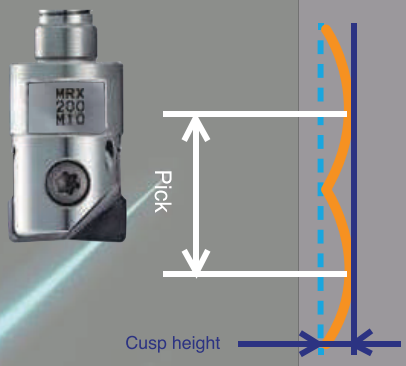
When using ϕ20 (R10) Ball Nose End Mill



< ϕ20mm Ball Nose End Mill (R10mm) >
Pick (ap) when theoretical cusp height is 0.002mm

ap=0.4mm

When using ϕ20 (R60) KRM Type



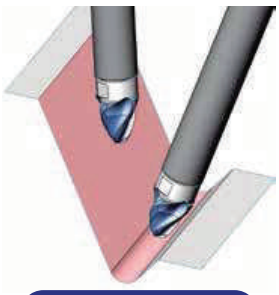
< ϕ20mm KRM Type (R60mm) >
Pick (ap) when theoretical cusp height is 0.002mm

ap=0.98mm

Improved efficiency: 2.5 times

Calculated from $ap=2\sqrt{(R^2-(R-H)^2)}$

Type of machining

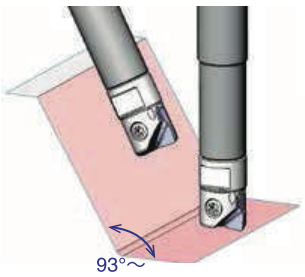


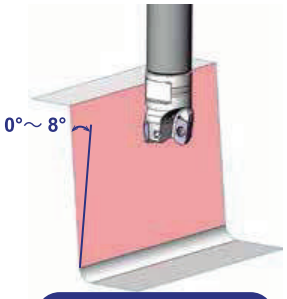
STLP for 5-axis

• For tapered wall and corner finishing

KRM for 5-axis

• For tapered wall & bottom finishing





MQT for 3-axis

• For tapered wall finishing with 3-axis

For inclined surface / side finish machining / For shoulder milling

High Precision Barrel Tools QM Series MQT TYPE

Multi-blade, high efficiency machining tool

MQT TYPE

Modular type
ϕ16 ~ ϕ35

High precision
BARREL TOOL
Tuff Modular Heads System

1. High precision type of QM Max. Improved body balance compared to the conventional type, Compatible with multi-tasking machines such as 5-axis machines. H-class inserts are available. In addition, high efficiency machining is possible due to the multi-blade specifications.
➡ Body outer diameter tolerance 0 to – 0.03 due to master insert
(When using YPHW type insert)

2. The main body has a lineup of types with a notch angle (3 °, 5 °), even with a 3-axis machine. Complex shape machining with tilt angle is possible.

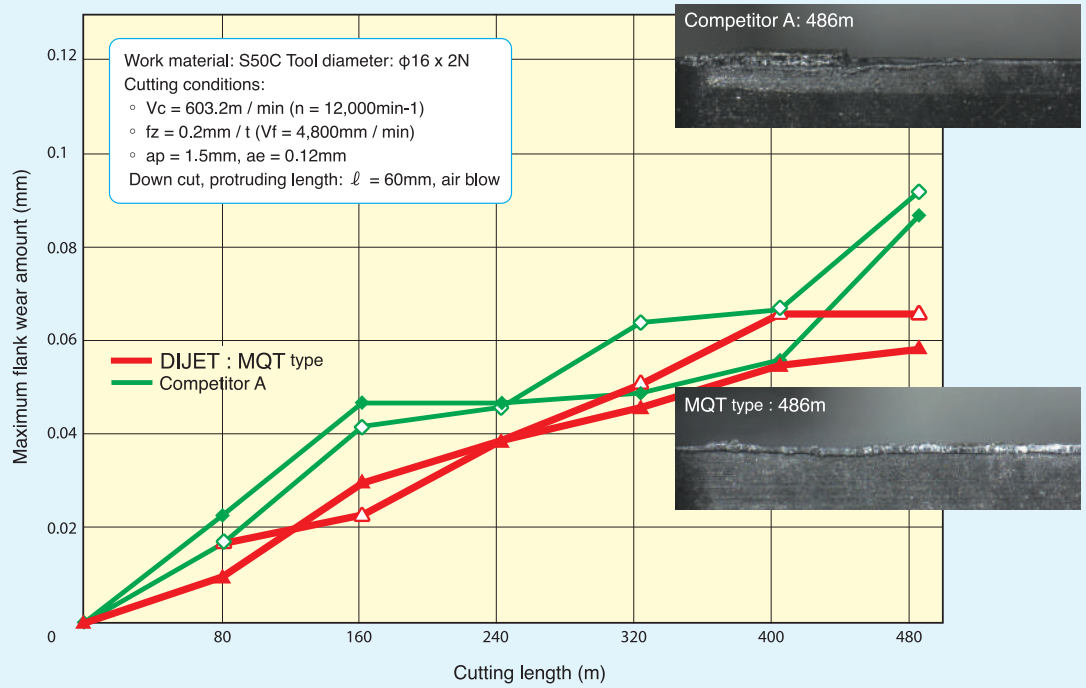
3. Insert grades range from general steel to pre-hardened steel, stainless steel, and cast iron. Compatible general-purpose PVD coating grade JC8015 and surface roughness improvement possible.
In addition to cermet CX75, for high-hardness materials and high-speed machining.
A new PVD coating grade DH102 has been added to the lineup.

For inclined surface / side finish machining / For shoulder milling

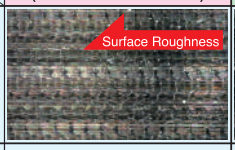
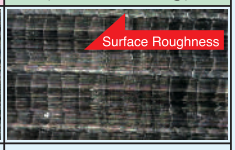
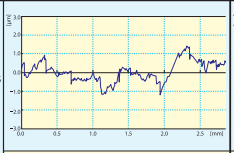
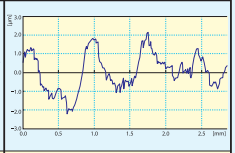
High Precision Barrel Tools QM Series MQT TYPE

Cutting performance

❶ Wear curve (5 ° inclined surface)



❷ Machined surface roughness (when processing about 486m) (feed direction)

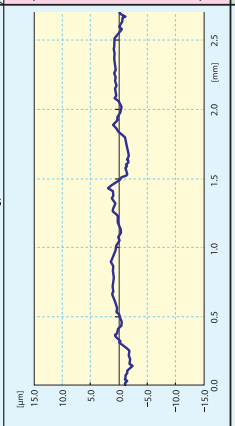
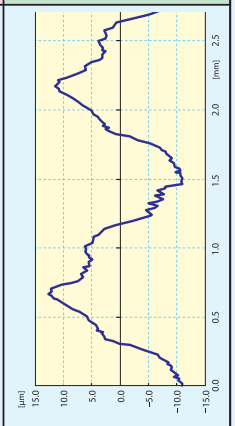
	XPHT100308ZER-R (Grade: JC8015)	Competitor A (PVD coating)
Machined surface Photo		
Machined surface Roughness (Full blade) Feed direction	 Ra=0.19μm Rz=1.18μm	 Ra=0.44μm Rz=2.02μm
Machining time	101.2min	101.2min

QM Max: MQT type is ap (Z pick) = 1.5mm
The machined surface is good, the cusp height is low,

Work material: S50C
Tool diameter: ϕ16 × 2N

Cutting conditions:
◦ Vc = 603.2m / min (n = 12,000min-1)
◦ f = 0.4mm / rev (Vf = 4,800mm / min)
◦ ap = 1.5mm, ae = 0.12mm
Down cut, protruding length: ℓ = 60mm

❸ Casp height H (when processing about 486m) (vertical feed direction)

	XPHT100308ZER-R (Grade: JC8015)	Competitor A (PVD coating)
Machined surface Roughness (Full blade) Of sending Vertical direction	 Casp height H = 4 μm	 Casp height H = 26 μm

Work material: S50C
Tool diameter: ϕ16 × 2N

Cutting conditions:
◦ Vc = 603.2m / min (n = 12,000min-1)
◦ f = 0.4mm / rev (Vf = 4,800mm / min)
◦ ap = 1.5mm, ae = 0.12mm
Down cut, protruding length: ℓ = 60mm

For inclined surface / side finish machining / For shoulder milling

High Precision Barrel Tools QM Series MQT TYPE

Through coolant hole

Face milling | Shoulder milling

Fig.1

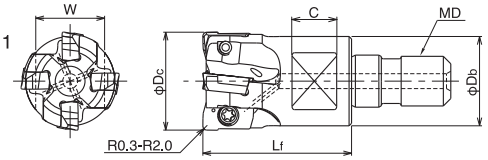
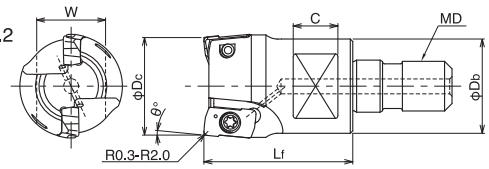


Fig.2



■ Body / Facemill type

Taper angle θ°	Cat No.	Stock	No. of insert	Dimensions (mm) φDc	Lf	ϕDb	MD	C	W	Applicable insert	Parts: Clamp screw	Parts: Wrench (Not included)	Fig
0°	MQT-2016A00-M8	●	2	16	23	14	M8	8	12	XP＊100308ZER-R YPHW1003＊＊Z＊R-＊＊ ZPMT1003＊＊ZER-PL	TSW-2556H	A-08	1
	MQT-4020A00-M10	●	4	20	30	18	M10	9	14		TSW-2556H		
	MQT-5025A00-M12	●	5	25	35	22.5	M12	10	17		DSW-2563H		
	MQT-6032A00-M16	●	6	32	43	29	M16	12	22		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.
3. Please refer to pages E367 - E368 for recommended cutting conditions.
4. Refer to page D16 for the recommended tightening torque for modular heads.
(It is recommended to use a dedicated spanner <DS type> for M8 size.)

Clamp screw	Recommended torque (N･m)
TSW-2556H	1.1
DSW-2563H	1.1

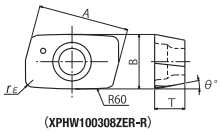
●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For inclined surface / side finish machining / For shoulder milling

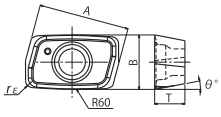
High Precision Barrel Tools QM Series MQT TYPE

Inserts

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

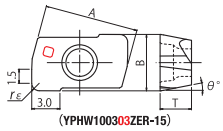


(XPHW100308ZER-R)

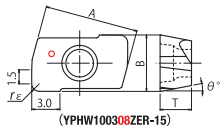


(XPHT100308ZER-R)

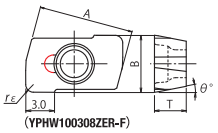
For finishing side face
(YPHW1003＊＊ZER-15) (YPHW100308ZER-F) (YPHW100308ZTR-F1)



(YPHW100303ZER-15)

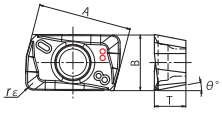


(YPHW100308ZER-15)

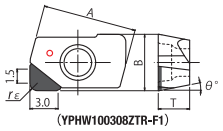


(YPHW100308ZER-F)
(For low feed machining)

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



CBN Insert



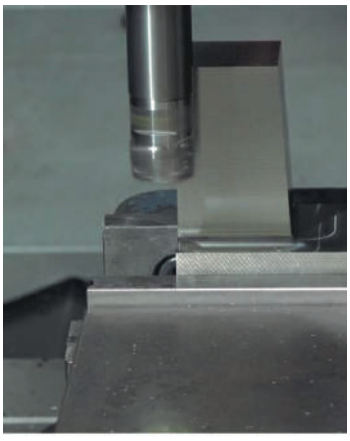
(YPHW100308ZTR-F1)

Type	Cat. No.	Tolerance	PVD Coated				Cermet	CBN	Dimensions (mm)				
			JC8015	JC8050	JC8118	DH102	CX75	JBN795	A	T	B	rε	θ°
For tapered 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 wall	**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°
	YPHW100308ZTR-F1	H						●	10.06	3.35	6	0.8	11°
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, but grade JBN795 insert is packed in 1 piece per case.

CUTTING DATA

Overhung length: 100mm



Result: MQT improved the efficiency 3 times, compared with ball nose end mill. (Pick feed : 0.56mm to 1.5mm)

Work	Part name	Test piece
	Material	NAK80 P21
	Hardness	40HRC
Tool	Tool No.	MQT-2020A03-M10
	Grade	XPHW100308ZER-R (JC8015)
Cutting conditions	n	n=6,400min^{-1}
	Vf	Vf=1,940mm/min
	ap(mm)	1.5mm
	ae(mm)	0.15mm
	Coolant	Dry
	Machine	Vertical MC

●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For inclined surface / side finish machining / For shoulder milling

High Precision Barrel Tools QM Series MQT TYPE

Definition of cutting edge shape for program creation

◦ When using the main body with an angle (MQT -• • • A03 / A05 type holder)

Fig.1 XPH W / T type

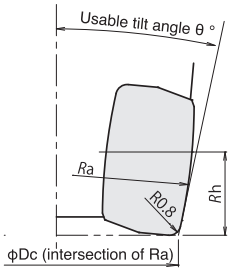
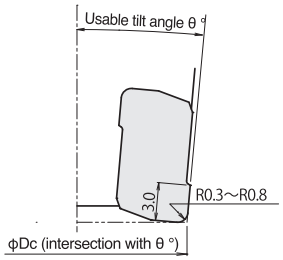


Fig.2 YPHW type



◦ Dimensions when using XPHW / T type

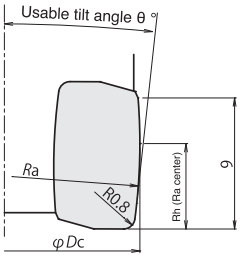
Available Tilt angle θ °	Cat. No.	Dimensions (mm) φDc	Ra	Rh	Fig
1°~6°	**MQT-2016A03-M8**	15.5	R64.19	8.76	1
3°~8°	**MQT-2016A05-M8**	15.5	R64.34	10.98	1
1°~6°	**MQT-2020A03-M10**	19.5	R63.34	8.67	1
3°~8°	**MQT-2020A05-M10**	19.5	R63.46	10.85	1

◦ Dc dimension when using YPHW type (tilt angle: 3 °, 5 °)

Available Tilt angle θ °	Cat. No.	Dimensions (mm) φDc	Fig
3°	**MQT-2016A03-M8**	16	2
5°	**MQT-2016A05-M8**	16	2
3°	**MQT-2020A03-M10**	20	2
5°	**MQT-2020A05-M10**	20	2

◦ When using the main body at an angle of 0 ° (MQT- • • • A00 type holder)

Fig.3 XPH W / T type



◦ Dimensions when using XPHW / T type

Available Tilt angle θ °	Cat. No.	Dimensions (mm) φDc	Ra	Rh	Fig
0°~3°	**MQT-2016A00-M8**	16	R63.27	5.48	3
0°~3°	**MQT-4020A00-M10**	20	R64.29	5.48	3
0°~3°	**MQT-5025A00-M12**	25	R63.26	5.48	3
0°~3	**MQT-6032A00-M16**	32	R62.41	5.48	3
0°~3°	**MQT-6035A00-M16**	35	R62.16	5.48	3

◦ Dc dimension when using YPHW type (vertical surface)

Available Tilt angle θ °	Cat. No.	Dimensions (mm) φDc	Fig
0°	**MQT-2016A00-M8**	16	—
0°	**MQT-4020A00-M10**	20	—
0°	**MQT-5025A00-M12**	25	—
0°	**MQT-6032A00-M16**	32	—
0°	**MQT-6035A00-M16**	35	—

Note) 1. The shape of the cutting edge differs depending on the combination of the insert and the main body. Please refer to the table above.
2. All cutters are supplied without wrench & MOLY.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For inclined surface / side finish machining / For shoulder milling

High Precision Barrel Tools QM Series MQT TYPE

■ RECOMMENDED CUTTING CONDITIONS

High-precision version QM Max MQT type (XPHT / W type insert for inclined surface finishing) + Anit Vibration Carbide Shank for Modular Head

Work Materials	Insert Grades	Tool dia. (mm)														
		16					20					20				
		No. of teeth 2N					No. of teeth 2N					No. of teeth 4N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 XPHT type (XPHW type) (CX75)	～55	≦1.5	＜0.12	12,000	4,800	～70	≦1.5	＜0.12	9,600	3,840	～70	≦1.5	＜0.12	9,600	7,680
		55～80	≦1.2	＜0.10	9,000	3,600	70～100	≦1.2	＜0.10	7,200	2,880	70～100	≦1.2	＜0.10	7,200	5,760
		80～105	≦1.0	＜0.10	7,200	2,880	100～130	≦1.0	＜0.10	5,760	2,300	100～130	≦1.0	＜0.10	5,760	4,600
		105～160	≦1.0	＜0.10	6,000	2,400	130～200	≦1.0	＜0.10	4,800	1,920	130～200	≦1.0	＜0.10	4,800	3,840
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 XPHT type (XPHW type) (CX75)	～55	≦1.5	＜0.12	10,000	4,000	～70	≦1.5	＜0.12	8,000	3,200	～70	≦1.5	＜0.12	8,000	6,400
		55～80	≦1.2	＜0.10	7,500	3,000	70～100	≦1.2	＜0.10	6,000	2,400	70～100	≦1.2	＜0.10	6,000	4,800
		80～105	≦1.0	＜0.10	6,000	2,400	100～130	≦1.0	＜0.10	4,800	1,920	100～130	≦1.0	＜0.10	4,800	3,840
		105～160	≦1.0	＜0.10	5,000	2,000	130～200	≦1.0	＜0.10	4,000	1,600	130～200	≦1.0	＜0.10	4,000	3,200
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 XPHT type (XPHW type) (DH102)	～55	≦1.2	＜0.12	9,000	3,600	～70	≦1.2	＜0.12	7,200	2,880	～70	≦1.2	＜0.12	7,200	5,760
		55～80	≦1.0	＜0.10	6,800	2,720	70～100	≦1.0	＜0.10	5,400	2,160	70～100	≦1.0	＜0.10	5,400	4,320
		80～105	≦0.8	＜0.10	5,400	2,160	100～130	≦0.8	＜0.10	4,320	1,730	100～130	≦0.8	＜0.10	4,320	3,460
		105～160	≦0.8	＜0.10	4,500	1,800	130～200	≦0.8	＜0.10	3,600	1,440	130～200	≦0.8	＜0.10	3,600	2,880
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 XPHW type (JC8015)	～55	≦1.0	＜0.12	8,000	3,200	～70	≦1.0	＜0.12	6,400	2,560	～70	≦1.0	＜0.12	6,400	5,120
		55～80	≦0.8	＜0.10	6,000	2,400	70～100	≦0.8	＜0.10	4,800	1,920	70～100	≦0.8	＜0.10	4,800	3,840
		80～105	≦0.6	＜0.10	4,800	1,920	100～130	≦0.6	＜0.10	3,840	1,540	100～130	≦0.6	＜0.10	3,840	3,080
		105～160	≦0.6	＜0.10	4,000	1,600	130～200	≦0.6	＜0.10	3,200	1,280	130～200	≦0.6	＜0.10	3,200	2,560
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 XPHW type (JC8015)	～55	≦1.0	＜0.10	5,000	1,500	～70	≦1.0	＜0.10	4,000	1,200	～70	≦1.0	＜0.10	4,000	2,400
		55～80	≦0.8	＜0.08	3,750	1,130	70～100	≦0.8	＜0.08	3,000	900	70～100	≦0.8	＜0.08	3,000	1,800
		80～105	≦0.6	＜0.08	3,000	900	100～130	≦0.6	＜0.08	2,400	720	100～130	≦0.6	＜0.08	2,400	1,440
		105～160	≦0.6	＜0.08	2,500	750	130～200	≦0.6	＜0.08	2,000	600	130～200	≦0.6	＜0.08	2,000	1,200
Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC	DH102 XPHW type	～55	≦1.0	＜0.10	3,600	720	～70	≦1.0	＜0.10	2,860	570	～70	≦1.0	＜0.10	2,860	1,140
		55～80	≦0.8	＜0.08	2,700	540	70～100	≦0.8	＜0.08	2,140	430	70～100	≦0.8	＜0.08	2,140	860
		80～105	≦0.6	＜0.08	2,160	430	100～130	≦0.6	＜0.08	1,720	340	100～130	≦0.6	＜0.08	1,720	680
		105～160	≦0.6	＜0.08	1,800	360	130～200	≦0.6	＜0.08	1,430	290	130～200	≦0.6	＜0.08	1,430	580
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 XPHW type (XPHT type) (DH102)	～55	≦1.5	＜0.12	12,000	6,000	～70	≦1.5	＜0.12	9,600	4,800	～70	≦1.5	＜0.12	9,600	9,600
		55～80	≦1.2	＜0.10	9,000	4,500	70～100	≦1.2	＜0.10	7,200	3,600	70～100	≦1.2	＜0.10	7,200	7,200
		80～105	≦1.0	＜0.10	7,200	3,600	100～130	≦1.0	＜0.10	5,760	2,880	100～130	≦1.0	＜0.10	5,760	5,760
		105～160	≦1.0	＜0.10	6,000	3,000	130～200	≦1.0	＜0.10	4,800	2,400	130～200	≦1.0	＜0.10	4,800	4,800
Stainless steel SUS304 Below 250HB	JC8015 XPHT type (XPHW type)	～55	≦1.2	＜0.12	10,000	4,000	～70	≦1.2	＜0.12	8,000	3,200	～70	≦1.2	＜0.12	8,000	6,400
		55～80	≦1.0	＜0.10	7,500	3,000	70～100	≦1.0	＜0.10	6,000	2,400	70～100	≦1.0	＜0.10	6,000	4,800
		80～105	≦0.8	＜0.10	6,000	2,400	100～130	≦0.8	＜0.10	4,800	1,920	100～130	≦0.8	＜0.10	4,800	3,840
		105～160	≦0.8	＜0.10	5,000	2,000	130～200	≦0.8	＜0.10	4,000	1,600	130～200	≦0.8	＜0.10	4,000	3,200

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

Theoretical cusp height: XPHT / W type

Casp height (μm)	ap(mm)	Casp height (μm)	ap(mm)
0.50	0.5	3.35	1.3
0.71	0.6	3.89	1.4
0.97	0.7	4.46	1.5
1.27	0.8	5.08	1.6
1.61	0.9	5.73	1.7
1.98	1.0	6.43	1.8
2.40	1.1	7.16	1.9
2.86	1.2	7.94	2.0

Note

1) Adjust the above cutting conditions according to the machine rigidity and workpiece rigidity.
2) If chatter occurs, make ap and ae shallower than the above values.
3) Remove chips by air blow.
4) Standard cutting conditions for YPHW * -15 / -F / -F1 and ZPMT * -PL type cutting edge replacement inserts are H180 to H186 (ZPMT * -PL type) and H187 to H206 (YPHW * -15 /). -F type), see pages H212 to H216 (YPHW * -F1 type).

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For inclined surface / side finish machining / For shoulder milling

High Precision Barrel Tools QM Series MQT TYPE

RECOMMENDED CUTTING CONDITIONS

High-precision version QM Max MQT type (XPHT / W type insert for inclined surface finishing) + Anti Vibration Carbide Shank for Modular Head

Work Materials	Insert Grades	Tool dia. (mm)									
		25					32／35				
		No. of teeth 5N					No. of teeth 6N				
		r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	r (mm)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015 XPHT type (XPHW type) (CX75)	～90	≦1.5	＜0.12	7,640	7,640	～120	≦1.5	＜0.12	5,460	6,550
		90～125	≦1.2	＜0.10	5,730	5,730	120～175	≦1.2	＜0.10	4,100	4,920
		125～160	≦1.0	＜0.10	4,580	4,580	175～225	≦1.0	＜0.10	3,280	3,940
		160～250	≦1.0	＜0.10	3,820	3,820	225～320	≦1.0	＜0.10	2,730	3,280
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	JC8015 XPHT type (XPHW type) (CX75)	～90	≦1.5	＜0.12	6,400	6,400	～120	≦1.5	＜0.12	4,550	5,460
		90～125	≦1.2	＜0.10	4,800	4,800	120～175	≦1.2	＜0.10	3,410	4,090
		125～160	≦1.0	＜0.10	3,840	3,840	175～225	≦1.0	＜0.10	2,730	3,280
		160～250	≦1.0	＜0.10	3,200	3,200	225～320	≦1.0	＜0.10	2,280	2,740
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	JC8015 XPHT type (XPHW type) (DH102)	～90	≦1.2	＜0.12	5,730	5,730	～120	≦1.2	＜0.12	4,090	4,910
		90～125	≦1.0	＜0.10	4,300	4,300	120～175	≦1.0	＜0.10	3,070	3,680
		125～160	≦0.8	＜0.10	3,440	3,440	175～225	≦0.8	＜0.10	2,450	2,940
		160～250	≦0.8	＜0.10	2,870	2,870	225～320	≦0.8	＜0.10	2,050	2,460
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	DH102 XPHW type (JC8015)	～90	≦1.0	＜0.12	5,100	5,100	～120	≦1.0	＜0.12	3,640	4,370
		90～125	≦0.8	＜0.10	3,830	3,830	120～175	≦0.8	＜0.10	2,730	3,280
		125～160	≦0.6	＜0.10	3,060	3,060	175～225	≦0.6	＜0.10	2,180	2,620
		160～250	≦0.6	＜0.10	2,550	2,550	225～320	≦0.6	＜0.10	1,820	2,180
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	DH102 XPHW type (JC8015)	～90	≦1.0	＜0.10	3,180	2,380	～120	≦1.0	＜0.10	2,280	2,050
		90～125	≦0.8	＜0.08	2,380	1,780	120～175	≦0.8	＜0.08	1,710	1,540
		125～160	≦0.6	＜0.08	1,910	1,430	175～225	≦0.6	＜0.08	1,370	1,230
		160～250	≦0.6	＜0.08	1,590	1,190	225～320	≦0.6	＜0.08	1,140	1,030
Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC	DH102 XPHW type	～90	≦1.0	＜0.10	2,300	1,150	～120	≦1.0	＜0.10	1,640	980
		90～125	≦0.8	＜0.08	1,720	860	120～175	≦0.8	＜0.08	1,230	740
		125～160	≦0.6	＜0.08	1,380	690	175～225	≦0.6	＜0.08	980	590
		160～250	≦0.6	＜0.08	1,150	580	225～320	≦0.6	＜0.08	820	490
Grey & Nodular cast iron FC, FCD (GG, GGG) Below 300HB	JC8015 XPHW type (XPHT type) (DH102)	～90	≦1.5	＜0.12	7,640	9,550	～120	≦1.5	＜0.12	5,460	8,190
		90～125	≦1.2	＜0.10	5,730	7,160	120～175	≦1.2	＜0.10	4,100	6,150
		125～160	≦1.0	＜0.10	4,580	5,720	175～225	≦1.0	＜0.10	3,280	4,920
		160～250	≦1.0	＜0.10	3,820	4,780	225～320	≦1.0	＜0.10	2,730	4,100
Stainless steel SUS304 Below 250HB	JC8015 XPHT type (XPHW type)	～90	≦1.2	＜0.12	6,400	6,400	～120	≦1.2	＜0.12	4,550	5,460
		90～125	≦1.0	＜0.10	4,800	4,800	120～175	≦1.0	＜0.10	3,410	4,090
		125～160	≦0.8	＜0.10	3,840	3,840	175～225	≦0.8	＜0.10	2,730	3,280
		160～250	≦0.8	＜0.10	3,200	3,200	225～320	≦0.8	＜0.10	2,280	2,740

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

Theoretical cusp height: XPHT / W type

Casp height (μm)	ap(mm)	Casp height (μm)	ap(mm)
0.50	0.5	3.35	1.3
0.71	0.6	3.89	1.4
0.97	0.7	4.46	1.5
1.27	0.8	5.08	1.6
1.61	0.9	5.73	1.7
1.98	1.0	6.43	1.8
2.40	1.1	7.16	1.9
2.86	1.2	7.94	2.0

Note

1) Adjust the above cutting conditions according to the machine rigidity and workpiece rigidity.
2) If chatter occurs, make ap and ae shallower than the above values.
3) Remove chips by air blow.
4) Standard cutting conditions for YPHW * -15 / -F / -F1 and ZPMT * -PL type cutting edge replacement inserts are H180 to H186 (ZPMT * -PL type) and H187 to H206 (YPHW * -15 /). -F type), see pages H212 to H216 (YPHW * -F1 type).

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

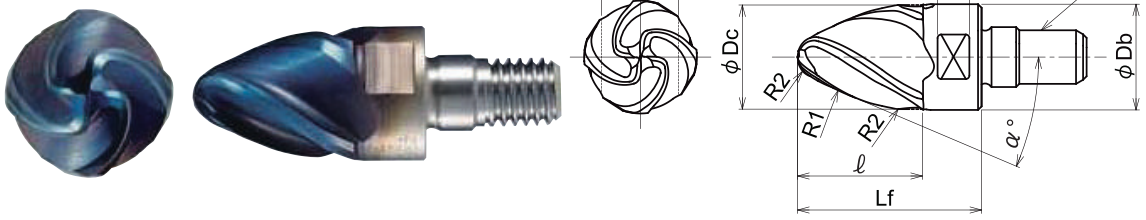
For inclined surface / side finish machining / For shoulder milling

Solid Modular Head STLP TYPE

- 4 flutes / Helix angle 30°
- Form accuracy: 0.010mm

DH COATING

5 axis



Cat. No.	Stock	Grade	No. of flutes	Dimensions (mm)									
				φDc	ℓ	Lf	R1	R2	α°	φDb	MD	C	W
STLP4160T20R4-M8	◎	DH115	4	16	14.3	26	1500	4	20°	15	M8	5.5	14
STLP4200T20R5-M10	◎			20	17.9	30	1500	5	20°	19	M10	5.5	17

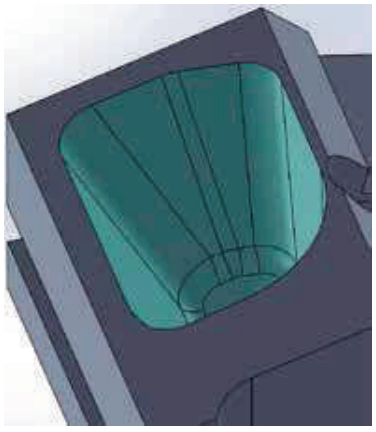
Note) Be sure to use DIJET DS type spanner wrench to prevent over-tightening.

■ Tightening Torque for head

Thread	Tightening torque	Spanner size of S-Head	Cat No. of spanner wrench DS type
M8	10～11N·m	14	DS-14
M10	10～16N·m	17	DS-17

■ CUTTING DATA

Overhung length: 106mm



Result: STLP achieved high efficient & precision machining, compared with ball nose end mill.

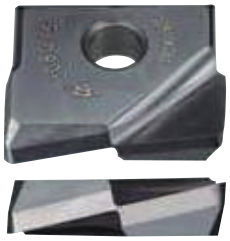
Work	Part name	Test piece
	Material	S50C C50
	Hardness	—
Tool	Tool No.	STLP4160T20R4-M8
	Grade	DH115
Cutting conditions	n	n=10,000min^{-1}
	Vf	Vf=1,200mm/min
	ap(mm)	2mm
	ae(mm)	0.15mm
	Coolant	Dry
	Machine	5-axis MC

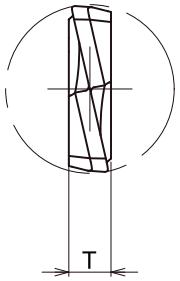
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

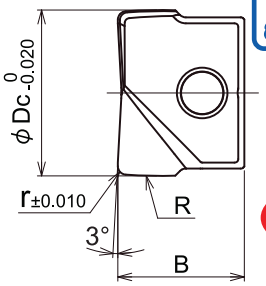
For inclined surface / side finish machining / For shoulder milling

Mirror Ball Modular Head KRM / MRX TYPE

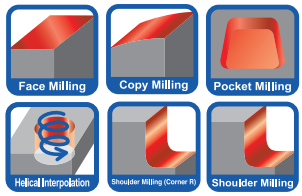
Insert for "MIRROR BARREL" KRM type







5 axis



Corner radius accuracy of inserts: within ±0.010mm

Radius form accuracy on the outer periphery: within ±0.010mm

Cat No.	PVD Coated		Dimensions (mm)				
	JC8015 (Z10~20)	DH102 (Z01)	R	r	φDc	B	T
KRM-160-R10-BR50	◎	◎	50	1	16	12	4
KRM-200-R10-BR60	◎	◎	60	1	20	15	5

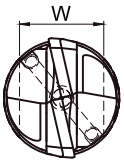
Note) Use only MIRROR RADIUS modular head MRX type or carbide shank end mill style.

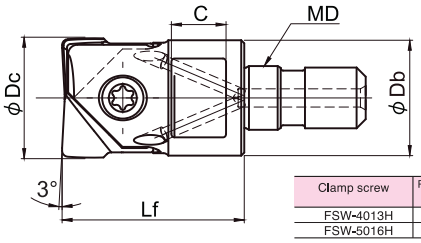
Modular head MRX type

Through coolant hole

5 axis

Accuracy of MRX after combined O.D. run out: below 15μm (Target below 10μm)
In case of using KRM type insert / Corner radius accuracy: within ±0.010mm, radius form accuracy on the outer periphery.: within ±0.010mm





Clamp screw	Recommended torque (N·m)
FSW-4013H	3.0
FSW-5016H	4.0

Cat. No. NEW	Cat. No. OLD	Stock	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Applicable inserts	Parts: Clamp screw	Parts: Wrench
MRX-160-M8	MRN-160-M8 (-H)	●	16	23	15	M8	8	12	RNM-160/170-.../HRM-160/170-... FRM-160/170.../KRM-160-...	FSW-4013H	T-15
MRX-200-M10	MRN-200-M10 (-H)	●	20	30	19	M10	8	14	RNM-200/210-.../HRM-200/220-... FRM-200/210.../KRM-200-...	FSW-5016H	A-20W

Note) 1. All holders are supplied without inserts & wrench.
2. Please see below for recommended tightening torque on Modular Head. (When mounting head to shank, recommend to use DIJET DS type spanner wrench to prevent over tightening.)

Tightening Torque for head

Thread	Tightening torque for head	Spanner size	Cat No. of spanner wrench DS type
M8	16N·m	12	DS-12
M10	16N·m	14	DS-14
M12	20N·m	17	DS-17
M16	25N·m	22	DS-22

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For inclined surface / side finish machining / For shoulder milling

Mirror Ball Modular Head KRM TYPE

CUTTING DATA

Overhung length: 130mm

Ball | Barrel

Ra=0.70μm

Ra=0.26μm

Result

KRM achieved excellent surface roughness compared with indexable ball nose end mill.

Work	Part name	Test piece (side milling)	
	Material	NAK80 P21	
	Hardness	40HRC	
Tool	Tool No.	MBX-200-M10	MBX-200-M10
	Grade	Ball BNM-200-SSR (DH108)	Barrel KRM-200-R10-BR60 (JC8015)
Cutting conditions	n	$n=6,369min^{-1}$	
	Vf	Vf=1,910mm/min	
	ap(mm)	0.4mm	1.0mm
	ae(mm)	0.1mm	
	Coolant	Dry	
	Machine	5-axis MC	

For Finishing / Profile Milling

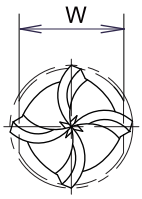
Ball S-Head

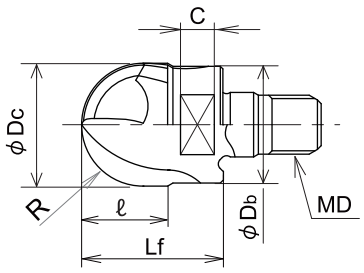
Mirror Series

SMHB TYPE

DH Hard Coated | Copy Milling | Pocket Milling

●4 flutes, Helix angle 45°





Tolerance (mm)

R of ball nose	Tolerance of R
R8	±0.008
R10	±0.010

■ BODY

Cat.No	Stock	Grades	No. of flutes	Dimensions (mm)							
				R	ϕDc	ℓ	Lf	ϕDb	MD	C	W
SMHB-4160-M8	●	DH115	4	8	16	11.2	19	15	M8	5.5	14
SMHB-4200-M10	●			10	20	14	23	19	M10	5.5	17

Note) Be sure to use DIJET DS type spanner wrench for preventing over-tightening.

■ TIGHTENING TORQUE FOR HEAD

Tool dia.ϕ Dc(mm)	Tightening torque	Spanner size W(mm)	Cat No. of spanner wrench
ϕ16	10～11N·m	14	DS-14
ϕ20	10～16N·m	17	DS-17

For Finishing / Profile Milling

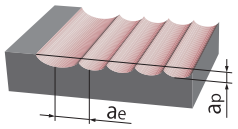
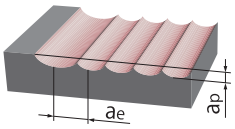
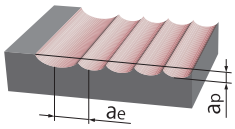
Ball S-Head

Mirror Series

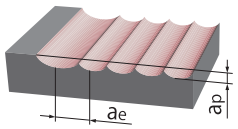
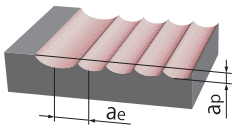
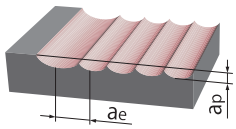
SMHB TYPE

RECOMMENDED CUTTING CONDITIONS

● Ball S Head SMHB type for Finishing

Work materials		Carbon steel・Alloy steel		Hardened die steel (1.2344, 1.2379) 42～52HRC		Stainless steel・heat resisting steel 38～42HRC	
Type of machining		 ap≦0.03Dc ae≦0.03Dc		 ap≦0.03Dc ae≦0.03Dc		 ap≦0.03Dc ae≦0.03Dc	
Tool dia.		n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)
R	φ Dc						
8	16	6,000	4,000	5,000	3,000	5,500	3,500
10	20	5,700	4,000	4,500	3,000	5,000	3,500

● Ball S Head SMHB type for Roughing & Semi Finishing

Work materials		Carbon steel・Alloy steel ～25HRC		Hardened die steel (1.2344, 1.2379) 42～52HRC		Stainless steel・heat resisting steel 38～42HRC	
Type of machining		 ap≦0.1Dc ae≦0.25Dc		 ap≦0.1Dc ae≦0.25Dc		 ap≦0.1Dc ae≦0.25Dc	
Tool dia.		n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)
R	φ Dc						
8	16	4,500	3,000	3,800	2,200	4,200	2,600
10	20	4,300	3,000	3,400	2,200	3,800	2,600

For Finishing / Profile Milling

Mirror ball

Mirror Series

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) R	φDc	ℓ1	ℓ2	L	φD1	φDs	θκ°	θn° テーパ角	Parts Clamp Screw	Parts Wrench (Not included)	Inserts	
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	●		10	20	–	38	104	17	20	–	–	FSW-5016H	A-20W	BNM-200...	RNM-200...
BNM-200050T-S25LS	●	1			34	50	170		25	3°33'					
BNMM-200075S-S20	●				–	75	141			–	–				
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 E402 - E405 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.
4. In case of steel shank, reduce the cutting parameters by 50%

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 stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

Mirror ball

Mirror Series

BNM TYPE

Copy Milling | Pocket Milling | Slotting

BNM-T-LS type
(Taper Neck, Long Shank)

Fig.1 (Straight Neck)

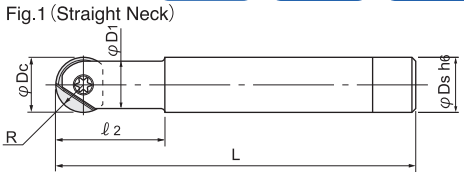


Fig.2 (Taper Neck)

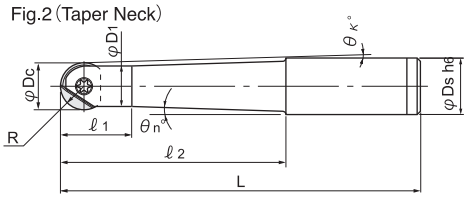
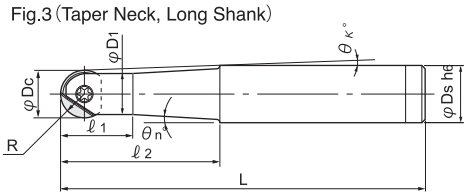


Fig.3 (Taper Neck, Long Shank)



Cat. No.	Stock	Fig.	Dimensions (mm) R	φDc	ℓ1	ℓ2	L	φD1	φDs	θK°	θn° Taper angle	Parts: Clamp Screw	Parts: Wrench (Not included)	Inserts	
BNMS-250045S-S25	●	1			–	45	121		25	–	–				
BNM-250060T-S32LS	●	2			41	60	200		32	4°10'	14°				
BNMM-250090S-S25	●	1	12.5	25	–	90	166	21	25	–	–	FSW-6020	A-30	BNM-250...	RNM-250...
BNMM-250090T-S25	●	2			41	90	166			–	2°20'				
BNML-250135T-S32	●				41	135	215		32	1°38'	1°30'				
BNMS-300053S-S32	●	1			–	53 (54)	133 (134)			–	–				
BNM-300080T-S32LS	●	2			49 (50)	80 (81)	220 (221)			0°53' (–)	4°				
BNMM-300106S-S32	●	1	15	30	–	106 (107)	186 (187)	26	32	–	–	FSW-8025	A-40	BNM-300... BNM-320...	RNM-300...
BNMM-300106T-S32	●	2			49 (50)	106 (107)	186 (187)			0°38' (–)	3°				
BNML-300160T-S32	●				49 (50)	160 (161)	240 (241)			0°24' (–)	1°10'				

Note) 1. All cutters are supplied without inserts.
2. Please refer page E402 - E405 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

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 stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

Mirror ball C body (Carbide shank)

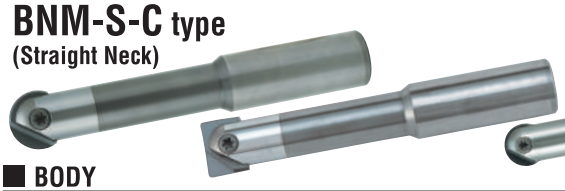
C Body carbide shank | Mirror Series | BNM TYPE

Mirror Ball Carbide Shanks

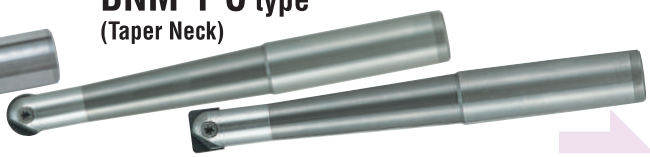
1. It is possible to machine deeper mold with high quality and high accuracy at higher cutting parameters due to increased tool rigidity and minimize the vibration.
2. By adopting carbide shank, tool rigidity is equal to solid carbide ball nose end mill.
3. Compared with steel shank, the tool life is 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) R	φDc	ℓ1	ℓ2	L	φD1	φDs	θK°	θn° Taper angle	Parts: Clamp Screw	Parts: Wrench (Not included)	Inserts	
BNMS-060017S-S06C	●	1			–	17	60		6	–	–				
BNMS-060030T-S10C	●	2	3	6	15	30	80	5.5	10	4°14'	6°	FSW-2005H	A-06	BNM-060... (BNM-070)	
BNMM-060035S-S06C	●	1			–	35	92		6	–	–				
BNML-060017S-S06C	●	1			–	17	120			–	–				
BNMS-080025S-S08C	●				–	25	90			–	–				
BNMM-080035S-S08C	●	1			–	35	92		8	–	–				
BNML-080075S-S08C	●		4	8	–	75	140	7.5		–	–	FSW-2506H	A-07	BNM-080...	RNM-080...
BNML-080095S-S08C	●				–	95	160			–	–				
BNML-080075T-S12C	●	2			20	75	132		12	1°37'	2°				
BNMS-100030S-S10C	●				–	30	100			–	–				
BNMM-100043S-S10C	●				–	43	100			–	–				
BNML-100075S-S10C	●	1			–	75	140		10	–	–				
BNML-100080S-S10C	●		5	10	–	80	220	9.5		–	–	FSW-3007H	A-08	BNM-100... (BNM-110)	RNM-100...
BNML-100095S-S10C	●				–	95	160			–	–				
BNML-100140S-S10C	●				–	140	220			–	–				
BNML-100075T-S12C	●	2			32.1	75	132		12	0°49'	1°30'				
BNMS-120028S-S12C	●				–	28	84			–	–				
BNMM-120053S-S12C	●	1			–	53	110		12	–	–				
BNML-120095S-S12C	●				–	95	160			–	–				
BNML-120100S-S12C	●		6	12	–	100	220	11.5		–	–	FSW-3509H	A-10	BNM-120...	RNM-120...
BNML-120085T-S16C	●	2			33.8	85	145		16	1°27'	2°				
BNML-120130S-S12C	●	1			–	130	200		12	–	–				
BNML-120150S-S12C	●				–	150	220			–	–				
BNMS-160033S-S16C	●	1			–	33	93		16	–	–				
BNMM-160063T-S20C	●	2			37.5	63	123		20	2°5'	4°				
BNML-160070S-S16C	●				–	70	140			–	–				
BNML-160090S-S16C	●	1	8	16	–	90	160	15	16	–	–	FSW-4013H	A-15	BNM-160... GRM-160...	RNM-160...
BNML-160100S-S16C	●				–	100	220			–	–				
BNML-160100T-S20C	●	2			44.5	100	166		20	1°15'	2°				
BNML-160110S-S16C	●	1			–	110	180		16	–	–				
BNML-160150S-S16C	●				–	150	220			–	–				

Note) 1. All cutters are supplied without inserts. 2. Please refer page E402 - E405 for recommended cutting conditions. 3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Please refer page E377 for ★Caution for the mounting on shrink-fit holder

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

Mirror ball C body (Carbide shank)

C Body carbide shank | Mirror Series | BNM TYPE

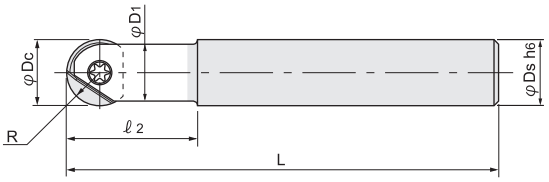


Fig.1 (Straight Neck)

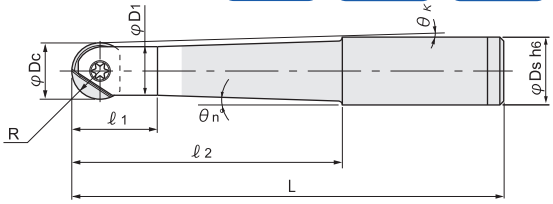


Fig.2 (Taper Neck)

■ BODY

Cat. No.	Stock	Fig.	Dimensions (mm) R	φDc	ℓ1	ℓ2	L	φD1	φDs	θκ°	θn° Taper angle	Parts: Clamp Screw	Parts: Wrench (Not included)	Inserts	
BNMS-200039S-S20C	●				–	39	105			–	–				
BNMM-200075S-S20C	●	1			–	75	141		20	–	–				
BNML-200100S-S20C	●				–	100	220			–	–				
BNML-200105S-S20C	●		10	20	–	105	180	19		–	–	FSW-5016H	A-20W	BNM-200... GRM-200...	RNM-200...
BNML-200115T-S25C	●	2			64.3	115	191		25	1°22'	2°				
BNML-200125S-S20C	●				–	125	200			–	–				
BNML-200170S-S20C	●	1			–	170	250		20	–	–				
BNML-200220S-S20C	●				–	220	300			–	–				
BNMM-250090S-S25C	●				–	90	166			–	–				
BNML-250100S-S25C	●	1	12.5	25	–	100	220	24	25	–	–	FSW-6020	A-30	BNM-250... GRM-250...	RNM-250...
BNML-250140S-S25C	●				–	140	220			–	–				
BNML-250170S-S25C	●				–	170	250			–	–				
BNMM-300120S-S32C	●				–	120 (121)	200 (201)			–	–				
BNML-300100S-S32C	●				–	100 (101)	220 (221)			–	–				
BNML-300140S-S32C	●	1	15	30	–	140 (141)	220 (221)	29	32	–	–	FSW-8025	A-40	BNM-300... GRM-300... BNM-320...	RNM-300...
BNML-300170S-S32C	●				–	170 (171)	250 (251)			–	–				
BNML-300220S-S32C	●				–	220 (221)	300 (301)			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page E402 - E405 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

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

For Finishing / Profile Milling

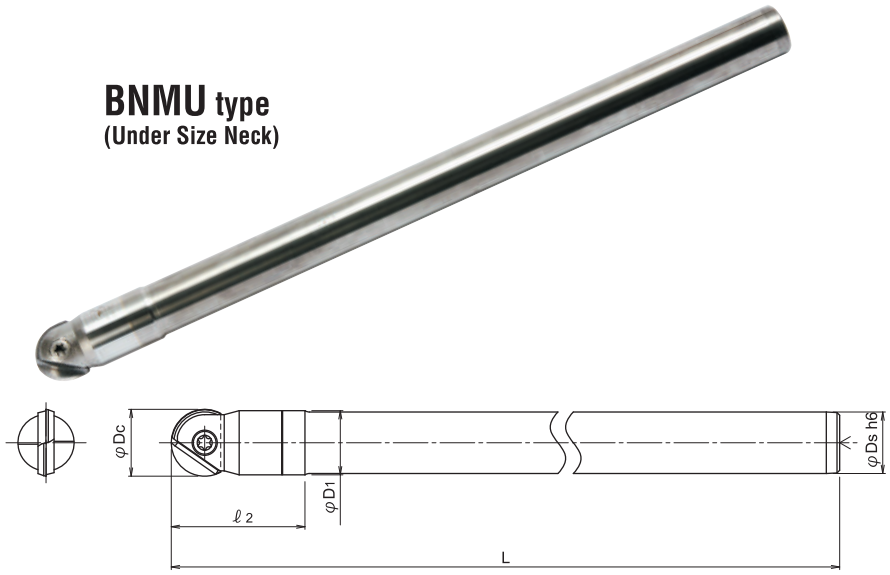
Mirror ball C body
(Under shank type) (Carbide shank)

C Body carbide shank | Mirror Series | BNM TYPE

1. Under neck type : φDs (Shank dia.) = φDc (Tool dia.) — 1～2mm
2. 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.
3. By adopting carbide shank, tool rigidity is equal to solid carbide ball nose end mill.
4. Compared with steel shank, the tool life is almost more than double.
5. Carbide shank can be used on shrink-fit type holders
6. 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

BNMU type
(Under Size Neck)



Cat. No.	Stock	Dimensions (mm)						Parts		Inserts	
		R	φDc	ℓ2	L	φD1	φDs	Clamp Screw	Wrench (Not included)		
BNMU-160220-S15C	●	8	16	–	220	15	15	FSW-4013H	A-15	BNM-160....,GRM-160....	RNM-160....
BNMU-200270-S18C	●	10	20	40	270	19	18	FSW-5016H	A-20W	BNM-200....,GRM-200....	RNM-200....

Note) 1. All cutters are supplied without inserts.
2. Please refer page E402 - E405 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Clamp Screw	Recommended torque (N•m)
FSW-4013H	3.0
FSW-5016H	4.0

Please refer page E377 for ★Caution for the mounting on shrink-fit holder

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

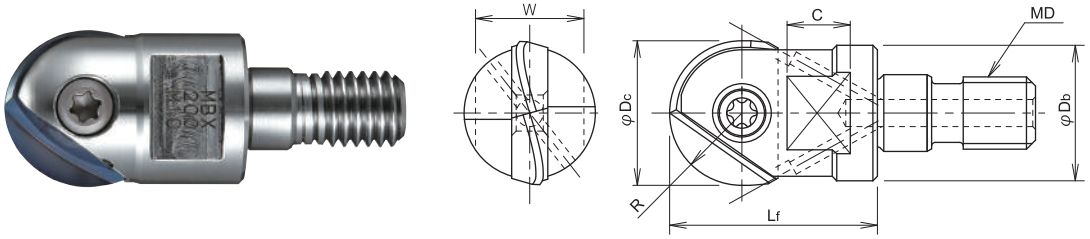
Mirror ball modular head

Mirror Series

MBX TYPE

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

Through Coolant Hole

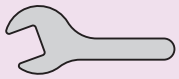


Cat. No. New	Cat. No. Old	Stock	R	φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp Screw	Parts: Wrench
MBX-100-M6	MBN-100-M6 (-H)	●	5	10	18	9.7	M6	6.5	8	BNM-100... / BNM-110	FSW-3007H	A-08
MBX-120-M6	MBN-120-M6 (-H)	●	6	12	20	11.5	M6	6.5	8	BNM-120...	FSW-3509H	A-10
MBX-160-M8	MBN-160-M8 (-H)	●	8	16	23	15	M8	8	12	BNM-160... / GRM-160...	FSW-4013H	A-15
MBX-200-M10	MBN-200-M10 (-H)	●	10	20	30	19	M10	8	14	BNM-200... / GRM-200...	FSW-5016H	A-20W
MBX-250-M12	MBN-250-M12 (-H)	●	12.5	25	35	24	M12	10	17	BNM-250... / GRM-250...	FSW-6020	A-30
MBX-300-M16	MBN-300-M16 (-H)	●	15	30	43 (44)	29	M16	12.5	22	BNM-300... / GRM-300... (BNM-320...)	FSW-8025	A-40
—	MBN-320-M16 (-H)	—	16	32	43	29	M16	12.5	22	BNM-320...	FSW-8025	A-40

Note) 1. All cutters are supplied without inserts.
2. Please refer page E402 - E405 for recommended cutting conditions.
3. Refer to page D16 for the recommended tightening torque for the modular head. (It is recommended to use a dedicated spanner <DS type> for M6 and M8 sizes.)
4. A wrench is not included with the main unit (sold separately).
* The values in () above indicate the dimensions when the ϕ32 insert (BNM-320 ... type) is attached.

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

◆ Dedicated spanner (for M6 and M8) Spanner model number



Spanner model number	Screw size	Tightening torque	Width across flats W	Thickness	Length
DS-08	M6	8.0 N·m	8	4	85
DS-12	M8	16 N·m	12	4	93

* Short handle specifications prevent overtightening.

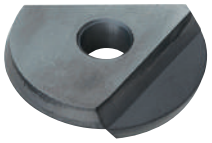
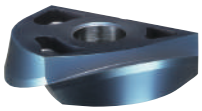
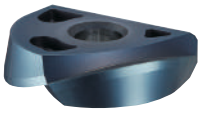
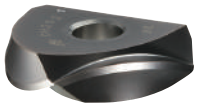
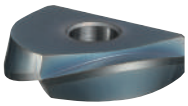
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

■ Mirror ball insert lineup

	Model number	Exterior	Features	Page
Insert shape	BNM type		• Straight blade	E384
	BNM-AAA type		• Straight blade • Ultra-precision grade (insert R accuracy ± 0.002mm)	E385
	BNM-SS type		• Twisted blade shape • By adopting the general-purpose grade “DH108”, stable machining and noticed very good tool life of the insert	E386
	BNM-SSR type		• Twisted blade shape • Adopts all R shapes and is ideal for processing (turbine blades, etc.) that uses an outer circumference of 180 degrees or more.	E387
	BNM-TS type		• By increasing the cutting edge strength, it is possible to cover the semi-finished area and stable machining of high hardness materials is possible. • The strong twist blade shape reduces chatter during machining and improves finished surface accuracy. • Adopts a new PVD coating “DH102” for high hardness materials.	E388 E389
	BNM-TG type/-S type		• Twisted blade shape • The BNM-TG type has a reinforced cutting edge that uses a negative blade shape to achieve a long life in high-hardness material finishing,	E390

* Please also refer to the guidelines for insert selection (page E401)

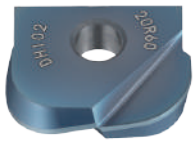
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

Mirror ball

Mirror Series BNM / MBX TYPE

■ Mirror ball insert lineup

	Model number	Exterior	Features	Page
Insert shape	GRM type		• Radius insert for largeR type shape machining. Improved the machined surface roughness of the flat surface.	E392

* Please also refer to the guidelines for insert selection (page E401)

For Finishing / Profile Milling

Mirror ball

Mirror Series BNM / MBX TYPE

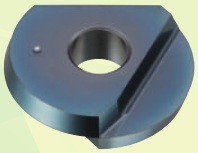
Mirror Ball

DH111 grade

Insert

Features

Wide application range for work material, as compared with conventional similar products, and double the tool life.
High precision machining possible with this new grade DH111 insert



Straight cutting edge on the inserts so high precision machining is possible.

Insert Radius accuracy is ± 0.006 mm good as solid carbide precision ball nose end mill.
Highly precision grade with accuracy ± 0.002 mm or less.

The new grade "DH111" is a special base material with excellent chipping resistance and wear resistance, and has oxidation resistance.
Combined with PVD coating "DH1 coat" with excellent impact resistance and adhesion,
Achieves twice the life of conventional products with dry and wet processing.

From general steel, pre-hardened steel, cast iron to difficult-to-cut materials such as stainless steel, titanium alloys, and heat-resistant alloys
Compatible with a wide range of work materials.

Ideal for high-precision machining such as blade machining.

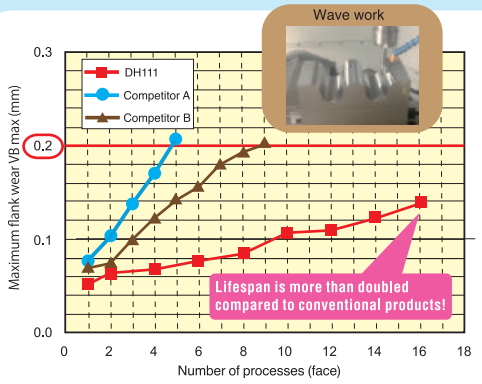
For Finishing / Profile Milling

Mirror ball

Mirror Series BNM / MBX TYPE

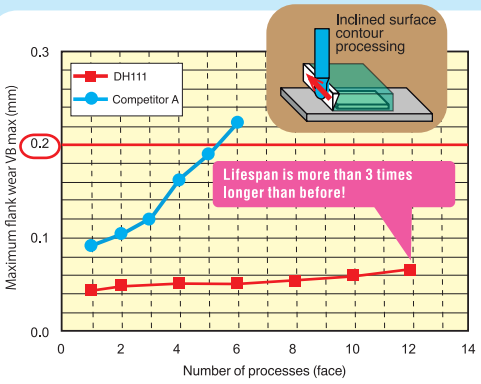
■ Cutting performance of DIJET CBN Mirror Ball Insert against competitor

(1) Life comparison (SKD11 / dry type)



Work material: SKD11 (raw material), corrugated work
Cutting conditions: n = 6,970min-1, Vc = 350m / min,
Vf = 2,790mm / min, f = 0.4mm / rev,
Ap = 0.2mm, ae = 0.32mm, round trip, Dry
Tool diameter: ϕ16 mm (insert model number: BNM-160, insert grade: DH111)

(2) Life comparison (SUS304 / wet)



Work material: SUS304, inclined surface
Cutting conditions: n = 4,500min-1, Vc = 226m / min,
Vf = 900mm / min, f = 0.2mm / rev,
Ap = 0.3mm, ae = 0.2mm, round trip, Wet
Tool diameter: ϕ16 mm (insert model number: BNM-160, insert grade: DH111)

Lineup of CBN inserts

CBN Mirror Ball Insert

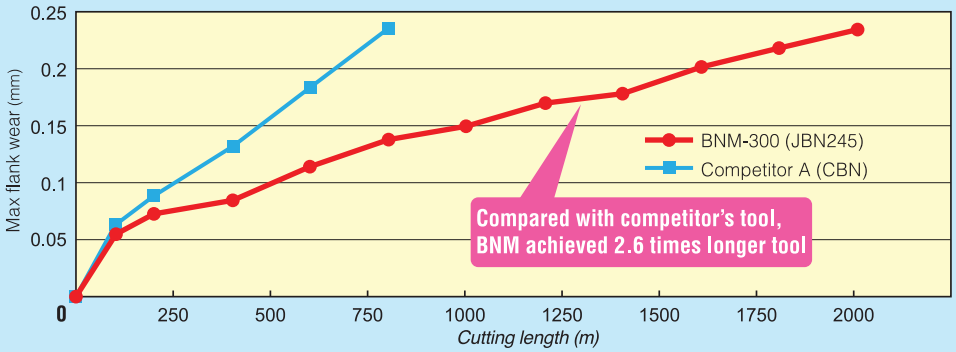
- Reduced the machining time by high speed cutting.
- Reduced the hand finishing and try out times by improved surface quality.
- Longer tool life.

Achieved huge cost reduction !

■ Cutting performance of DIJET CBN Mirror Ball Insert against competitor

Tool life comparison

Material: FCD700, Cutting conditions : n=1,5000min-1 ,Vf=1,200mm/min, ap=0.2mm, ae=0.6mm. Overhung length: 98mm



For Finishing / Profile Milling

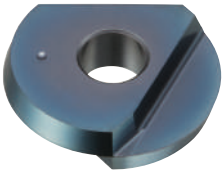
Mirror ball

Mirror Series **BNM / MBX** TYPE

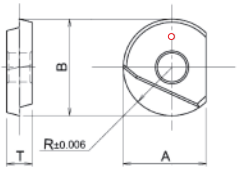
INSERTS (Straight Blade)

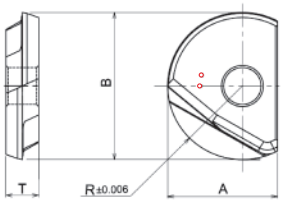
Radius form accuracy of insert: within ±0.006mm

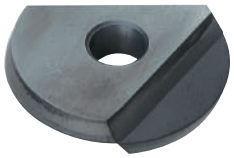
※ CBN Insert



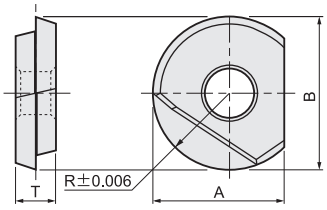
● DH111, JC1000, KT9



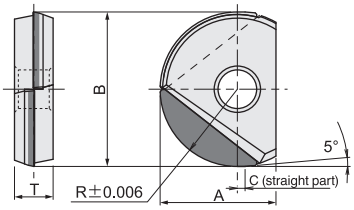




● DH103



● CBN Insert (JBN245)



Cat. No.	PVD coated		Diamond coated	Uncoated	CBN	Dimensions (mm)				
	DH103 (Z05)	DH111 (Z10)	JC10000	KT9 (K10)	JBN245	R	B	A	C	T
BNM-060	●	●	●	●		3	6	5	—	2
BNM-070		●	●			3.5	7	5.5	—	2
BNM-080	●	●	●	●		4	8	7	—	2.4
BNM-100	●	●	●	●		5	10	8.5	—	2.6
BNM-110			●			5.5	11	9	—	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. However, the grades JC10000 and JBN245 are included in one case.

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Note) 1. The holder (main body) is partially used. BNM-060 / BNM-070 can be attached to the ϕ6 holder, and BNM-100 / BNM-110 can be attached to the ϕ10 holder.
2. DH111 is recommended for wet cutting.
3. JC8003 has been replaced by DH103.
4. JC5015 and JC4015 have been replaced by grade DH111.
5. Please refer to the precautions when installing the insert (page E377).
6. In case of CBN - Ball refer page E405 for cutting parameters

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

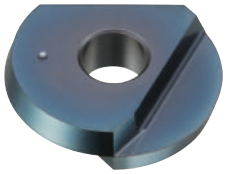
For Finishing / Profile Milling

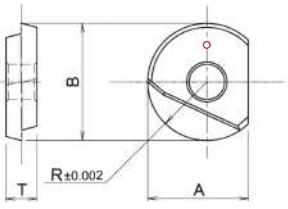
Mirror ball

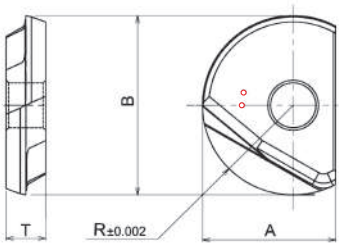
Mirror Series **BNM / MBX** TYPE

■ INSERTS (Straight blade, Ultra-precision grade)

Radius form accuracy of insert:
within ±0.002mm







Cat. No.	PVD coated	Dimensions (mm)			
	DH111 (Z10)	R	B	A	T
BNM-060-AAA	●	**3**	6	5	2
BNM-080-AAA	●	**4**	8	7	2.4
BNM-100-AAA	●	**5**	10	8.5	2.6
BNM-120-AAA	●	**6**	12	10	3
BNM-160-AAA	●	**8**	16	12	4
BNM-200-AAA	●	**10**	20	15	5
BNM-250-AAA	●	**12.5**	25	18.5	6
BNM-300-AAA	●	**15**	30	22.5	7
BNM-320-AAA	●	**16**	32	23.5	7

1 insert per case.

Note) 1. Please refer to the precautions when installing the insert (page E377).
2. JC5015 has been replaced by grade DH111.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

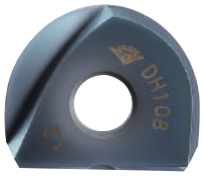
Mirror ball (SS / SSR insert) Mirror Series BNM / MBX TYPE

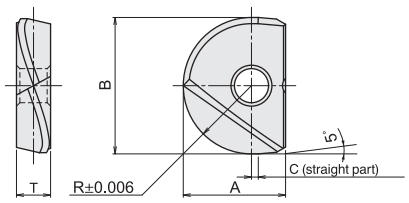
Features of BNM-SS / SSR

An improved version of the mirror-s insert for the high precision machining by indexable ball nose type cutter "Mirror ball BNM / MBX type", noticed high performance.
Adapted a new grade DH108 and a PVD coating "DH Coat" and a special base material, as a general purpose grade compatible with a wide range and work material such as a general steel, pre hardened steel, stainless steel, cast iron.
Achieved stable machining and better tool life

Corresponding insert (twisted blade type)

Fig.1 R8 or less (outer diameter ϕ16 or less)

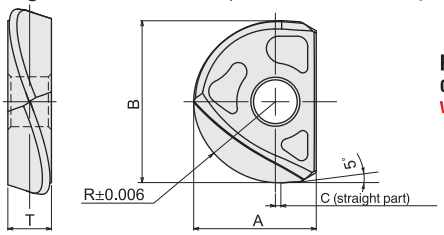




Radius form accuracy of insert: within ±0.006mm

※ϕ10 or more

Fig.2 R10 or more (outer diameter ϕ20 or more)



Radius form accuracy of insert: within ±0.006mm

※ϕ10 or more

Cat. No.	PVD coated	Dimensions (mm)					Fig.
	DH108	R	B	A	C	T	
BNM-060-SS	●	3	6	5	—	2	1
BNM-080-SS	●	4	8	7	0.5	2.4	1
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
BNM-320-SS	●	16	32	23.5	1	7	2

2 insert per case.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For Finishing / Profile Milling

Mirror ball (SS / SSR insert) Mirror Series BNM / MBX TYPE

■ Compatible inserts (twisted blade type, all R types)

Incase fo BNM-SSR type, insert is round on periphery by 200 degree, this type of inserts are suitable for turbine blade machining. Since, there is no straight outer circumference, chattering is reduced compared to regular tools while machining the vertical walls.

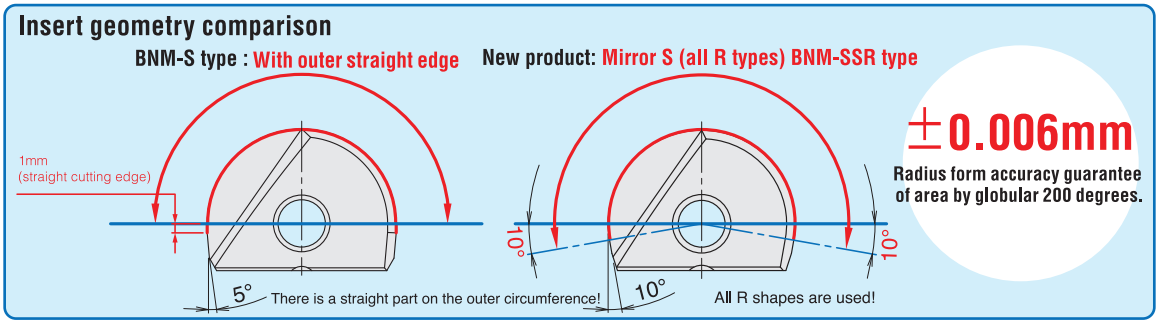
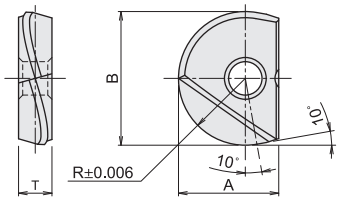


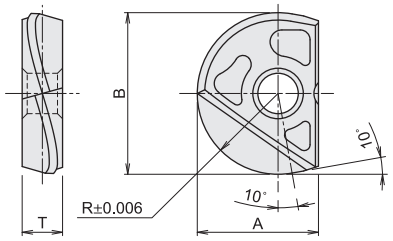
Fig.1 R8 or less (outer diameter ϕ16 or less)



Radius form accuracy of insert: within ±0.006mm

Cannot be re-polished

Fig.2 R10 or more (outer diameter ϕ20 or more)



Radius form accuracy of insert: within ±0.006mm

Cannot be re-polished

Cat. No.	PVD coated	Dimensions (mm)				Fig.
	DH108	R	B	A	T	
BNM-080-SSR	●	4	8	7	2.4	1
BNM-100-SSR	●	5	10	8.5	2.6	1
BNM-120-SSR	●	6	12	10	3	1
BNM-160-SSR	●	8	16	12	4	1
BNM-200-SSR	●	10	20	15	5	2
BNM-250-SSR	●	12.5	25	18.5	6	2
BNM-300-SSR	●	15	30	22.5	7	2

2 insert per case.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For Finishing / Profile Milling

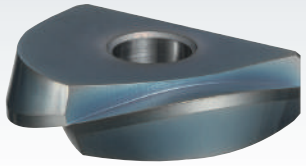
Mirror ball (TS insert) Mirror Series BNM / MBX TYPE

Features of BNM-TS type

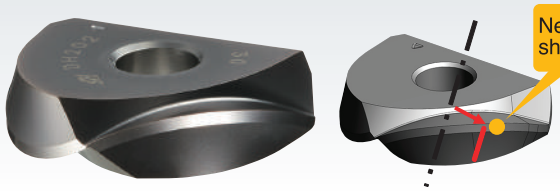
Insert for machining high hardness materials with good cutting edge strength and sharpness

- By increasing the cutting edge strength, it is possible to cover the semi-finished area and stable machining of high hardness materials is possible.
- Strongly twisted blade shape, for +ve rake reduces chatter during machining & improves finished surface accuracy.
- The shape of the chip pocket in the center has been improved to improve chip evacuation.
- Adopts a new grade "DH202" that is a combination of a new PVD coating "DH2 coat" for high hardness materials and fine particle cemented carbide for high hardness materials.
- By adopting a negative blade shape, a long life is achieved even while machining high hardness materials exceeding 60HRC.

BNM-TG type insert

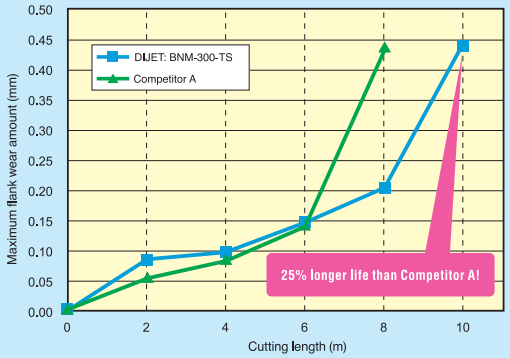


BNM-TS type insert (strong twist)



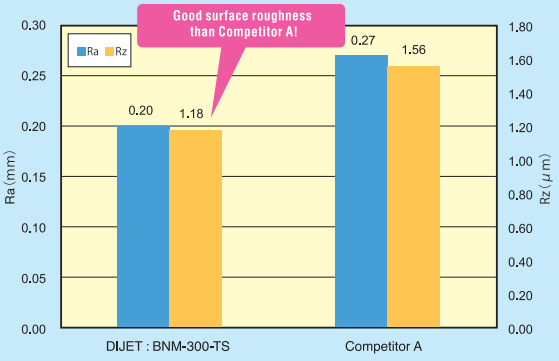
Cutting conditions

(1) Life comparison in 5 ° inclined surface machining (60HRC)



(2) Comparison of surface roughness in 5 ° inclined surface machining (60HRC)

Feed direction * After processing 2 sides



Work material : SKD11 (60HRC), 5 ° inclined surface, length 120 mm x width 120 mm x height 50 mm
Cutting conditions : n = 3,300min-1, Vc = 310m / min, Vf = 1,800mm / min, f = 0.55mm / rev,
Ae = 0.1mm, Pf = 0.4mm, downcut, air blow (external refueling)
Tool diameter: ϕ30mm
(Insert model number: BNM-300-TS)
Overhung length: 98mm

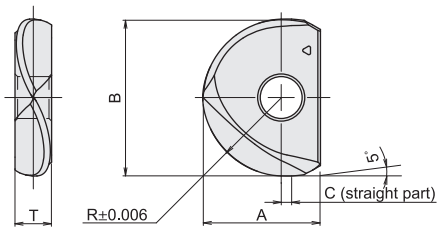
● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For Finishing / Profile Milling

Mirror ball (TS insert) Mirror Series BNM / MBX TYPE

Corresponding insert (strong twist blade type)

Radius form accuracy of insert: within ±0.006mm

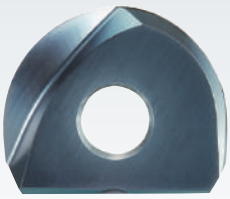


Cat. No.	PVD coated	Dimensions (mm)				
	DH202	R	B	A	C	T
BNM-160-TS	●	8	16	12	1.5	4
BNM-200-TS	●	10	20	15	2	5
BNM-250-TS	●	12.5	25	18.5	2	6
BNM-300-TS	●	15	30	22.5	2	7

2 insert per case.

Features of Insert

Insert for machining high hardness materials that has both cutting edge strength and sharpness



- By increasing the cutting edge strength, it is possible to cover the semi-finished area and stable machining of high hardness materials is possible.
- The strong torsion blade shape improves the impact resistance during biting during machining and reduces cutting resistance.
- Improved the shape of the chip pocket in the center to improve chip evacuation.
- Adopts a new grade "DH102" that is a combination of a new PVD coating "New DH Coat" for high-hardness materials and high-speed machining and fine particle cemented carbide for high-hardness materials.
- By adopting a negative blade shape, a long life is achieved even when machining high hardness materials exceeding 60HRC.

Cat. No.	PVD coated	Dimensions (mm)				
	DH102	R	B	A	C	T
BNM-060-TS	●	3	5	6	-	2
BNM-080-TS	●	4	7	8	0.5	2.4
BNM-100-TS	●	5	8.5	10	1	2.6
BNM-120-TS	●	6	10	12	1.5	3
BNM-160-TS	●	8	16	12	1.5	4
BNM-200-TS	●	10	20	15	2	5
BNM-250-TS	●	12.5	25	18.5	2	6
BNM-300-TS	●	15	30	22.5	2	7

2 insert per case.

For Finishing / Profile Milling

Mirror ball (Mirror S / TG insert) Mirror Series BNM / MBX TYPE

Strong Cutting Edge Mirror S

BNM-TG Type Line-Up

for high hardened material

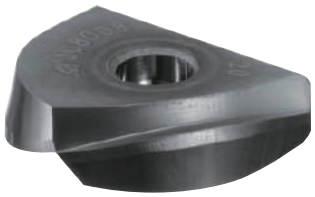
DH Coating

Series expansion, strong edge MIRROR-S insert
BNM-TG type for MIRROR BALL BNM / MBN type.

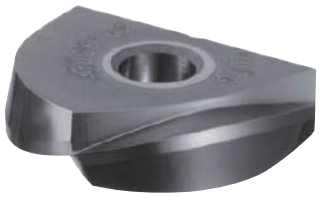
- Suitable for severe conditions, such as long overhung length, welding, plunging and machining different material at the same time.
- Adopted new PVD coated grade "DH102" suitable for high hardened material.
- Adopting negative rake cutting edge achieved longer tool life even high speed machining on hardened materials, 60HRC.

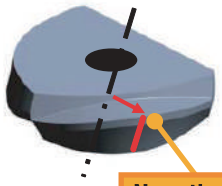
■ INSERTS (S type, TG type)

BNM-S : Standard type



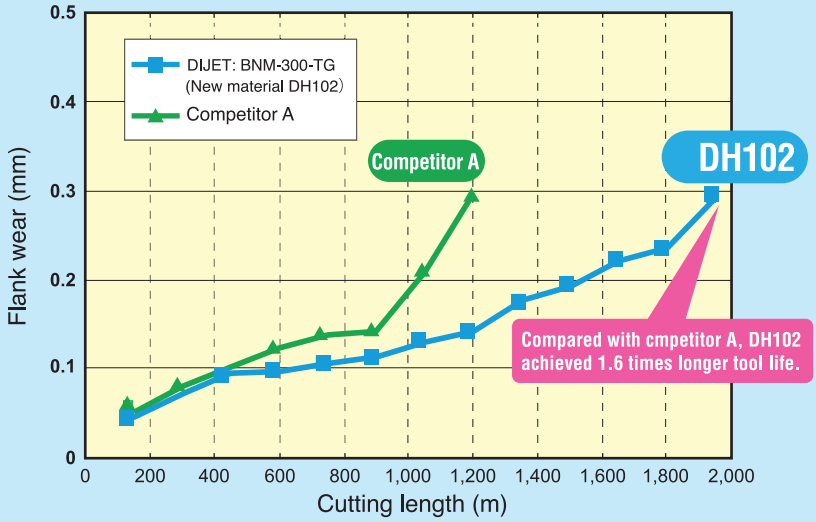
BNM-TG : Stronger cutting edge type





■ Cutting Performance

Tool life comparison on hardened die steel (60HRC)



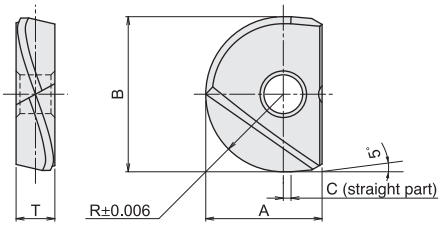
Material : SKD11 60HRC
Cutting conditions: n = 4,500 min^{-1}, Vc = 424m/min , Vf = 2,200 mm/min , f = 0.49mm/rev , ap = 0.15mm, ae = 0.2mm
Tool dia : ø30mm (Insert No. : BNM-300-TG)
Overhung length : 98mm

For Finishing / Profile Milling

Mirror ball (Mirror S / TG insert) Mirror Series BNM / MBX TYPE

■ Corresponding insert (twisted blade type)

BNM-S type BNM-TG type



Radius form accuracy of insert: within ±0.006mm

※φ10 or more
(Insert : DH102, FZ05)

Cat. No.	Uncoated	DLC	Dimensions (mm)				
	FZ05 (Z01)	JC20003	R	B	A	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

Cat. No.	PVD Coated	Dimensions (mm)				
	DH102 (Z01)	R	B	A	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 insert per case.

Note) 1. The mirror S / TG insert is an insert exclusively for mirror balls. When using, use a mirror ball (pages E374 to E378) or Please use it by setting it on the mirror ball modular head (E279 page).
2. Please contact our nearest sales office for re-polishing.
3. Please note that BNM-060-S and BNM-060-TG do not have a straight part.
4. Refer to the precautions when installing the insert (page E394).
5. The BNM-S type insert (grade JC8008) will be replaced with the BNM-SS type insert (grade DH108, page E386).

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For Finishing / Profile Milling

Mirror ball (Giant Radius insert) Mirror Series GRM TYPE

■"GRM type" radius Inserts for MIRROR BALL

CBN Material

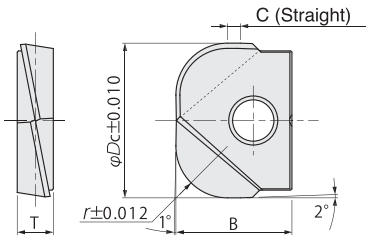
- Adopting CBN grade achieved high speed machining on cast iron and longer tool life.
- Reduced the hand finishing and try out times by improved surface quality.

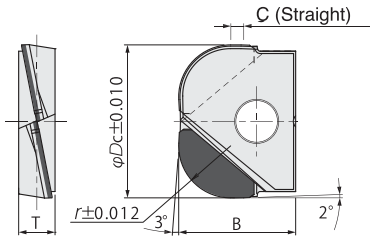
- Reduced the hand finishing and try out times by improved surface quality.
- Body durability is higher than ball nose end mill with same radius, therefore prevents chattering problem and larger pick feed improved machining efficiency.
- Possible to high precision & high efficient machining even in case of general machine.
- Adopted new PVD coated grade "DH102" suitable for high hardened material and PVD coated grade "JC8015" for general steel.

PVD coated grade (JC8015 / DH102)

CBN insert (JBN245)

Corner radius accuracy of inserts : below ± 0.012 mm





Cat. No.	PVD coated		CBN	Dimensions (mm)				
	JC8015 (Z10~20)	DH102 (Z01)	JBN245	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, but grade JBN245 insert is packed in 1 piece per case.
Note : GRM type insert is exclusive use of MIRROR BALL. Please use only MIRROR BALL Carbide shank bodies.

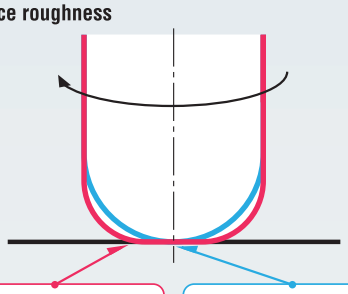
For Finishing / Profile Milling

Mirror ball (Giant Radius insert) Mirror Series GRM TYPE

■ Application for choice of GRM type insert

For relatively open surfaces

• Surface roughness

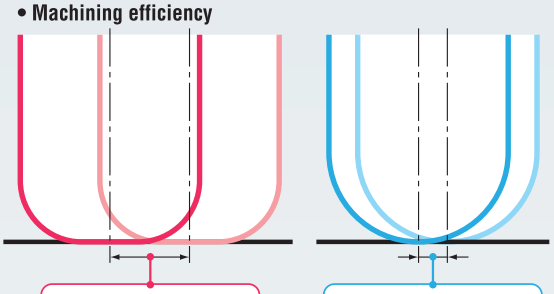


◎ **GRM type**
Cutting by periphery edge, therefore able to keep nominal cutting feed.

Ball nose end mill
Cutting speed at the centre point becomes "0", therefore generate cutter mark easily.

Control cutter mark and achieved good surface roughness.

• Machining efficiency



◎ **GRM type**
Large pick feed

Ball nose end mill
Small pick feed

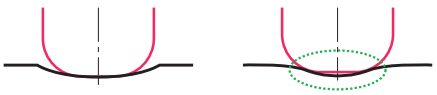
Improved machining efficiency

◎ **GRM type** Possible to high precision & high efficient machining even in case of low speed machine.

Attention for 3D profile milling.

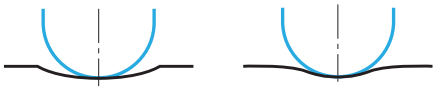
◎ **GRM type**

• For wide concave surface	• For narrow concave surface
Good	Remains stock removal

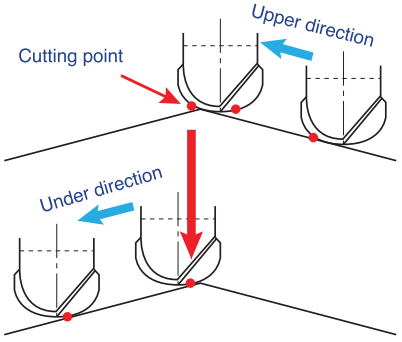


Ball nose end mill

• For wide concave surface	• For narrow concave surface
Good	Good



Attention for ramping milling.

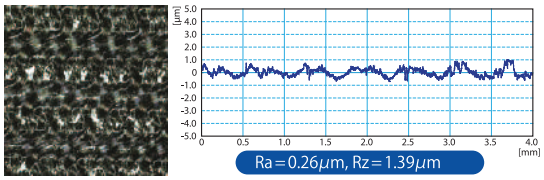


Note) Due to cutting point of insert changes at top of slope, the cutting marks sometimes changes with a program. But there are no problems with the forming accuracy.

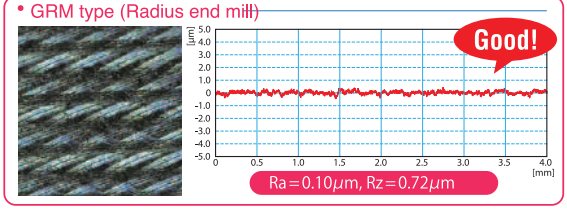
Machined surface comparison (flat surface)

Material : SKD11 (60HRC) 1.2379
Tool No. : MBN-200-M10(ø20) + MSN-M10-20-S20C
Insert No. : GRM-200-R60 (ø20mmxR6), Insert grade : DH102
n=5,000 min^{-1}, Vc=314m/min, Vf=3,000 mm/min, fz=0.3mm/t,
ap=0.1mm, ae=0.4mm
Overhung length : 50mm, Machine : Vertical MC

• Ball nose end mill



• GRM type (Radius end mill)



● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

■ CONTROLLED TORQUE WRENCH (WITH REPLACEABLE BLADE)

● **Tightening of 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

★ Precautions when installing the insert

1. Cleaning the holder insert seat
2. Cleaning the insert (especially the reference surface and mounting holes should be clean)
3. Replace the heavily worn reamer bolt as soon as possible.
4. Be careful not to overtighten the reamer bolt.

Tool diameter (mm)	Recommended tightening 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

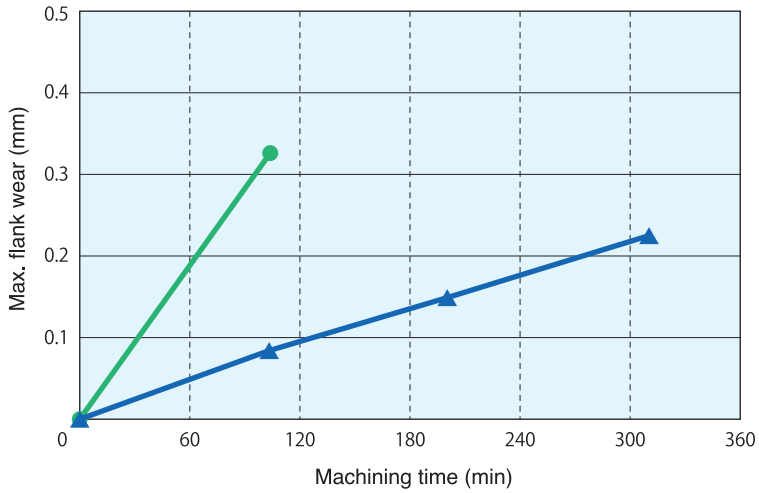
For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

CUTTING PERFORMANCE

Tool Life Comparison "Carbide Shank C Body vs Steel Shank"



Steel Shank
BNML-080075T-S12
Insert grade JC5015

Carbide Shank
BNML-080075T-S12C
Insert grade JC5015

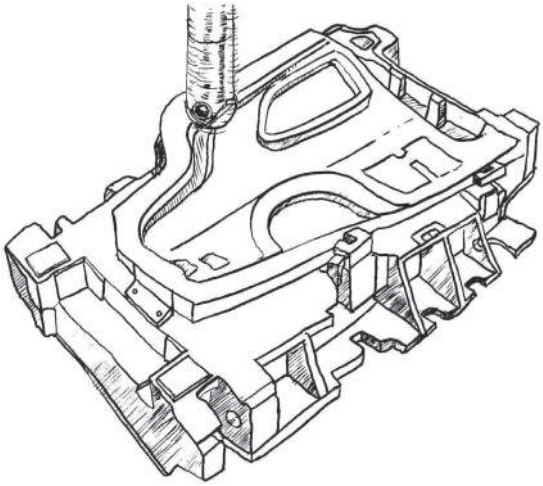
Material : SKD 11

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.

Cuting 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.**

For Finishing / Profile Milling

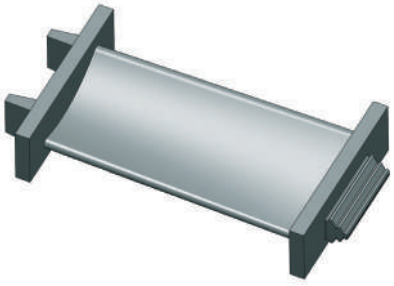
Mirror ball

Mirror Series BNM / MBX TYPE

■ CASE STUDIES

1.Replacement of solid carbide ball nose end mill with Mirror ball.

Overhung length : 40mm

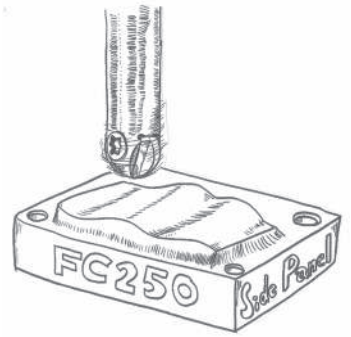


Work	Part name	Turbine blade
	Material	Stainless steel (SUS420)
	Hardness	—
Tool	Tool No.	BNMM-080035S-S08C
	Grade	BNM-080 (JC5015)
Cutting conditions	Vc, (n)	n=2,000min^{-1}, Vc=50m/min
	Vf, (f)	Vf=800mm/min, f=0.4mm/rev
	ap(mm)	0.15mm
	ae(mm)	0.15mm
	Coolant	Oil coolant
	Machine	Vertical MC

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.

2.Finishing by CBN insert (side panel).

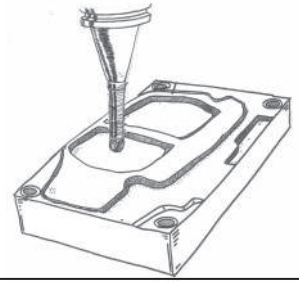


Work	Part name	Side panel (Drawing die set)
	Material	FC250
	Hardness	160-260HB
Tool	Tool No.	BNMM-250090S-S25C
	Grade	BNM-250 (JBN245)
Cutting conditions	Vc, (n)	n=18,000min^{-1}, Vc=1,414m/min
	Vf, (f)	Vf=12,000mm/min, f=0.67mm/rev
	ap(mm)	0.2mm
	ae(mm)	0.4mm
	Coolant	Air blow
	Machine	Vertical MC

Result

By machining with CBN Mirror ball on FC250 grey cast iron, we could achieve 1.5 times reduction in machining time and surface roughness was very good.

3.Finishing by CBN insert (body side).



Work	Part name	Stamping die (Body side)
	Material	GM246M (FCD600)
	Hardness	190-241HB
Tool	Tool No.	BNMM-300120S-S32C
	Grade	BNM-300 (JBN245)
Cutting conditions	Vc, (n)	n=15,000min^{-1}, Vc=1,414m/min
	Vf, (f)	Vf=9,000mm/min, f=0.60mm/rev
	ap(mm)	0.1mm
	ae(mm)	0.5mm
	Coolant	Mist coolant
	Machine	Vertical MC

Result

By machining with CBN Mirror ball insert on FCD600 nodular cast iron, we could achieve 1.8 times reduction in cycle time compared with coated carbide insert (N=8,000 min^{-1} & Vf=5000 mm/min). We could finish entire die in 22 hours by 1 insert and surface was very good. It helped to reduce hand polishing time.

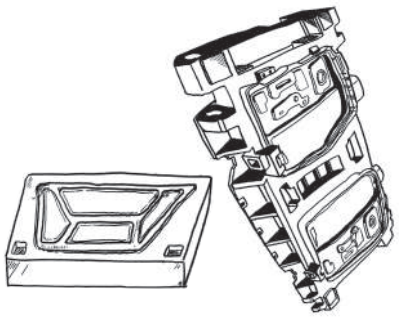
For Finishing / Profile Milling

Mirror ball

Mirror Series BNM / MBX TYPE

■ CASE STUDIES

4.Replacement of steel shank body with carbide shank body.

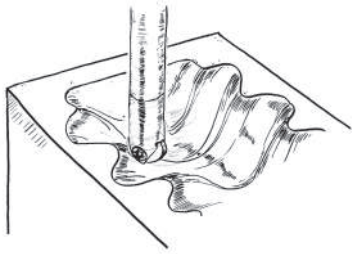


Work	Part name	Stamping die
	Material	GM241 (Cast steel)
	Hardness	250-300 HB
Tool	Tool No.	BNML-300170S-S32C (C Body)
	Grade	BNM-300, JC5015
Cutting conditions	Vc, (n)	6,000min^{-1}, 565m/min
	Vf, (f)	5,000mm/min, 0.83mm/rev
	ap(mm)	0.1mm
	ae(mm)	0.7mm
	Coolant	Dry
	Machine	Double column MC

Result: Achieved long tool life 5,080m and improved surface roughness compared with exisiting steel shank. Reduced the hand finishing process by 10 hours

5.Replacement of solid carbide ball nose end mill.

Semi-Finishing • Finishing by Carbide Shank



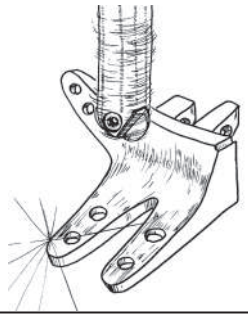
Tool life : 2 hours

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-finishing 0.1mm, Finishing 0.05mm
	ae(mm)	0.1mm
	Coolant	Mist coolant
	Machine	High speed vertical MC

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.

6.High speed & high precision machining (Aircraft parts)

Required surface roughness Rz : 6.3μm



Work	Part name	Vertical tail parts
	Material	SCM440
	Hardness	40HRC
Tool	Tool No.	BNML-120095S-S12C (C Body)
	Grade	BNM-120, JC5015
Cutting conditions	Vc, (n)	10,000min^{-1}, 377m/min
	Vf, (f)	800mm/min, 0.08mm/rev
	ap(mm)	0.2mm
	ae(mm)	0.1mm
	Coolant	Water soluble
	Machine	Vertical MC

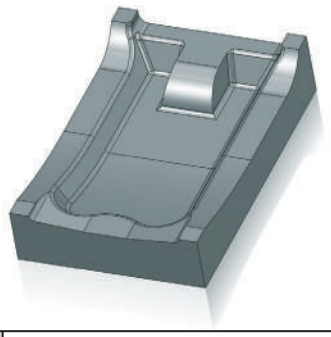
Result: No chatter and very smooth cutting. Improved surface quality compared with solid ball nose end mill. Achieved the reduction in machining time.

For Finishing / Profile Milling

Mirror ball (SS insert) Mirror Series BNM / MBX TYPE

■ CASE STUDIES "MIRROR S"

1.Replacement of solid carbide ball nose end mill with Mirror ball.



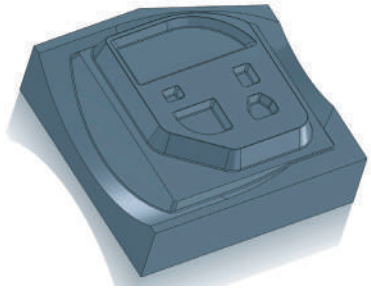
Work	Part name	Upper die
	Material	Die steel
	Hardness	32-35HRC
Tool	Tool No.	BNMM-250090S-S25C
	Grade	BNM-250-SS (DH108)
Cutting conditions	Vc, (n)	n=3,000min^{-1}, Vc=235m/min
	Vf, (f)	Vf=2,500mm/min, f=0.83mm/rev
	ap(mm)	0.3mm
	ae(mm)	0.25mm
	Coolant	Dry
	Machine	Vertical MC

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



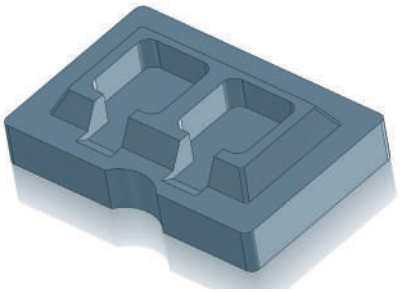
Work	Part name	—
	Material	ZAS
	Hardness	—
Tool	Tool No.	BNML-300160T-S32
	Grade	BNM-300-SS (FZ05)
Cutting conditions	Vc, (n)	n=2,200min^{-1}, Vc=207m/min
	Vf, (f)	Vf=2,000mm/min, f=0.9mm/rev
	ap(mm)	0.6mm
	ae(mm)	0.6mm
	Coolant	Air blow
	Machine	Vertical MC

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-SS (DH108)
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

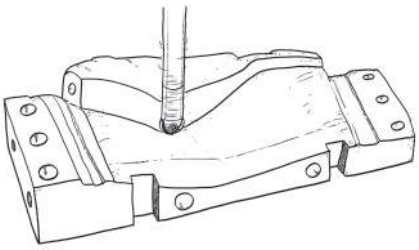
Machining with Mirror ball could give more tool life than the competitor's solid carbide ball nose end mill.

For Finishing / Profile Milling

Mirror ball (SS insert) Mirror Series BNM / MBX TYPE

■ CASE STUDIES "MIRROR S"

4.Super finishing by MIRROR S insert.



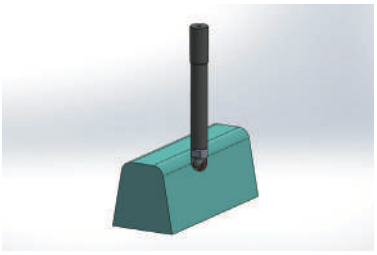
Work	Part name	Bumper mold
	Material	S55C
	Hardness	—
Tool	Tool No.	BNML-200105S-S20C
	Grade	BNM-200-SS, DH108
Cutting conditions	Vc, (n)	8,000min^{-1}, 503m/min
	Vf, (f)	4,000mm/min, 0.5mm/rev
	ap(mm)	0.05mm
	ae(mm)	0.4mm
	Coolant	Mist coolant
	Machine	Vertical MC

Result

Achieved excellent surface roughness, observed VBmax= below 0.025mm even after 5.7 hours machining. Insert was still in good condition.

11. Improvement example with SKD11 (59HRC)

Protruding 195



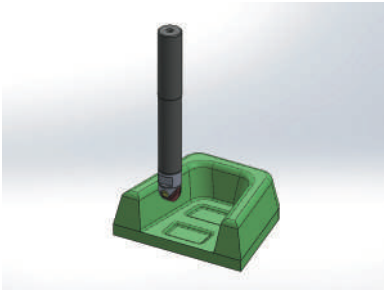
Work	Part name	Press die
	Material	SKD11
	Hardness	59HRC
Tool	Tool No.	MBX-300-M16
	Grade	MBX-300-TG (DH102)
Cutting conditions	Vc, (n)	n = 3,000min-1, Vc = 283m / min
	Vf, (f)	Vf = 2,500mm / min, f = 0.83mm / rev
	ap(mm)	0.1mm
	ae(mm)	0.5mm
	Coolant	Air blow
	Machine	Vertical MC

Result

Where the current company A has 2 to 3 passes and requires hand polishing in the post-process, the mirror ball can be processed in 1 pass, the processing time is greatly reduced and no post-process is required. The service life has been dramatically improved, and 2 works / inserts can be processed.

12. Tool application conversion from solid ball end mill (life improvement)

Overhung 100



Work	Part name	Press die
	Material	FCD550
	Hardness	-
Tool	Tool No.	MBX-200-M10
	Grade	BNM-200-TS (DH202)
Cutting conditions	Vc, (n)	n = 9,000min-1, Vc = 565m / min
	Vf, (f)	Vf = 7,000mm / min, f = 0.78mm / rev
	ap(mm)	0.1mm
	ae(mm)	0.3mm
	Coolant	Air blow
	Machine	Gate MC

Result

Conventionally, solid ball end mills required two tools for one mold, but machining is completed with one insert.
The machined surface has also been improved.

For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

GENERAL RECOMMENDED CUTTING CONDITIONS

Calculation of cutting conditions

1. Spindle speed

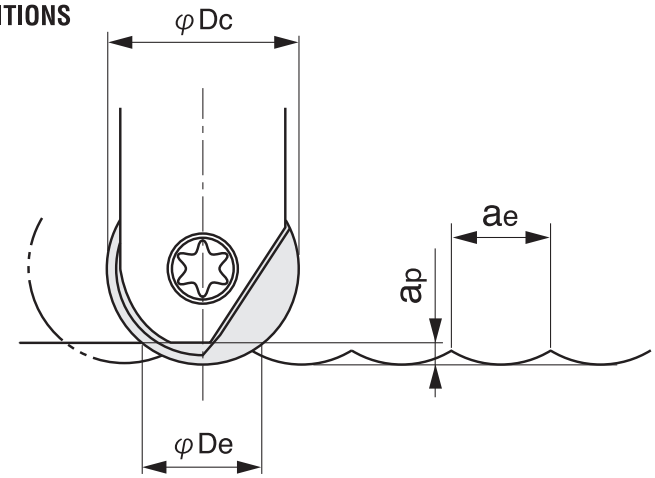
$$n = \frac{Vc \times 1000}{\times De} \ (min^{-1})$$

$$De = 2 \times \sqrt{ap \times (Dc-ap)} \ (mm)$$

2. Feed speed

$$Vf = n \times f \ (mm/min)$$

$$f = h\ max. \times \frac{Dc}{\sqrt{ap \times (Dc-ap)}} \ (mm/rev)$$



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.

Table 1. Effective tool diameter chart

Tool dia. φDc (mm)	Effective tool diameter : De (mm)													
	Notch : 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 2. Maximum chip thickness chart

Work material	Hardness	Maximum chip thickness : h max (mm)								
		Tool diameter : Dc (mm)								
		6	8	10	12	16	20	25	30	32
Gray cast iron (FC250, FC300)	160~260HB	0.07	0.09	0.12	0.15	0.18	0.18	0.21	0.21	0.21
Ductile 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
Pre-hardened steel (HPM, NAK)	280~400HB	0.03	0.05	0.065	0.09	0.09	0.09	0.11	0.11	0.11
Tool steel (SKD61, SKD11)	180~255HB	0.03	0.05	0.065	0.09	0.11	0.11	0.13	0.13	0.13
Hardened 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
Bronze, brass alloy	80~150HB	0.10	0.12	0.15	0.18	0.21	0.21	0.24	0.24	0.24
Aluminum 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

For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

■ Guideline for selecting insert type and grade

Work Materials	Insert model number / grade													
	BNM					BNM-S			BNM -SS	BNM -TG	BNM -TS	GRM		
	DH103	DH111	JC10000	KT9	JBN245	(JC8008)	FZ05	JC20003	DH108	DH102	DH202	JC8015	DH102	JBN245
Carbon steel S50C, S55C (C50, C55) Below 250HB	○	◎ ☆							◎			◎	○	
Cast steel (GM190, ICD5) Hardness 285 or less	○	◎ ☆							◎			◎	○	
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	○	◎ ☆							◎			◎	○	
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	◎	○							◎			○	◎	
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	◎	○							◎			○	◎	
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	◎	○							◎	○	○	○	◎	
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC									○	◎	◎		◎	
High speed tool steel (SKH, HAP) Hardness 63-70HRC										◎	◎		◎	
Gray cast iron (FC250) Hardness 160-260HB	◎	○			★				○	◎	◎	○	◎	★
Ductile cast iron (FCD700) Hardness 170-300HB	◎	○			★				○	◎	◎	○	◎	★
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	○	◎ ☆							◎			◎	○	
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	○	◎ ☆							◎			◎	○	
Aluminum alloy (A5052)				◎			◎	◎						
Aluminum alloy (A7075)				◎			◎	◎						
Aluminum alloy casting (Si less than 13%)				◎			◎	◎						
Copper alloy (C1100)				◎			◎	◎						
Graphite			○					◎						
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	○	◎ ☆							◎			◎	○	
Heat resistant alloy (INCO718) Hardness 35-43HRC	○	◎ ☆							◎			◎	○	

◎: 1st recommended, ○: 2nd recommended, ☆: Wet cutting, ★: High-speed cutting

For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror ball insert BNM type + carbide shank mirror ball or
Mirror ball insert BNM type + Modular head MBX type +
Anti Vibration (All Carbide Shank Arbor for Modular Head)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)											
			6				8				10			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Cast steel (GM190, ICD5) Hardness 285 or less	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	BNM BNM-SS	DH103 DH108	0.05	0.1	18,570	5,570	0.05	0.15	13,930	4,180	0.1	0.2	12,730	5,090
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	BNM BNM-SS	DH103 DH108	0.05	0.1	15,920	3,180	0.05	0.15	11,940	2,390	0.1	0.2	11,140	3,340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	BNM BNM-SS	DH103 DH108	0.05	0.1	13,260	2,650	0.05	0.15	9,950	1,990	0.1	0.2	9,550	2,870
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	BNM-TG BNM-TS	DH102 DH202	0.05	0.1	10,610	2,120	0.05	0.15	7,960	1,590	0.1	0.15	7,960	2,390
High speed tool steel (SKH, HAP) Hardness 63-70HRC	BNM-TG BNM-TS	DH102 DH202	0.05	0.05	7,960	1,590	0.05	0.1	5,970	1,190	0.05	0.1	6,370	1,270
Gray cast iron (FC250) Hardness 160-260HB	BNM BNM-TG BNM-TS	DH103 DH102 DH202	0.1	0.1	18,570	7,430	0.1	0.15	13,930	5,570	0.15	0.2	12,730	6,370
Ductile cast iron (FCD700) Hardness 170-300HB	BNM BNM-TG BNM-TS	DH103 DH102 DH202	0.1	0.1	18,570	7,430	0.1	0.15	13,930	5,570	0.15	0.2	12,730	6,370
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Aluminum alloy (A5052)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.1	23,870	9,550	0.2	0.15	17,900	7,160	0.25	0.2	15,920	7,960
Aluminum alloy (A7075)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.1	23,870	9,550	0.2	0.15	17,900	7,160	0.25	0.2	15,920	7,960
Aluminum alloy casting (Si less than 13%)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.1	23,870	9,550	0.2	0.15	17,900	7,160	0.25	0.2	15,920	7,960
Copper alloy (C1100)	BNM BNM-S	KT9 FZ05 JC20003	0.15	0.1	23,870	9,550	0.15	0.15	17,900	7,160	0.2	0.2	15,920	7,960
Graphite	BNM BNM-S	JC10000 JC20003	0.15	0.1	23,870	9,550	0.15	0.15	17,900	7,160	0.2	0.2	15,920	7,960
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	BNM BNM-SS	DH111 DH108	0.05	0.1	10,610	3,180	0.05	0.15	7,960	2,390	0.1	0.15	9,550	3,820
Heat resistant alloy (INCO718) Hardness 35-43HRC	BNM BNM-SS	DH111 DH108	0.05	0.1	7,960	1,590	0.05	0.1	5,970	1,190	0.1	0.1	6,370	1,910

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

For Finishing / Profile Milling

Mirror ball

Mirror Series **BNM / MBX** TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror ball insert BNM type + carbide shank mirror ball or
Mirror ball insert BNM type + Modular head MBX type +
Anti Vibration (All Carbide Shank Arbor for Modular Head)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)											
			12				16				20			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Cast steel (GM190, ICD5) Hardness 285 or less	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	BNM BNM-SS	DH103 DH108	0.1	0.2	10,610	4,240	0.1	0.25	8,950	5,370	0.1	0.3	7,160	5,010
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	BNM BNM-SS	DH103 DH108	0.1	0.2	9,280	2,780	0.1	0.25	7,960	3,980	0.1	0.3	6,370	3,820
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	BNM BNM-SS	DH103 DH108	0.1	0.2	7,960	2,390	0.1	0.25	6,960	3,480	0.1	0.3	5,570	3,340
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	BNM-TG BNM-TS	DH102 DH202	0.1	0.2	6,630	1,990	0.1	0.25	5,970	2,990	0.1	0.3	4,770	2,860
High speed tool steel (SKH, HAP) Hardness 63-70HRC	BNM-TG BNM-TS	DH102 DH202	0.05	0.1	5,310	1,060	0.05	0.1	4,970	1,490	0.05	0.15	3,980	1,190
Gray cast iron (FC250) Hardness 160-260HB	BNM BNM-TG BNM-TS	DH103 DH102 DH202	0.15	0.2	10,610	5,310	0.15	0.25	8,950	6,270	0.15	0.3	7,160	5,730
Ductile cast iron (FCD700) Hardness 170-300HB	BNM BNM-TG BNM-TS	DH103 DH102 DH202	0.15	0.2	10,610	5,310	0.15	0.25	8,950	6,270	0.15	0.3	7,160	5,730
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Aluminum alloy (A5052)	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.2	13,260	6,630	0.25	0.25	10,940	7,660	0.25	0.3	8,750	7,000
Aluminum alloy (A7075)	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.2	13,260	6,630	0.25	0.25	10,940	7,660	0.25	0.3	8,750	7,000
Aluminum alloy casting (Si less than 13%)	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.2	13,260	6,630	0.25	0.25	10,940	7,660	0.25	0.3	8,750	7,000
Copper alloy (C1100)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.2	13,260	6,630	0.2	0.25	10,940	7,660	0.2	0.3	8,750	7,000
Graphite	BNM BNM-S	JC10000 JC20003	0.2	0.2	13,260	6,630	0.2	0.25	10,940	7,660	0.2	0.3	8,750	7,000
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	BNM BNM-SS	DH111 DH108	0.1	0.2	7,960	3,180	0.1	0.25	5,970	2,990	0.1	0.3	4,770	2,860
Heat resistant alloy (INCO718) Hardness 35-43HRC	BNM BNM-SS	DH111 DH108	0.1	0.1	5,310	1,590	0.1	0.1	4,970	1,990	0.1	0.15	3,980	1,590

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

For Finishing / Profile Milling

Mirror ball

Mirror Series BNM / MBX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror ball insert BNM type + carbide shank mirror ball or
Mirror ball insert BNM type + Modular head MBX type +
Anti Vibration (All Carbide Shank Arbor for Modular Head)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 25 ap (mm)	25 ae (mm)	25 n (min-1)	25 Vf (mm/min)	30 ap (mm)	30 ae (mm)	30 n (min-1)	30 Vf (mm/min)	32 ap (mm)	32 ae (mm)	32 n (min-1)	32 Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Cast steel (GM190, ICD5) Hardness 285 or less	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	BNM BNM-SS	DH103 DH108	0.1	0.4	6,370	4,460	0.1	0.5	5,310	3,720	0.1	0.5	4,970	3,480
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	BNM BNM-SS	DH103 DH108	0.1	0.4	5,730	3,440	0.1	0.5	4,770	2,860	0.1	0.5	4,480	2,690
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	BNM BNM-SS	DH103 DH108	0.1	0.4	5,090	3,050	0.1	0.5	4,240	2,540	0.1	0.5	3,980	2,390
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	BNM-TG BNM-TS	DH102 DH202	0.1	0.4	4,460	2,680	0.1	0.5	3,710	2,230	0.1	0.5	3,480	2,090
High speed tool steel (SKH, HAP) Hardness 63-70HRC	BNM-TG BNM-TS	DH102 DH202	0.05	0.2	3,820	1,530	0.05	0.3	3,180	1,270	0.05	0.3	2,980	1,190
Gray cast iron (FC250) Hardness 160-260HB	BNM BNM-TG BNM-TS	DH103 DH102 DH202	0.15	0.4	6,370	5,100	0.15	0.5	5,310	4,250	0.15	0.5	4,970	3,980
Ductile cast iron (FCD700) Hardness 170-300HB	BNM BNM-TG BNM-TS	DH103 DH102 DH202	0.15	0.4	6,370	5,100	0.15	0.5	5,310	4,250	0.15	0.5	4,970	3,980
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Aluminum alloy (A5052)	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.4	7,640	6,110	0.25	0.5	6,370	5,100	0.25	0.5	5,970	4,780
Aluminum alloy (A7075)	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.4	7,640	6,110	0.25	0.5	6,370	5,100	0.25	0.5	5,970	4,780
Aluminum alloy casting (Si less than 13%)	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.4	7,640	6,110	0.25	0.5	6,370	5,100	0.25	0.5	5,970	4,780
Copper alloy (C1100)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.4	7,640	6,110	0.2	0.5	6,370	5,100	0.2	0.5	5,970	4,780
Graphite	BNM BNM-S	JC10000 JC20003	0.2	0.4	7,640	6,110	0.2	0.5	6,370	5,100	0.2	0.5	5,970	4,780
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	BNM BNM-SS	DH111 DH108	0.1	0.4	4,460	2,680	0.1	0.5	3,710	2,230	0.1	0.5	3,480	2,090
Heat resistant alloy (INCO718) Hardness 35-43HRC	BNM BNM-SS	DH111 DH108	0.1	0.2	3,820	1,530	0.1	0.3	3,180	1,270	0.1	0.3	2,980	1,190

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

For Finishing / Profile Milling

Mirror ball

Mirror Series BNM / MBX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror ball insert BNM type (grade JBN245) + carbide shank mirror ball or
Mirror ball insert BNM type (grade JBN245) + modular head MBX type +
Anti Vibration (All Carbide Shank Arbor for Modular Head)

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)							
			16				20			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Gray cast iron (FC250) Hardness 160-260HB	BNM	JBN245	0.05	0.25	23,870	11,940	0.05	0.3	19,100	11,460
Ductile cast iron (FCD700) Hardness 170-300HB	BNM	JBN245	0.05	0.25	19,890	7,960	0.05	0.3	15,920	7,960

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)							
			25				30			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Gray cast iron (FC250) Hardness 160-260HB	BNM	JBN245	0.05	0.4	15,280	9,170	0.05	0.5	12,730	8,910
Ductile cast iron (FCD700) Hardness 170-300HB	BNM	JBN245	0.05	0.4	12,730	6,370	0.05	0.5	10,610	6,370

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

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
3) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.
4) It is recommended to use a set of a well-balanced holder and a carbide shank.
5) By using mist processing, the accuracy of the machined surface can be further improved.
6) Create a program so that it is not plunged as much as possible.
7) If it is unavoidable to perform plunge processing, lower the cutting feed before use.
8) Since variations in the removal allowance greatly affect the service life, perform preprocessing as uniformly as possible..

For Finishing / Profile Milling

Mirror ball

Mirror Series

GRM TYPE

RECOMMENDED CUTTING CONDITIONS

Giant Radius Insert for Mirror Ball GRM Type + Carbide Shank Mirror Ball or
Giant Radius Insert for Mirror Ball GRM Type + Modular Head MBX Type +
Anti Vibration (All Carbide Shank Arbor for Modular Head)

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)									
			16					20				
			ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	GRM	JC8015	0.15	0.25	2.5	7,960	4,780	0.15	0.3	3	6,370	4,460
Cast steel (GM190, ICD5) Hardness 285 or less	GRM	JC8015	0.15	0.25	2.5	7,960	4,780	0.15	0.3	3	6,370	4,460
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	GRM	JC8015	0.15	0.25	2.5	7,960	4,780	0.15	0.3	3	6,370	4,460
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	GRM	DH102	0.1	0.25	2.5	7,960	4,780	0.1	0.3	3	6,370	4,460
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	GRM	DH102	0.1	0.25	2.5	6,960	3,480	0.1	0.3	3	5,570	3,340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	GRM	DH102	0.1	0.25	2.5	5,970	2,990	0.1	0.3	3	4,770	2,860
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	GRM	DH102	0.1	0.25	2.5	5,970	2,990	0.1	0.3	3	4,770	2,860
High speed tool steel (SKH, HAP) Hardness 63-70HRC	GRM	DH102	0.05	0.1	1	3,980	1,190	0.05	0.15	1.5	3,180	950
Gray cast iron (FC250) Hardness 160-260HB	GRM	DH102	0.15	0.25	2.5	7,960	5,570	0.15	0.3	3	6,370	5,100
Ductile cast iron (FCD700) Hardness 170-300HB	GRM	DH102	0.15	0.25	2.5	7,960	5,570	0.15	0.3	3	6,370	5,100
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	GRM	JC8015	0.15	0.25	2.5	7,960	4,780	0.15	0.3	3	6,370	4,460
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	GRM	JC8015	0.15	0.25	2.5	7,960	4,780	0.15	0.3	3	6,370	4,460
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	GRM	JC8015	0.1	0.25	2.5	4,970	2,490	0.1	0.3	3	3,980	2,390
Heat resistant alloy (INCO718) Hardness 35-43HRC	GRM	JC8015	0.1	0.1	1	3,980	1,590	0.1	1.5	1.5	3,180	1,270

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

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

For Finishing / Profile Milling

Mirror ball

Mirror Series

GRM TYPE

RECOMMENDED CUTTING CONDITIONS

Giant Radius Insert for Mirror Ball GRM Type + Carbide Shank Mirror Ball or
Giant Radius Insert for Mirror Ball GRM Type + Modular Head MBX Type +
Anti Vibration (All Carbide Shank Arbor for Modular Head)

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)									
			25					30				
			ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	GRM	JC8015	0.15	0.4	4	5,730	4,010	0.15	0.5	5	4,770	3,340
Cast steel (GM190, ICD5) Hardness 285 or less	GRM	JC8015	0.15	0.4	4	5,730	4,010	0.15	0.5	5	4,770	3,340
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	GRM	JC8015	0.15	0.4	4	5,730	4,010	0.15	0.5	5	4,770	3,340
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	GRM	DH102	0.1	0.4	4	5,730	4,010	0.1	0.5	5	4,770	3,340
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	GRM	DH102	0.1	0.4	4	5,090	3,050	0.1	0.5	5	4,240	2,540
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	GRM	DH102	0.1	0.4	4	4,460	2,680	0.1	0.5	5	3,710	2,230
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	GRM	DH102	0.1	0.4	4	3,820	2,290	0.1	0.5	5	3,180	1,910
High speed tool steel (SKH, HAP) Hardness 63-70HRC	GRM	DH102	0.05	0.2	2	3,180	1,270	0.05	0.3	3	2,650	1,060
Gray cast iron (FC250) Hardness 160-260HB	GRM	DH102	0.15	0.4	4	5,730	4,580	0.15	0.5	5	4,770	3,820
Ductile cast iron (FCD700) Hardness 170-300HB	GRM	DH102	0.15	0.4	4	5,730	4,580	0.15	0.5	5	4,770	3,820
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	GRM	JC8015	0.15	0.4	4	5,730	4,010	0.15	0.5	5	4,770	3,340
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	GRM	JC8015	0.15	0.4	4	5,730	4,010	0.15	0.5	5	4,770	3,340
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	GRM	JC8015	0.1	0.4	4	3,820	2,290	0.1	0.5	5	3,180	1,910
Heat resistant alloy (INCO718) Hardness 35-43HRC	GRM	JC8015	0.1	0.2	2	3,180	1,270	0.1	0.3	3	2,650	1,060

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

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

For Finishing / Profile Milling

Mirror ball

Mirror Series

GRM TYPE

RECOMMENDED CUTTING CONDITIONS

Giant Radius Insert for Mirror Ball GRM Type (Grade JBN245) + Carbide Shank Mirror Ball
Or Giant Radius Insert GRM type for mirror ball (grade JBN245) +
Modular Head MBX Type + Stubborn Ittetsu (All Carbide Shank Arbor for Modular Head)

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 16					Tool dia. (mm) 20				
			ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min^{-1})	Vf (mm/min)	ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min^{-1})	Vf (mm/min)
Gray cast iron (FC250) Hardness 160-260HB	GRM	JBN245	0.05	0.25	2.5	19,890	9,950	0.05	0.3	3	15,920	9,550
Ductile cast iron (FCD700) Hardness 170-300HB	GRM	JBN245	0.05	0.25	2.5	15,920	6,370	0.05	0.3	3	12,730	6,370

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 25					Tool dia. (mm) 30				
			ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min^{-1})	Vf (mm/min)	ap (mm)	ae (mm) Curved surface	ae (mm) Plain	n (min^{-1})	Vf (mm/min)
Gray cast iron (FC250) Hardness 160-260HB	GRM	JBN245	0.05	0.4	4	12,730	7,640	0.05	0.5	5	10,610	7,430
Ductile cast iron (FCD700) Hardness 170-300HB	GRM	JBN245	0.05	0.4	4	10,190	5,100	0.05	0.5	5	8,490	5,090

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

Overhung length ℓ/Dc	n (min^{-1})	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

NOTE

1) The cutting parameters to be adjusted according to the machine rigidity or work rigidity.
2) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
3) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.
4) It is recommended to use a set of a well-balanced holder and a carbide shank.
5) By using mist processing, the accuracy of the machined surface can be further improved.
6) Create a program so that it is not plunged as much as possible.
7) If it is unavoidable to perform plunge processing, lower the cutting feed before use.
8) Since variations in the removal allowance greatly affect the service life, perform preprocessing as uniformly as possible..

Note :

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM TYPE

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.
6. The insert set has no front and back.

Fig.1 (Taper Neck)

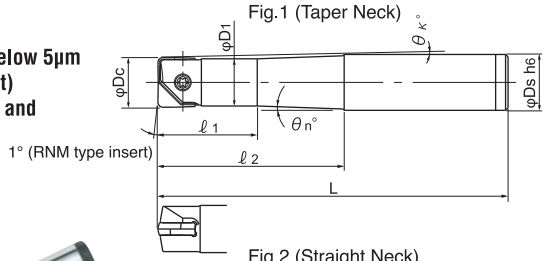
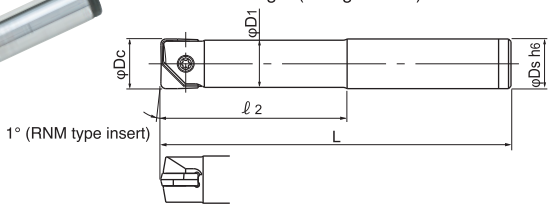


Fig.2 (Straight Neck)



RNM-S type (Straight Neck)
RNM-T type (Taper Neck)

BODY

Cat. No.	Stock	Dimensions (mm) φDc	L	ℓ1	ℓ2	φD1	φDs	θκ°	θn° Taper angle	Parts: Inserts	Parts: Clamp screw	Parts: Wrench (Not included)	Fig.
RNMM-160070S-S16	●		140	–	70			–	–	RNM-160... RNM-170... FRM-160/170...	FSW-4013H	A-15	2
RNMM-160090S-S16	●	16	160	–	90	15	16	–	–				
RNML-160100S-S16	●		200	–	100			–	–				
RNMM-200075S-S20	●		141	–	75			–	–	RNM-200... RNM-210... FRM-200/210...	FSW-5016H	A-20W	2
RNMM-200105S-S20	●	20	180	–	105	19	20	–	–				
RNML-200125S-S20	●		250	–	125			–	–				
RNMM-250090S-S25	●		166	–	90			–	–	RNM-250... RNM-260... FRM-250...	FSW-6020	A-30	2
RNMM-250140S-S25	●	25	220	–	140	24	25	–	–				
RNML-250150S-S25	●		300	–	150			–	–				
RNMM-300106S-S32	●	30	186	–	106	29	32	–	–	RNM-300... FRM-300...	FSW-8025	A-40	2
RNMM-300140S-S32	●		220	–	140			–	–				
RNMM-320106S-S32	●	32	186	–	106	31	32	–	–	RNM-320... FRM-320...	FSW-8025	A-40	2
RNMM-320140S-S32	●		220	–	140			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page E423 - E431 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately) Please purchase separately.
4. Incase of using steel shank please reduce the above by 50%

Clamp screw	Recommended torque (N•m)	Clamp screw	Recommended torque (N•m)
FSW-2005H	0.5	FSW-4013	3.0
FSW-2506H	0.9	FSW-5016	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509	2.0	FSW-8025	6.0

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

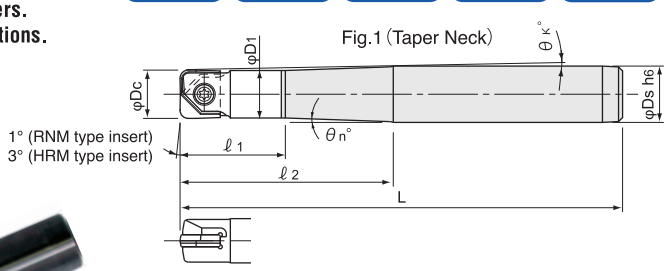
Finishing / High feed Profile Milling

Mirror Radius (Carbide shank)

C Body carbide shank | Mirror Series | RNM TYPE

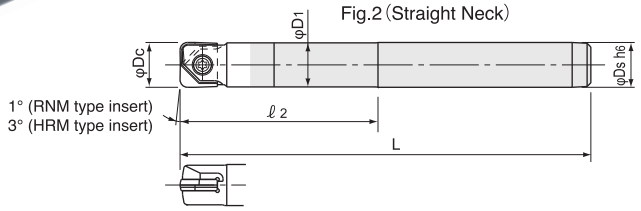
1. By adopting carbide shank, tool rigidity is equal to solid carbide radius end mill.
2. Tool life increased to twice compared with MIRROR RADIUS steel shank.
3. Carbide shank can be used on shrink-fit type holders.
4. Insert locates accurately in any of the two radial positions. It is mounted into the cutter body.
5. The insert set has no front and back.

Fig.1 (Taper Neck)



RNM-S-C type (Straight Neck)
RNM-T-C type (Taper Neck)

Fig.2 (Straight Neck)



BODY

Cat. No.	Stock	Dimensions (mm) φDc	L	ℓ1	ℓ2	φD1	φDs	θ κ°	θ n° Taper angle	Parts: Inserts	Parts: Clamp screw	Parts: Wrench (Not included)	Fig.
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		–	–	RNM-100... HRM-100/110... FRM- 100...	FSW-3007H	A-08	2
RNMM-100050U-S10C	●		100	–	50		10	–	–				2
RNMM-100050S-S10C	●		110	–	50			–	–				2
RNMM-100053T-S12C	●		110	22.5	53	9.8	12	1°7'	1°				1
RNML-100075S-S10C	●		140	–	75		10	–	–				2
RNMS-120030U-S12C	●	12	80	–	30	11.5		–	–	RNM-120... RNM-130... HRM-120/130... FRM- 120...	FSW-3509	A-10	2
RNMM-120060U-S12C	●		110	–	60		12	–	–				2
RNMM-120053S-S12C	●		110	–	53	11.8		–	–				2
RNML-120095S-S12C	●		160	–	95			–	–				
RNMS-160035U-S16C	●	16	90	–	35	15.5		–	–	RNM-160... RNM-170... HRM-160/170... FRM- 160/...170...	FSW-4013	A-15	2
RNMM-160070S-S16C	●		140	–	70			–	–				
RNMM-160090S-S16C	●		160	–	90	15.8	16	–	–				
RNML-160120S-S16C	●		210	–	120			–	–				
RNML-160150S-S16C	●		220	–	150			–	–				

Note) 1. All cutters are supplied without inserts.
2. Please refer page E423 - E431 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately) Please purchase separately.

Clamp screw	Recommended torque (N·m)	Clamp screw	Recommended torque (N·m)
FSW-2005H	0.5	FSW-4013	3.0
FSW-2506H	0.9	FSW-5016	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509	2.0	FSW-8025	6.0

Please refer page E412 for "Caution for the mounting on shrink-fit holder"

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Finishing / High feed Profile Milling

Mirror Radius (Carbide shank)

C Body carbide shank | Mirror Series | RNM TYPE

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.
5. The insert set has no front and back.

RNM-S-C type (Straight Neck)
RNM-T-C type (Taper Neck)

Fig.1 (Taper Neck)

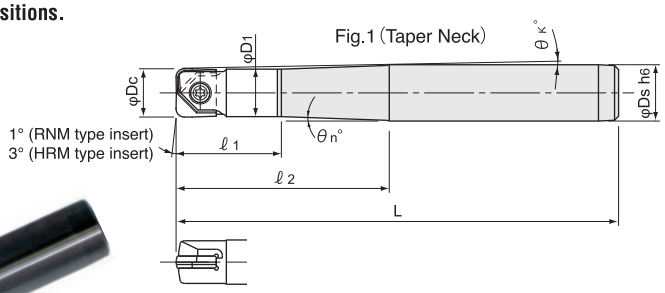
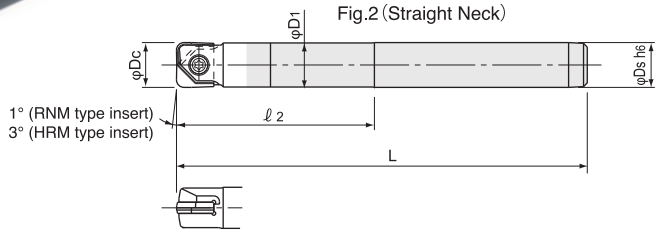


Fig.2 (Straight Neck)



■ BODY

Cat. No.	Stock	Dimensions (mm) φDc	L	ℓ 1	ℓ 2	φD1	φDs	θ κ°	θ n° Taper angle	Parts Inserts	Clamp screw	Wrench (Not included)	Fig.
RNMS-200040U-S20C	●		105	–	40	19.5		–	–	RNM-200... RNM-210... HRM-200/220... FRM-200/210...			2
RNMM-200075S-S20C	●		141	–	75			–	–				
RNMM-200105S-S20C	●	20	180	–	105	19.8	20	–	–		FSW-5016	A-20W	2
RNML-200150S-S20C	●		220	–	150			–	–				
RNML-200170S-S20C	●		250	–	170			–	–				
RNMM-250090S-S25C	●		166	–	90			–	–	RNM-250... RNM-260... FRM-250...			
RNMM-250140S-S25C	●	25	220	–	140	24.8	25	–	–		FSW-6020	A-30	2
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

Note) 1. All cutters are supplied without inserts.
2. Please refer page E423 - E31 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately) Please purchase separately.

Clamp screw	Recommended torque (N·m)	Clamp screw	Recommended torque (N·m)
FSW-2005H	0.5	FSW-4013	3.0
FSW-2506H	0.9	FSW-5016	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509	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.

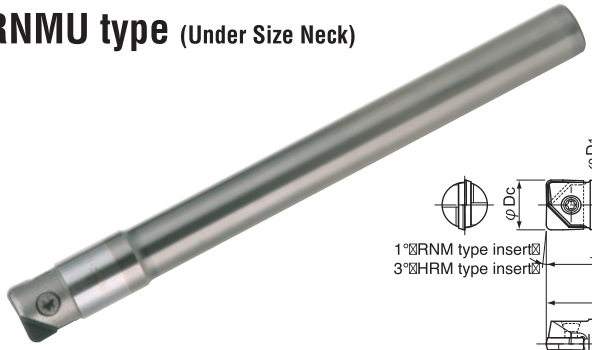
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

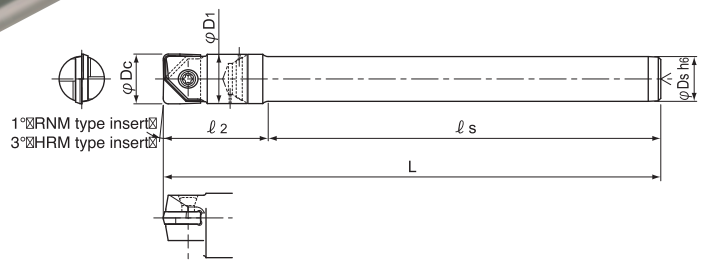
Finishing / High feed Profile Milling

Mirror Radius
(Under shank type) (Carbide shank)

C Body carbide shank | Mirror Series | RNM TYPE

RNMU type (Under Size Neck)





■ BODY

Cat. No.	Stock	Dimensions (mm) φDc	ℓ2	ℓs	L	φD1	φDs	Parts: Inserts	Clamp screw	Wrench (Not included)
RNMU-080075S-S7.8C	●	8	25	50	75	7.8	7.8	RNM-080... HRM-080/090... FRM-080...	FSW-2506H	A-07
RNMU-080110S-S7.8C	●			85	110					
RNMU-090090S-S8C	●	9	25	65	90	7.8	8	HRM-090-R20	FSW-2506H	A-07
RNMU-090130S-S8C	●			105	130					
RNMU-100085S-S9.8C	●	10	27	58	85	9.8	9.8	RNM-100... HRM-100/110... FRM-100...	FSW-3007H	A-08
RNMU-100130S-S9.8C	●			103	130					
RNMU-110100S-S10C	●	11	27	73	100	9.8	10	HRM-110-R20	FSW-3007H	A-08
RNMU-110150S-S10C	●			123	150					
RNMU-120110S-S11C	●	12	30	77	110	11.8	11	RNM-120/130... HRM-120/130... FRM-120...	FSW-3509	A-10
RNMU-120160S-S11C	●			127	160					
RNMU-130110S-S12C	●	13	30	80	110	11.8	12	RNM-130... HRM-130-R20	FSW-3509	A-10
RNMU-130160S-S12C	●			130	160					
RNMU-160120S-S15C	●	16	35	82	120	15.8	15	RNM-160/170... HRM-160/170... FRM-160/170...	FSW-4013	A-15
RNMU-160170S-S15C	●			132	170					
RNMU-170130S-S16C	●	17	35	95	130	15.8	16	RNM-170... HRM-170-R30 FRM-170...	FSW-4013	A-15
RNMU-170180S-S16C	●			145	180					
RNMU-200140S-S18C	●	20	40	96	140	19.8	18	RNM-200/210... HRM-200/220... FRM-200/210...	FSW-5016	A-20W
RNMU-200200S-S18C	●			156	200					
RNMU-220150S-S20C	●	22	40	110	150	19.8	20	HRM-220-R30	FSW-5016	A-20W
RNMU-220220S-S20C	●			180	220					

Note) 1. All cutters are supplied without inserts.
2. Please refer page E423 - E431 for recommended cutting conditions.
3. The wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately) Please purchase separately.

Clamp screw	Recommended torque (N•m)	Clamp screw	Recommended torque (N•m)
FSW-2005H	0.5	FSW-4013	3.0
FSW-2506H	0.9	FSW-5016	4.0
FSW-3007H	1.2	FSW-6020	5.0
FSW-3509	2.0	FSW-8025	6.0

Please refer page E412 for "Caution for the mounting on shrink-fit holder"

● : Standard stock items ☐ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

Finishing / High feed Profile Milling

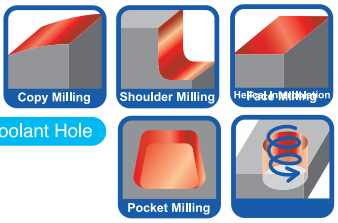
Mirror Radius Modular Head Mirror Series MRX TYPE

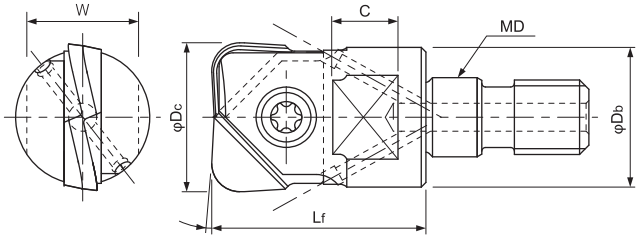
Accuracy of MRX type modular head mounted on MSN carbide shank holder :

☆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

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





3 ° (when using HRM / FRM type insert)
1 ° (when using RNM type insert)

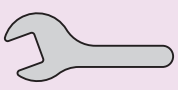
■ BODY

Cat. No. New	Cat. No. Old	Stock	Dimensions (mm) φDc	Lf	φDb	MD	C	W	Inserts	Parts: Clamp screw	Parts: Wrench
MRX-100-M6	MRN-100-M6 (-H)	●	10	18	9.7	M6	6.5	8	RNM-100-.../HRM-100/110-... FRM-100...	FSW-3007H	A-08
MRX-120-M6	MRN-120-M6 (-H)	●	12	20	11.5	M6	6.5	8	RNM-120/130-.../HRM-120/130-... FRM-120...	FSW-3509H	A-10
MRX-160-M8	MRN-160-M8 (-H)	●	16	23	15	M8	8	12	RNM-160/170-.../HRM-160/170-... FRM-160/170...	FSW-4013H	A-15
MRX-200-M10	MRN-200-M10 (-H)	●	20	30	18.5	M10	8	14	RNM-200/210-.../HRM-200/220-... FRM-200/210...	FSW-5016H	A-20W
MRX-250-M12	MRN-250-M12 (-H)	●	25	35	24	M12	10	17	RNM-250/260-.../FRM-250...	FSW-6020	A-30
MRX-300-M16	MRN-300-M16 (-H)	●	30	43	29	M16	12.5	22	RNM-300-.../FRM-300...	FSW-8025	A-40
MRX-320-M16	MRN-320-M16 (-H)	●	32	43	30	M16	12.5	22	RNM-320-.../FRM-320...	FSW-8025	A-40

Note) 1. Refer to pages E423 - E431 for recommended cutting conditions.
2. The insert is not installed in the holder. Please purchase separately.
3. Refer to page E422 for the recommended tightening torque for the modular head.
(It is recommended to use a dedicated spanner <DS type> for M6 and M8 sizes.)

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

◆ Dedicated spanner (for M6, M8) (sold separately) Spanner model number



Spanner model number	Screw size	Tightening torque	Width across flats W	Thickness	Length
DS-08	M6	8.0 N·m	8	4	85
DS-12	M8	16 N·m	12	4	93

* Short handle specifications prevent overtightening.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

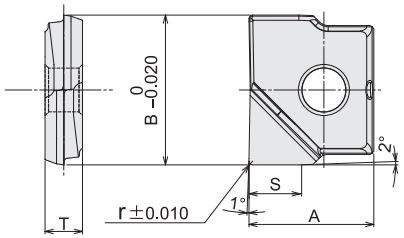
RNM / MRX TYPE

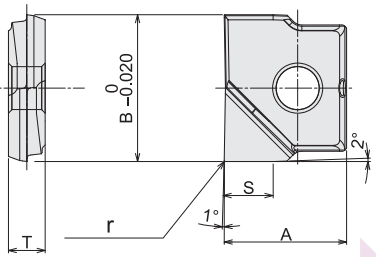
■ INSERTS

Radius form accuracy of insert: within ±0.010mm

Through Coolant Hole ● RNM-□□□-R0

φ10 or more
Grade: DH103, JC8015, KT9





※ Corner radius : below 0.1mm

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

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

Note) 1. Please refer to the precautions when installing the insert on page E412
2. JC8003 has been replaced by DH103.

※: Corner R0.1 or less

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

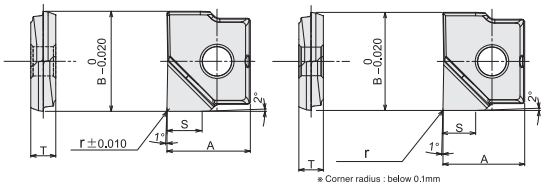
RNM / MRX TYPE

INSERTS

Radius form accuracy of insert: within ±0.010mm

ϕ10 or more
Grade: DH103, JC8015, KT9

Through Coolant Hole ● RNM-□□□-R0



(Continued from the previous page)

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

2 inserts per case, but JC10000 : 1 piece per case.
Note) 1. Please refer to the precautions when installing the insert on page E412. 2. JC8003 has been replaced by DH103.
※: Corner R0.1 or less

* About the specification change of RNM type insert

The insert RNM type for Mirror Radius will be gradually changed to a new shape as soon as the current product is sold out. Only the appearance has been changed, and you can use it in the same way as the old and new.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Finishing / High feed Profile Milling

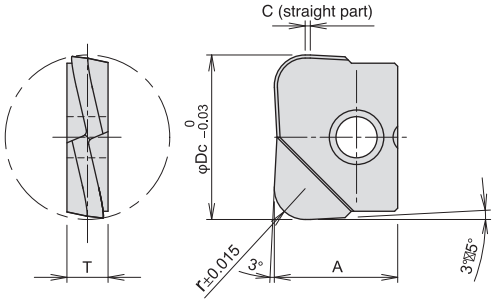
Mirror Radius

Mirror Series

HRM TYPE

Radius form accuracy of insert: within ±0.015mm

■ Corresponding insert (for medium finish to finish) (HRM type)



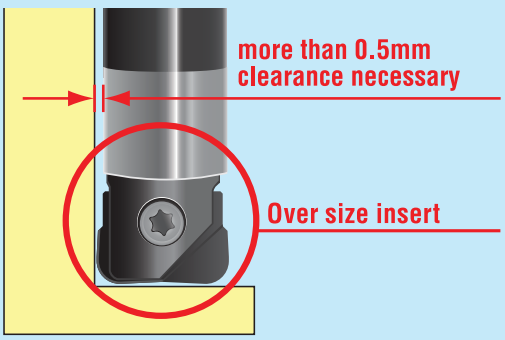
Cat. No.	PVD coated JC8015 (Z10~20)	Dimensions (mm) φDc	r	A	C	T
HRM-060-R05	●		0.5			
HRM-060-R10	●	6	1	5	—	2
HRM-060-R15	●		1.5			
HRM-080-R20	●	8	2	7	0.3	2.4
HRM-090-R20	●	9	2	7	0.3	2.4
HRM-100-R20	●	10	2	8.5	0.3	2.6
HRM-110-R20	●	11	2	8.5	0.3	2.6
HRM-120-R20	●	12	2	10	0.5	3
HRM-130-R20	●	13	2	10	0.5	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.

Features of "MIRROR RADIUS" Over size inserts

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

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



Please refer to the precautions when installing the insert on page E412

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

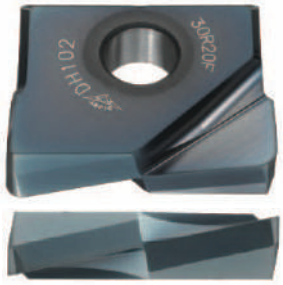
■ INSERTS

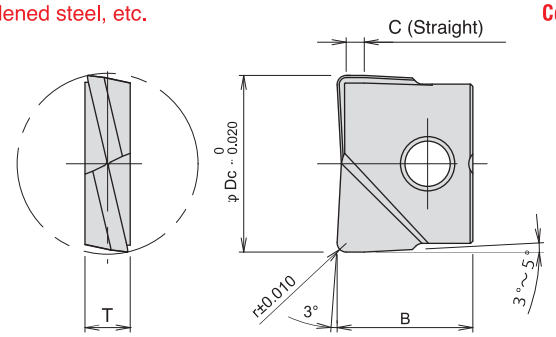
FRM type

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.
- 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 JC8015 (Z10~20)	PVD coated DH102 (Z01)	Dimensions (mm) φDc	r	B	C	T
FRM-100-R05	●	●		0.5			
FRM-100-R10	●	●	10	1	8.5	1.5	2.6
FRM-100-R20		●		2			
FRM-120-R05	●	●		0.5			
FRM-120-R10	●	●	12	1	10	1.5	3
FRM-120-R20	●	●		2			
FRM-120-R30		●		3			
FRM-160-R05	●	●		0.5			
FRM-160-R10	●	●		1			
FRM-160-R15		●	16	1.5	12	2	4
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			

Cat. No.	PVD coated JC8015 (Z10~20)	PVD coated DH102 (Z01)	Dimensions (mm) φDc	r	B	C	T
FRM-200-R15		●		1.5			
FRM-200-R20	●	●	20	2	15	2	5
FRM-200-R30		●		3			
FRM-210-R10	●	●	21	1	15	2	5
FRM-250-R05		●		0.5			
FRM-250-R10	●	●	25	1	18.5	2.5	6
FRM-250-R20	●	●		2			
FRM-250-R30		●		3			
FRM-300-R05		●		0.5			
FRM-300-R10	●	●	30	1	22.5	3	7
FRM-300-R20	●	●		2			
FRM-300-R30		●		3			
FRM-320-R05		●		0.5			
FRM-320-R10	●	●	32	1	23.5	3	7
FRM-320-R20	●	●		2			
FRM-320-R30		●		3			

2 inserts per case.

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

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Finishing / High feed Profile Milling

Mirror Radius

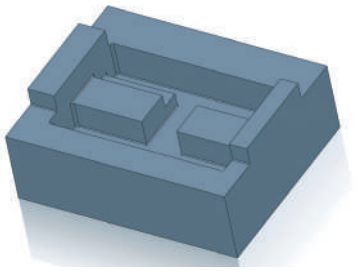
Mirror Series

RNM / MRX TYPE

■ CASE STUDIES

1.Replacement of solid carbide ball nose end mill with Mirror radius

Overhung length : 30mm

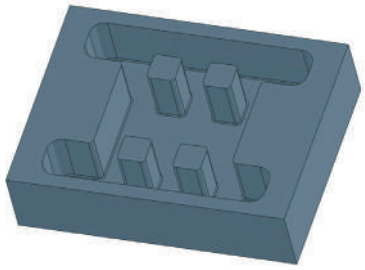


Result

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
	a_p(mm)	Semi-finishing: 0.25mm Finishing: 0.05mm
	a_e(mm)	Semi-finishing: 3.5mm Finishing: 0.3mm
	Coolant	Air blow
	Machine	Vertical MC

2.Improved efficiency



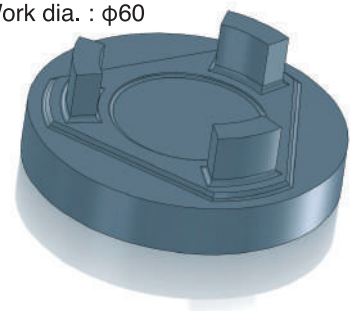
Result

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
	a_p(mm)	0.05mm
	a_e(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, DH103
Cutting conditions	Vc, (n)	n=3,000min^{-1}, Vc=113m/min
	Vf, (fz)	Vf=1,000mm/min , f=0.3mm/rev
	a_p(mm)	0.5mm
	a_e(mm)	5.8mm
	Coolant	Water soluble
	Machine	Vertical MC

Finishing / High feed Profile Milling

Mirror Radius

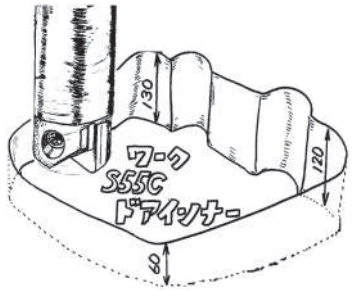
Mirror Series

RNM / MRX TYPE

■ CASE STUDIES

4.High speed and high accuracy machining

Finishing for inner side wall



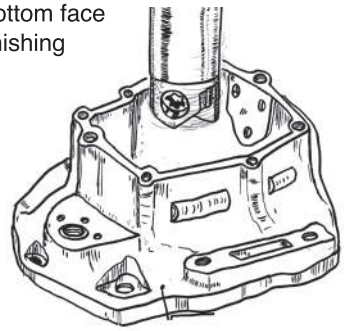
Result

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 2 pass
	ae(mm)	10mm
	Coolant	Wet cutting
	Machine	Vertical MC

Finishing / High feed Profile Milling

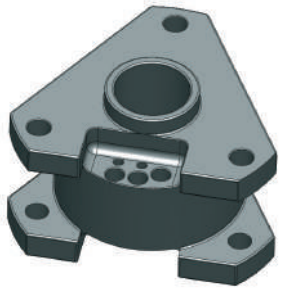
Mirror Radius

Mirror Series

RNM / MRX TYPE

■ CASE STUDIES

6.Replacement of solid carbide ball nose end mill with Mirror radius



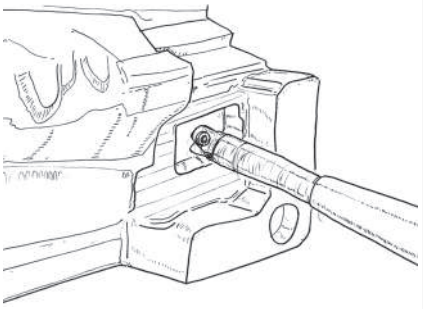
Work	Part name	Electric parts
	Material	S50C
	Hardness	–
Tool	Tool No.	RNMS-060015U-S06C
	Grade	HRM-060-R15, JC8015
Cutting conditions	Vc, (n)	n=8,000min^{-1}, Vc=150m/min
	Vf, (fz)	Vf=6,400mm/min , f=0.8mm/rev
	ap(mm)	0.2mm
	ae(mm)	0.2mm
	Coolant	Water soluble (External)
	Machine	Vertical MC

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

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

■ Guideline for selecting insert model number and grade

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	RNM				HRM	FRM	
			DH103	JC8015	JC10000	KT9	JC8015	DH102	JC8015
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015		◎			◎		◎
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015		◎			◎		◎
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015		◎			◎		◎
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	○	◎			◎		◎
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	○	◎			◎		◎
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015		○			○	◎	○
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102						◎	
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	○					◎	
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	◎	○			○	◎	○
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	◎	○			○	◎	○
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	○	◎			◎	○	◎
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	○	◎			◎	○	◎
Aluminum alloy (A5052)	RNM	KT9				◎			
Aluminum alloy (A7075)	RNM	KT9				◎			
Aluminum alloy casting (Si less than 13%)	RNM	KT9				◎			
Copper alloy (C1100)	RNM	KT9				◎			
Graphite	RNM	JC10000			◎				
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015					◎		◎
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015					◎		◎

◎: 1st recommended, ○: 2nd recommended, ☆: Wet cutting, ★: High-speed cutting

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert RNM / HRM / FRM Type + Carbide Shank Mirror Radius or
Mirror radius insert RNM / HRM / FRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For side finishing)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)											
			6				8				10			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	0.2	0.1	15,920	3,980	0.3	0.1	11940	2990	0.3	0.1	9,550	2,870
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.2	0.1	14,850	3,710	0.2	0.1	11140	2790	0.3	0.1	8,910	2,670
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015	0.2	0.1	13,260	1,330	0.2	0.1	9950	1000	0.3	0.1	7,960	800
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102	0.2	0.1	10,610	1,060	0.2	0.1	7960	800	0.3	0.1	6,370	640
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	0.1	0.1	7,960	320	0.1	0.1	5970	240	0.1	0.1	4,770	290
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	0.1	18,570	6,500	0.3	0.1	13930	4880	0.3	0.15	11,140	3,900
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	0.1	18,570	6,500	0.3	0.1	13930	4880	0.3	0.15	11,140	3,900
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	0.2	0.1	14,850	4,460	0.3	0.1	11140	3340	0.3	0.1	8,910	2,670
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	0.2	0.1	14,850	4,460	0.3	0.1	11140	3340	0.3	0.1	8,910	2,670
Aluminum alloy (A5052)	RNM	KT9	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Aluminum alloy (A7075)	RNM	KT9	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Aluminum alloy casting (Si less than 13%)	RNM	KT9	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Copper alloy (C1100)	RNM	KT9	0.2	0.15	13,260	5,300	0.25	0.15	9950	3980	0.3	0.15	7,960	3,180
Graphite	RNM	JC10000	0.3	0.2	18,570	7,430	0.4	0.2	13930	5570	0.5	0.2	11,140	4,460
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015	0.2	0.1	5,310	1,060	0.2	0.1	3980	800	0.25	0.1	3,180	760
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015	0.2	0.1	4,240	850	0.2	0.1	3180	640	0.25	0.1	2,550	610

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert RNM / HRM / FRM Type + Carbide Shank Mirror Radius or
Mirror radius insert RNM / HRM / FRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For side finishing)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 12/13 ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	16/17 ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	20/21 ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	0.3	0.1	7,960	2,390	0.4	0.1	5,970	2,390	0.5	0.1	4,770	1,910
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.3	0.1	7,430	2,230	0.4	0.1	5,570	1,670	0.5	0.1	4,460	1,340
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015	0.3	0.1	6,630	660	0.4	0.1	4,970	750	0.5	0.1	3,980	600
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102	0.3	0.1	5,310	530	0.4	0.1	3,980	600	0.5	0.1	3,180	480
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	0.1	0.1	3,980	320	0.2	0.1	2,980	300	0.2	0.1	2,390	240
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.3	0.2	9,280	3,250	0.4	0.2	6,960	3,480	0.5	0.2	5,570	3,340
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.3	0.2	9,280	3,250	0.4	0.2	6,960	3,480	0.5	0.2	5,570	3,340
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	0.3	0.1	7,430	2,230	0.4	0.1	5,570	2,230	0.5	0.1	4,460	1,780
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	0.3	0.1	7,430	2,230	0.4	0.1	5,570	2,230	0.5	0.1	4,460	1,780
Aluminum alloy (A5052)	RNM	KT9	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Aluminum alloy (A7075)	RNM	KT9	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Aluminum alloy casting (Si less than 13%)	RNM	KT9	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Copper alloy (C1100)	RNM	KT9	0.4	0.15	6,630	2,650	0.5	0.15	4,970	2,500	0.7	0.15	3,980	2,000
Graphite	RNM	JC10000	0.6	0.2	9,280	3,710	0.8	0.2	6,960	3,500	1	0.2	5,570	2,800
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015	0.25	0.1	2,650	640	0.25	0.1	1,990	480	0.3	0.1	1,590	380
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015	0.25	0.1	2,120	510	0.25	0.1	1,590	380	0.3	0.1	1,270	300

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert RNM / HRM / FRM Type + Carbide Shank Mirror Radius or
Mirror radius insert RNM / HRM / FRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For side finishing)

Overhung length ℓ/Dc	n (min^{-1})	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 25/26 ap (mm)	ae (mm)	n (min^{-1})	Vf (mm/min)	30 ap (mm)	ae (mm)	n (min^{-1})	Vf (mm/min)	32 ap (mm)	ae (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	0.8	0.1	3,820	1,530	1	0.1	3,180	1,270	1.2	0.1	2,980	1,190
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.8	0.1	3,570	1,070	1	0.1	2,970	890	1.2	0.1	2,790	840
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015	0.6	0.1	3,180	480	0.8	0.1	2,650	400	1	0.1	2,490	370
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102	0.6	0.1	2,550	380	0.8	0.1	2,120	320	1	0.1	1,990	300
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	0.3	0.1	1,910	190	0.4	0.1	1,590	160	0.5	0.1	1,490	150
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.8	0.2	4,460	2,680	1	0.2	3,710	2,230	1.2	0.2	3,480	2,090
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.8	0.2	4,460	2,680	1	0.2	3,710	2,230	1.2	0.2	3,480	2,090
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	0.8	0.1	3,570	1,430	1	0.1	2,970	1,190	1	0.1	2,790	1,120
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	0.8	0.1	3,570	1,430	1	0.1	2,970	1,190	1.2	0.1	2,790	1,120
Aluminum alloy (A5052)	RNM	KT9	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Aluminum alloy (A7075)	RNM	KT9	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Aluminum alloy casting (Si less than 13%)	RNM	KT9	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Copper alloy (C1100)	RNM	KT9	0.8	0.15	3,180	1,590	1	0.15	2,650	1,330	1	0.15	2,490	1,250
Graphite	RNM	JC10000	1.2	0.2	4,460	2,230	1.6	0.2	3,710	1,860	1.6	0.2	3,480	1,740
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015	0.35	0.1	1,270	320	0.4	0.1	1,060	270	0.4	0.1	990	250
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015	0.35	0.1	1,020	260	0.4	0.1	850	210	0.4	0.1	800	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 spindle speed with keeping feed per tooth.
3) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert RNM / HRM / FRM Type + Carbide Shank Mirror Radius or
Mirror radius insert RNM / HRM / FRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For side finishing)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm)											
			6				8				10			
			ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	0.1	1.0(~3)	13,790	3,450	0.15	1.2(~4)	10,350	3,110	0.15	1.2(~5)	8,280	2,480
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.1	1.0(~3)	12,730	3,180	0.15	1.2(~4)	9,550	2,870	0.15	1.2(~5)	7,640	2,290
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015	0.05	1.0(~3)	10,080	1,010	0.06	1.2(~4)	7,560	760	0.08	1.2(~5)	6,050	610
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102	0.05	1.0(~3)	6,900	690	0.06	1.2(~4)	5,170	520	0.08	1.2(~5)	4,140	410
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	0.03	1.0(~2)	5,310	210	0.04	1.2(~3)	3,980	160	0.05	1.2(~4)	3,180	190
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.1	1.0(~3)	15,920	4,780	0.15	1.2(~4)	11,940	4,180	0.15	1.2(~5)	9,550	3,340
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.1	1.0(~3)	15,920	4,780	0.15	1.2(~4)	11,940	4,180	0.15	1.2(~5)	9,550	3,340
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	0.1	1.0(~3)	12,730	3,180	0.15	1.2(~4)	9,550	2,870	0.15	1.2(~5)	7,640	2,290
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	0.1	1.0(~3)	12,730	3,180	0.15	1.2(~4)	9,550	2,870	0.15	1.2(~5)	7,640	2,290
Aluminum alloy (A5052)	RNM	KT9	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Aluminum alloy (A7075)	RNM	KT9	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Aluminum alloy casting (Si less than 13%)	RNM	KT9	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Copper alloy (C1100)	RNM	KT9	0.15	1.0(~3)	10,610	3,180	0.2	1.2(~4)	7,960	2,390	0.2	1.2(~5)	6,370	1,910
Graphite	RNM	JC10000	0.2	1.0(~3)	15,920	6,370	0.25	1.2(~4)	11,940	4,780	0.25	1.2(~5)	9,550	3,820
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015	0.1	1.0(~3)	2,920	580	0.15	1.2(~4)	2,190	440	0.15	1.2(~5)	1,750	350
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015	0.1	1.0(~3)	2,920	580	0.15	1.2(~5)	2,190	440	0.15	1.2(~5)	1,750	350

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

■ RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert RNM / HRM / FRM Type + Carbide Shank Mirror Radius or
Mirror radius insert RNM / HRM / FRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For side finishing)

Overhung length ℓ/Dc	n (min^{-1})	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 12/13 ap (mm)	ae (mm)	n (min^{-1})	Vf (mm/min)	16/17 ap (mm)	ae (mm)	n (min^{-1})	Vf (mm/min)	20/21 ap (mm)	ae (mm)	n (min^{-1})	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	0.15	1.5(~5)	6,900	2,070	0.15	2.0(~9)	5,170	2,070	0.2	2.5(~13)	4,140	1,660
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.15	1.5(~5)	6,370	1,910	0.15	2.0(~9)	4,770	1,430	0.2	2.5(~13)	3,820	1,150
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015	0.1	1.5(~5)	5,040	600	0.1	2.0(~9)	3,780	570	0.15	2.5(~13)	3,020	450
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102	0.1	1.5(~5)	3,450	410	0.1	2.0(~9)	2,590	390	0.15	2.5(~13)	2,070	310
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	0.05	1.5(~5)	2,650	210	0.05	2.0(~6)	1,990	200	0.05	2.5(~8)	1,590	160
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	1.5(~5)	7,960	3,180	0.2	2.0(~9)	5,970	2,390	0.2	2.5(~13)	4,770	1,910
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	1.5(~5)	7,960	3,180	0.2	2.0(~9)	5,970	2,390	0.2	2.5(~13)	4,770	1,910
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,370	1,910	0.15	2.0(~9)	4,770	1,910	0.15	2.5(~13)	3,820	1,530
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	0.15	1.5(~5)	6,370	1,910	0.15	2.0(~9)	4,770	1,910	0.15	2.5(~13)	3,820	1,530
Aluminum alloy (A5052)	RNM	KT9	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Aluminum alloy (A7075)	RNM	KT9	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Aluminum alloy casting (Si less than 13%)	RNM	KT9	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Copper alloy (C1100)	RNM	KT9	0.2	1.5(~5)	5,310	1,590	0.2	2.0(~9)	3,980	1,190	0.25	2.5(~13)	3,180	950
Graphite	RNM	JC10000	0.25	1.5(~5)	7,960	3,180	0.25	2.0(~9)	5,970	3,580	0.3	2.5(~13)	4,770	2,860
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015	0.15	1.5(~5)	1,460	290	0.15	2.0(~9)	1,090	220	0.2	2.5(~13)	880	180
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015	0.15	1.5(~5)	1,460	290	0.15	2.0(~9)	1,090	220	0.2	2.5(~13)	880	180

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

RNM / MRX TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert RNM / HRM / FRM Type + Carbide Shank Mirror Radius or
Mirror radius insert RNM / HRM / FRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For side finishing)

Overhung length ℓ/Dc	n (min-1)	Vf (mm/min)
~ 3Dc	100%	100%
Over 3Dc-5Dc	70%	70%
Over 5Dc ~ 10Dc	50%	50%

Work Materials	Recommended Insert Model Number	Recommended Insert Grade	Tool dia. (mm) 25/26 ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	30 ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)	32 ap (mm)	ae (mm)	n (min-1)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	RNM HRM FRM	JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Cast steel (GM190, ICD5) Hardness 285 or less	RNM HRM FRM	JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Die steel SKD61, SKD11 (1.2344, 1.2379) Below 255HB	RNM HRM FRM	JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Mold steel HPM7, PX5, P20 (1.2311, P20) 30-36HRC	RNM HRM FRM	DH103 JC8015	0.2	4.0(~18)	3,310	1,320	0.2	4.2(~23)	2,760	1,100	0.2	4.2(~25)	2,590	1,040
Mold steel NAK80, HPM1, P21 (1.2311, P21) 38-43HRC	RNM HRM FRM	DH103 JC8015	0.2	4.0(~18)	3,060	920	0.2	4.2(~23)	2,550	770	0.2	4.2(~25)	2,390	720
Hardened die steel SKD61, DAC, DHA (1.2344, 1.2379) 42-52HRC	HRM FRM	DH102 JC8015	0.15	4.0(~18)	2,420	360	0.15	4.2(~23)	2,020	300	0.15	4.2(~25)	1,890	280
Hardened die steel SKD11, SLD, DC11 (1.2344, 1.2379) 55-62HRC	FRM	DH102	0.15	4.0(~18)	1,660	250	0.15	4.2(~23)	1,380	210	0.15	4.2(~25)	1,290	190
High speed tool steel (SKH, HAP) Hardness 63-70HRC	FRM	DH102	0.05	4.0(~10)	1,270	130	0.05	4.2(~12)	1,060	110	0.05	4.2(~13)	990	100
Gray cast iron (FC250) Hardness 160-260HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	4.0(~18)	3,820	1,910	0.2	4.2(~23)	3,180	1,590	0.2	4.2(~25)	2,980	1,490
Ductile cast iron (FCD700) Hardness 170-300HB	RNM HRM FRM	DH102 DH103 JC8015	0.2	4.0(~18)	3,820	1,910	0.2	4.2(~23)	3,180	1,590	0.2	4.2(~25)	2,980	1,490
Austenitic Stainless steel (SUS304, 316, 317) 17Cr system	RNM HRM FRM	JC8015	0.15	4.0(~18)	3,060	1,220	0.15	4.2(~23)	2,550	1,020	0.15	4.2(~25)	2,390	960
Martensitic Stainless steel (SUS403, 420J2, 430) 13Cr system	RNM HRM FRM	JC8015	0.15	4.0(~18)	3,060	1,220	0.15	4.2(~23)	2,550	1,020	0.15	4.2(~25)	2,390	960
Aluminum alloy (A5052)	RNM	KT9	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Aluminum alloy (A7075)	RNM	KT9	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Aluminum alloy casting (Si less than 13%)	RNM	KT9	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Copper alloy (C1100)	RNM	KT9	0.25	4.0(~18)	2,550	770	0.25	4.2(~23)	2,120	640	0.25	4.2(~25)	1,990	600
Graphite	RNM	JC10000	0.3	4.0(~18)	3,820	2,290	0.3	4.2(~23)	3,180	1,910	0.3	4.2(~25)	2,980	1,790
Titanium alloy (Ti-6Al-4V) Hardness 35-43HRC	HRM FRM	JC8015	0.2	4.0(~18)	700	140	0.2	4.2(~23)	580	120	0.2	4.2(~25)	550	110
Heat resistant alloy (INCO718) Hardness 35-43HRC	HRM FRM	JC8015	0.2	4.0(~18)	700	140	0.2	4.2(~23)	580	120	0.2	4.2(~25)	550	110

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) Use air blow to flush the chips out. Pay particular attention to chip control when machining cavities with vertical MC.
4) The above are the cutting conditions when the protrusion length is 3Dc. Adjust the rotation speed n (min-1) and feed speed Vf (mm / min) according to the protrusion length.
5) When using a steel shank, reduce the rotation speed n (min-1) and feed rate Vf (mm / min) to 80% of the above conditions.

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

HRM TYPE

■ RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert HRM Type + Carbide Shank Mirror Radius or
Mirror radius insert HRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For semi-finishing)

※ 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)									
		φ6×R1.5					φ8×R2/φ9×R2				
		ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	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

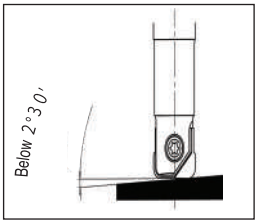
Depth of cut adjustment by corner radius (ap × ratio)	Corner radius	ap
	R0.5	ap×0.65
	R1	ap×0.80
	R1.5	ap×1.0

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

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. Pay particular attention to chip control when machining cavities with vertical MC.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of good surface requirement, recommend to reduce feed speed.
7) In case of ramping, ramping angle up to 2° 30' is recommended.
8) For groove cutting, standard cutting conditions can be used up to ℓ = 5Dc, but if it exceeds 5Dc, adjust by lowering the feed or notch. Keep the overhang length as short as possible.



Please refer to the precautions when installing the insert on page E412

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

HRM TYPE

RECOMMENDED CUTTING CONDITIONS

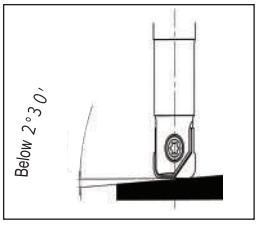
Mirror Radius Insert HRM Type + Carbide Shank Mirror Radius or
Mirror radius insert HRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For semi-finishing)

Work Materials	Insert Grades	Tool dia. (mm)									
		φ10×R2/φ11×R2					φ12×R2/φ13×R2				
		ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	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

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. Pay particular attention to chip control when machining cavities with vertical MC.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of good surface requirement, recommend to reduce feed speed.
7) In case of ramping, ramping angle up to 2° 30' is recommended.
8) For groove cutting, standard cutting conditions can be used up to ℓ = 5Dc, but if it exceeds 5Dc, adjust by lowering the feed or notch. Keep the overhang length as short as possible.



★ Precautions when installing the insert
1. Cleaning the holder insert seat.
2. Cleaning the insert. (Especially the reference surface and mounting holes should be clean)
3. Replace the heavily worn reamer bolt as soon as possible.
4. Be careful not to overtighten the reamer bolt.
We recommend using a torque control wrench (page 260).
(Refer to the table on the right for the recommended tightening torque)

Tool dia. (mm)	Recommended tightening torque
φDc	N·m
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0

Finishing / High feed Profile Milling

Mirror Radius

Mirror Series

HRM TYPE

RECOMMENDED CUTTING CONDITIONS

Mirror Radius Insert HRM Type + Carbide Shank Mirror Radius or
Mirror radius insert HRM type + Modular head MRX type +
Anti vibration (All Carbide Shank Arbor for Modular Head)
(For semi-finishing)

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

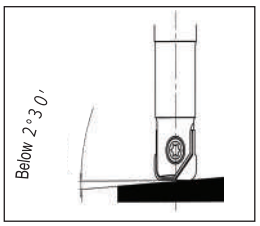
Work Materials	Insert Grades	Tool dia. (mm)									
		φ16×R3/φ17×R3					φ20×R3/φ22×R3				
		ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	ae (mm)	ap (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C (C50, C55) Below 250HB	JC8015	35	7.0	0.60	3,800	4,500	40	9.8	0.60	3,000	3,600
		80	7.0	0.60	3,800	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	R2	ap×0.75	Corner radius	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 : 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. Pay particular attention to chip control when machining cavities with vertical MC.
5) In case of 50-55HRC (Hardened die steel), recommend to reduce ap, n, Vf by 30% on above table.
6) In case of good surface requirement, recommend to reduce feed speed.
7) In case of ramping, ramping angle up to 2° 30' is recommended.
8) For groove cutting, standard cutting conditions can be used up to ℓ = 5Dc, but if it exceeds 5Dc, adjust by lowering the feed or notch. Keep the overhang length as short as possible.



Please refer to the precautions when installing the insert on page E412

High efficiency
For deep carving

Anti Vibration (All Carbide Shank Arbor for Modular Head) MSN TYPE

Through Coolant Hole

Fig.1

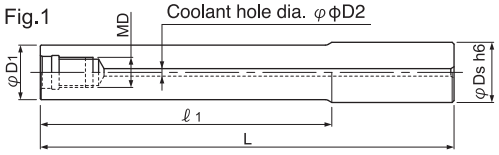
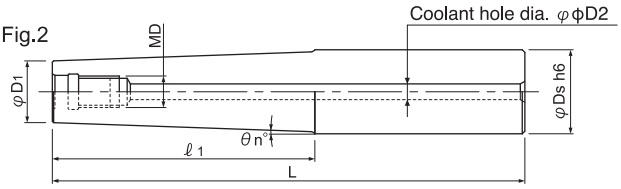


Fig.2



■ END MILL SHANK TYPE

Cat. No.	Stock	Dimensions (mm)							Weight (kg)	Fig.
		φDs	ℓ1	L	φD1	θn°	MD	φD2		
MSN-M6-12-S10C	●	10	12	60	9.7	–			0.06	1
MSN-M6-15-S12C	●	12	15	60	11.5	–			0.08	1
MSN-M6-15-S16C	●	16	15	60	13.5	–			0.15	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-M6-30-S16C	●	16	30	80	13.5	–			0.19	1
MSN-M6-35T-S12C	●	12	35	92	9.5	1°30′			0.12	2
MSN-M6-50-S10C	●	10	50	100	9.7	–	M6	3	0.09	1
MSN-M6-50-S12C	●	12	50	100	11.5	–			0.13	1
MSN-M6-50-S16C	●	16	50	100	13.5	–			0.23	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-M6-80-S16C	●	16	80	130	13.5	–			0.28	1
MSN-M8-20-S16C	●	16	20	75	15.5	–			0.17	1
MSN-M8-40-S16C	●	16	40	95	15.5	–			0.22	1
MSN-M8-40T-S20C	●	20	40	100	14.5	3°30′			0.36	2
MSN-M8-77T-S20C	●	20	77	143	14.5	1°45′	M8	4	0.49	2
MSN-M8-80-S16C	●	16	80	135	15.5	–			0.32	1
MSN-M8-120-S16C	●	16	120	175	15.5	–			0.42	1
MSN-M8-152-S16C	●	16	152	207	15.5	–			0.51	1
MSN-M10-20-S20C	●	20	20	80	19.5	–			0.29	1
MSN-M10-40-S20C	●	20	40	100	19.5	–			0.39	1
MSN-M10-40T-S20C	●	20	40	100	18.5	0°43′			0.39	2
MSN-M10-70-S20C	●	20	70	130	19.5	–			0.50	1
MSN-M10-85T-S25C	●	25	85	161	18.5	2°			0.90	2
MSN-M10-90-S20C	●	20	90	150	19.5	–	M10	4	0.60	1
MSN-M10-90T-S20C	●	20	90	150	18.5	0°19′			0.58	2
MSN-M10-140-S20C	●	20	140	200	19.5	–			0.80	1
MSN-M10-140T-S20C	●	20	140	200	18.5	0°12′			0.77	2
MSN-M10-160-S20C	●	20	160	220	19.5	–			0.87	1
MSN-M10-210-S20C	●	20	210	270	19.5	–			1.07	1

Note) Please refer page D16 for recommended tightening torque.

●: Standard stock items ☐: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficiency
For deep carving

Anti Vibration (All Carbide Shank Arbor for Modular Head) MSN TYPE

Through Coolant Hole

Fig.1

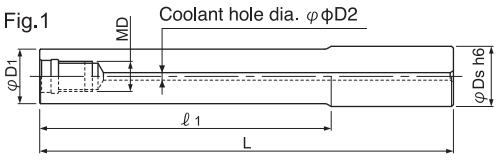
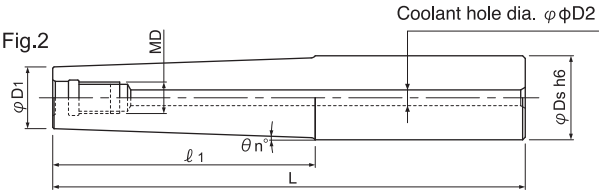


Fig.2



■ END MILL SHANK TYPE

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

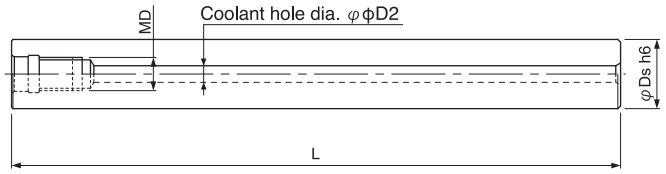
Note) Please refer page D16 for recommended tightening torque.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

High efficiency
For deep carving

Anti Vibration (All Carbide Shank Arbor for Modular Head) 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-M8-87S-S14C	●	14	87	M8	4	0.16
MSN-M8-137S-S14C	●		137			0.26
MSN-M8-97S-S15C	●		97			0.21
MSN-M8-147S-S15C	●	15	147	M8	4	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	●		130			0.42
MSN-M10-190S-S18C	●	18	190	M10	4	0.62
MSN-M10-240S-S18C	●		240			0.89
MSN-M10-130S-S20C	●		130			0.53
MSN-M10-190S-S20C	●	20	190	M10	4	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	●		145			0.91
MSN-M12-215S-S25C	●	25	215	M12	6	1.36
MSN-M12-285S-S25C	●		285			1.80
MSN-M16-160S-S28C	●		160			1.22
MSN-M16-230S-S28C	●	28	230	M16	8	1.77
MSN-M16-310S-S28C	●		310			2.41
MSN-M16-157S-S32C	●		157			1.61
MSN-M16-217S-S32C	●	32	217	M16	8	2.22
MSN-M16-287S-S32C	●		287			2.94
MSN-M16-357S-S32C	●		357			3.66

Note) Please refer page D16 for recommended tightening torque.

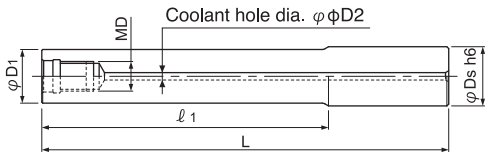
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For high efficiency milling

Anti Vibration G-Body (Steel Shank Arbor for Modular Head) MGN TYPE

G-Body Through Coolant Hole

- G-Body with high rigidity and excellent durability
- Short type
- For measures against damage caused by chip biting during machining with a short protrusion length or rough machining, we recommend Stubborn G-Body (steel shank) with excellent cost performance.



■ END MILL SHANK TYPE

Cat. No.	Stock	Dimensions (mm)							Weight (kg)
		φDs	ℓ1	L	φD1	θn°	MD	φD2	
MGN-M8-17-S16	●	16	17	97	15.5	—	M8	4	0.13
MGN-M10-30-S20	●	20	30	100	19	—	M10	4	0.21
MGN-M12-35-S25	●	25	35	105	24	—	M12	4	0.36
MGN-M12-85-S25	●	25	85	165	24	—	M12	4	0.57
MGN-M16-37-S32	●	32	37	107	29	—	M16	6	0.56
MGN-M16-77-S32	●	32	77	157	29	—	M16	6	0.83

Note) 1. For the cutting conditions when combining the modular head and stubborn G-Body, refer to the standard cutting condition table for modular head + stubborn Ittetsu MSN type (all cemented carbide shank arbor). Please apply as it is.
2. Please refer page D16 for recommended tightening torque.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

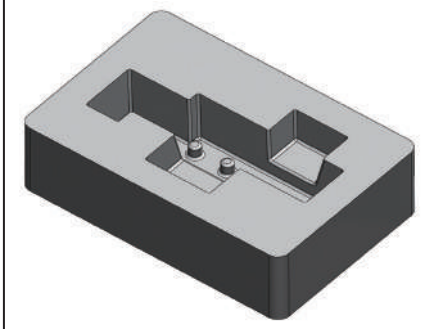
For high efficiency milling

Modular head series

Replaceable head tool

CASE STUDIES

1. TA conversion from solid ball end mill

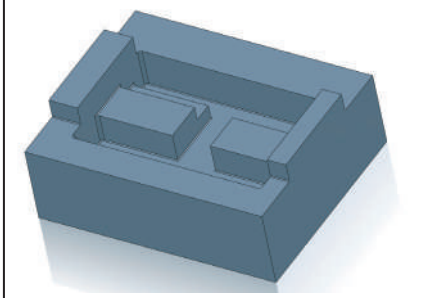


Work	Part name	Die casting mold
	Material	Alloy tool steel (DH21: heat treatment)
	Hardness	48HRC
Tool	Tool No.	Head: MRX-120-M6-H (with coolant hole) Arbor: MSN-M6-50-S12C
	Grade	HRM-120-R20 (JC8015)
Cutting conditions	Vc, (n)	n = 4,000min-1, Vc = 150m / min
	Vf, (fz)	Vf = 4,000mm / min, f = 1mm / rev
	ap(mm)	0.25mm
	ae(mm)	5mm
	Coolant	Wet (coolant through)
	Machine	Vertical MC

Result

Proposed high feed mirror radius where the current competitor G solid ball end mill is used. Hardened steel can be machined from rough to medium finish without chattering, improving machining efficiency. In addition, the effect of coolant through eliminates the trouble of chip biting.

2. Switch to a modular head with a coolant hole



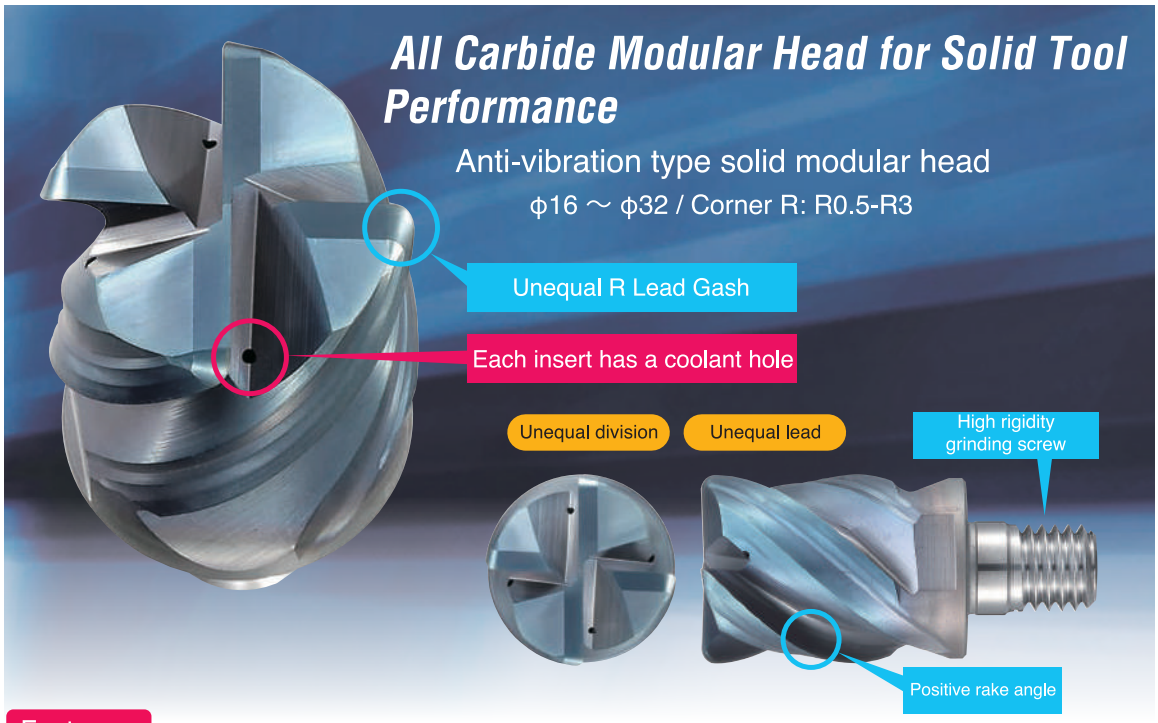
Work	Part name	Plastic mold
	Material	Alloy tool steel (PX5)
	Hardness	28-32HRC
Tool	Tool No.	Head: MRX-120-M6-H (with coolant hole) Arbor: MSN-M6-90S-S12C
	Grade	HRM-120-R20 (JC8015)
Cutting conditions	Vc, (n)	n = 3,000min-1, Vc = 113m / min
	Vf, (fz)	Vf = 1,500mm / min, f = 0.5mm / rev
	ap(mm)	0.5mm
	ae(mm)	4mm
	Coolant	Internal air blow
	Machine	Vertical MC

Result

With the pocket machining with a depth of 50 mm, the current head without a coolant hole made by competitor A was damaged because chips did not discharge, but it was switched to a head with a coolant hole to improve the high feed machining for deep engraving. The insert can be used continuously even after machining for 2 hours.

For machining solid and difficult-to-cut materials

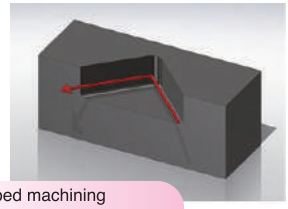
Anti-vibration S head (solid modular head) SMSR TYPE



Features

1. Adopted a new grade "DH115" by combining new PVD coating "DH coat" and ultrafine cemented carbide. Supports a wide range of work materials from carbon steel and pre-hardened steel to stainless steel and titanium alloys
2. Excellent anti - vibration and stable machining are achieved by adopting unequal division and unequal flutes. The synergistic effect of the all-carbide shank arbor "Anti Vibration" makes the machined surface finish so good even for thin-walled work and corner machining of pockets.
3. Low resistance positive flute type and internal lubrication support (with coolant holes for each flute) prevent welding of work material and improve chip evacuation. Also ideal for machining heat resistant alloys such as titanium alloys and Inconel.

Case Study

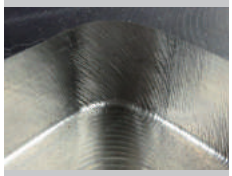


V-shaped machining
Out stick length: 80 mm
Side cutting (down cut)

No chatter

Anti-vibration S head SMSR type

Chatter



Our conventional product

Work materials	Part name	Test piece
	Material	Ti-6Al-4V
	Hardness	36HRC
Tools	Tool No.	SMSR-4160R10-M8（ϕ16-R1）+ MSN-M8-70-S16C
	Insert model number, grade	-
Cutting Conditions	Spindle speed, cutting speed	Vc=100m/min
	Feed speed, Feed rate	f=0.20mm/rev
	ap	16mm
	ae	0.8mm
	Coolant	Internal refueling
	Depth of cut	Vertical MC
Result	It can be machined without chattering and has a better machined surface than our conventional products.	

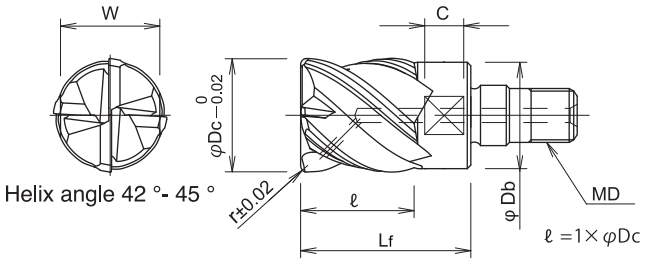
Excellent anti - vibration !

For machining solid and difficult-to-cut materials

Anti-vibration S head (solid modular head) SMSR TYPE

Through coolant hole

- 4-flute, helix angle
- Blade length 1D



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

Note) 1. To prevent overtightening, use the dedicated spanner (DS type) specified by us for the solid modular head (S head).
2. Refer to pages E439 - E440 for standard cutting conditions.

Precautions when installing the S head

Since the cemented carbides are bonded together, tighten the tightening torque with a small force of about 1/5 of the normal force.

S head tightening torque

Tool diameter φDc (mm)	Width across flats W (mm)	Spanner model number	Recommended 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

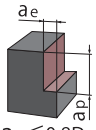
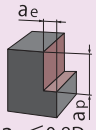
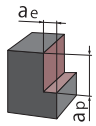
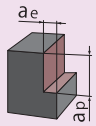
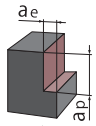
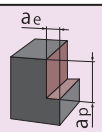
* The spanner is not included with the modular head body.

For machining solid and difficult-to-cut materials

Anti-vibration S head (solid modular head) SMSR TYPE

■ Anti-vibration S head recommended cutting conditions

● Shoulder milling

Work Materials	Type of Machining	Tool dia. (mm)								
		16			20			25		
		No. of teeth 4N			No. of teeth 4N			No. of teeth 4N		
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel S50C, S55C Hardness 250HB or less	 ap≦0.8Dc ae≦0.1Dc	70	2,980	1,430	70	2,390	1,150	100	1,910	920
		110	2,690	1,230	125	2,150	980	150	1,720	780
		150	2,390	1,030	175	1,910	830	200	1,530	660
Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC	 ap≦0.8Dc ae≦0.1Dc	70	2,390	1,150	70	1,910	920	100	1,530	730
		110	2,150	980	125	1,720	780	150	1,380	630
		150	1,910	830	175	1,530	660	200	1,220	530
Hardened steel (SKD61, DAC, DHA) Hardness 42-52HRC	 ap≦0.8Dc ae≦0.1Dc	70	1,390	670	70	1,110	530	100	890	430
		110	1,250	570	125	1,000	460	150	800	360
		150	1,110	480	175	890	380	200	710	310
Austenitic stainless steel (SUS304, 316, 317) 17Cr system	 ap≦0.8Dc ae≦0.1Dc	70	1,990	960	70	1,590	760	100	1,270	610
		110	1,790	820	125	1,430	650	150	1,150	520
		150	1,590	690	175	1,270	550	200	1,020	440
Titanium alloy Ti-6AL-4V 35-43HRC	 ap≦0.8Dc ae≦0.1Dc	70	1,590	640	70	1,270	510	100	1,020	410
		110	1,430	540	125	1,150	440	150	920	350
		150	1,270	460	175	1,020	370	200	810	290
Heat resistant alloy (INCO718) Hardness 35-43HRC	 ap≦0.8Dc ae≦0.1Dc	70	990	200	70	800	160	100	640	130
		110	900	170	125	720	140	150	570	110
		150	800	140	175	640	120	200	510	90

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

■ Cutting condition reduction rate when using SMSR type

* If you want to increase the tool protrusion length, reduce it from the above condition table as shown in the table below.

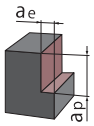
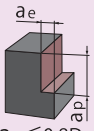
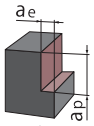
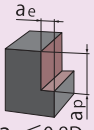
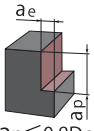
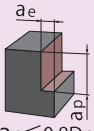
L／D	n (min-1)	Vf(mm/min)	ap(mm)	ae(mm)
L≦4D	0%	0%	0%	0%
4D＜L≦6D	20% REDUCTION	30% REDUCTION	0%	～0.05Dc
6D＜L	30% REDUCTION	50% REDUCTION	～0.5Dc	～0.025Dc

For machining solid and difficult-to-cut materials

Anti-vibration S head (solid modular head) SMSR TYPE

■ Anti-vibration S head recommended cutting conditions

● Shoulder milling

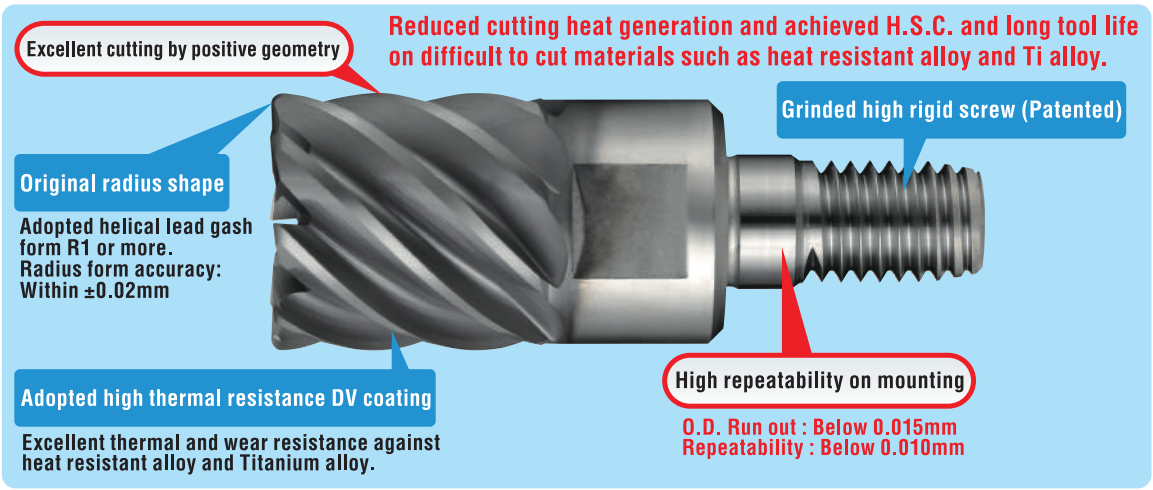
Work Materials	Type of Machining	Tool dia. (mm)								
		30			32					
		No. of teeth 4N			No. of teeth 4N					
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)			
Carbon steel S50C, S55C Hardness 250HB or less	 ap≦0.8Dc ae≦0.1Dc	110	1,590	760	110	1,490	720			
		160	1,430	650	160	1,340	610			
		210	1,270	550	210	1,190	510			
Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC	 ap≦0.8Dc ae≦0.1Dc	110	1,270	610	110	1,190	570			
		160	1,150	520	160	1,070	490			
		210	1,020	440	210	950	410			
Hardened steel (SKD61, DAC, DHA) Hardness 42-52HRC	 ap≦0.8Dc ae≦0.1Dc	110	740	360	110	700	340			
		160	670	310	160	630	290			
		210	590	250	210	560	240			
Austenitic stainless steel (SUS304, 316, 317) 17Cr system	 ap≦0.8Dc ae≦0.1Dc	110	1,060	510	110	990	480			
		160	950	430	160	900	410			
		210	850	370	210	800	350			
Titanium alloy Ti-6AL-4V 35-43HRC	 ap≦0.8Dc ae≦0.1Dc	110	850	340	110	800	320			
		160	760	290	160	720	270			
		210	680	240	210	640	230			
Heat resistant alloy (INCO718) Hardness 35-43HRC	 ap≦0.8Dc ae≦0.1Dc	110	530	110	110	500	100			
		160	480	90	160	450	90			
		210	420	80	210	400	70			

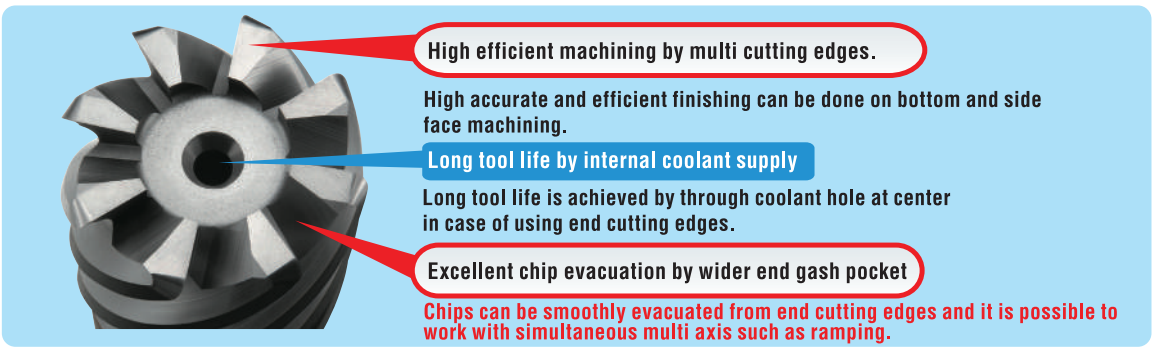
ℓ : Overhung length, ap : Depth of cut, ae : width of cut, n : Spindle speed, Vf : Feed speed

Solid / multi-blade

S head (solid modular head) SMSA TYPE

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

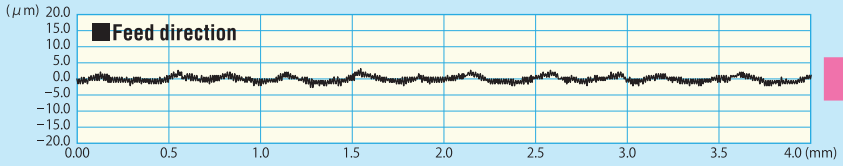




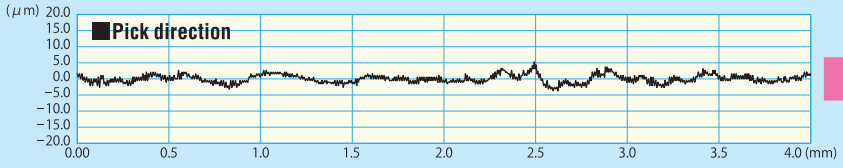
■ Cutting performance of S-HEAD

Surface roughness results (Side face finishing)

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



Ra: 0.72μm
Rz: 4.64μm

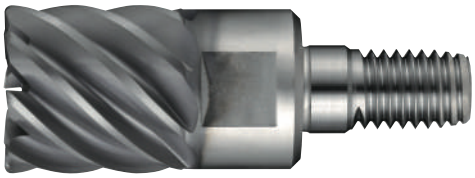


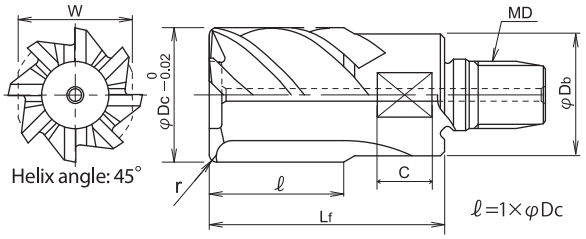
Ra: 1.00μm
Rz: 5.97μm

Solid / multi-blade

S head (solid modular head) SMSA TYPE

Through Coolant Hole





■ BODY

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

Note) 1. Please refer page E443 - E446 for recommended cutting conditions.

Precautions when installing the S head

Since the cemented carbides are bonded together, tighten the tightening torque with a small force of about 1/5 of the normal force.

S head tightening torque

Tool diameter φDc (mm)	Width across flats W (mm)	Spanner model number	Recommended 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

* The spanner is not included with the modular head body.

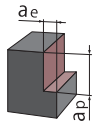
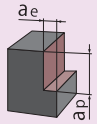
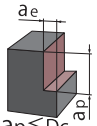
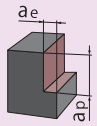
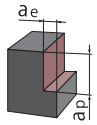
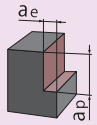
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Solid / multi-blade

S head (solid modular head) SMSA TYPE

RECOMMENDED CUTTING CONDITIONS

SMSA type + MSN Carbide Shank Holder

Work Materials	Type of Machining	Tool dia. (mm)					
		16			20		
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)
Carbon & Alloy steel S50C, S55C 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
Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC	 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
Austenitic stainless steel (SUS304, 316, 317)	 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
Aluminum alloy (A5052)	 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
Titanium alloy (Ti-6Al-4V) Hardness 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
Heat resistant alloy (INCO718) Hardness 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

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

NOTE

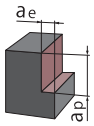
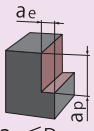
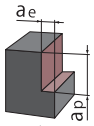
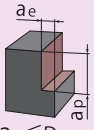
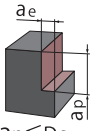
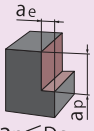
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed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

Solid / multi-blade

S head (solid modular head) SMSA TYPE

■ RECOMMENDED CUTTING CONDITIONS

● SMSA type + MSN Carbide Shank Holder

Work Materials	Type of Machining	Tool dia. (mm)					
		25			30/32		
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)
Carbon & Alloy steel S50C, S55C 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
Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC	 ap≦Dc ae≦0.03Dc	100	900	240	110	700	180
		150	800	180	160	600	130
		200	600	120	210	500	100
Austenitic stainless steel (SUS304, 316, 317)	 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
Aluminum alloy (A5052)	 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
Titanium alloy (Ti-6Al-4V) Hardness 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
Heat resistant alloy (INCO718) Hardness 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

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

■ NOTE

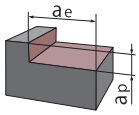
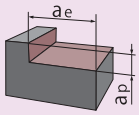
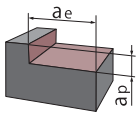
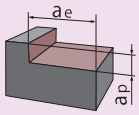
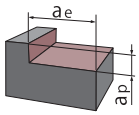
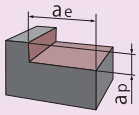
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed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

Solid / multi-blade

S head (solid modular head) SMSA TYPE

RECOMMENDED CUTTING CONDITIONS

SMSA type + MSN Carbide Shank Holder

Work Materials	Type of Machining	Tool dia. (mm)					
		16			20		
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)
Carbon & Alloy steel S50C, S55C 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
Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC	 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
Austenitic stainless steel (SUS304, 316, 317)	 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
Aluminum alloy (A5052)	 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
Titanium alloy (Ti-6Al-4V) Hardness 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
Heat resistant alloy (INCO718) Hardness 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

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

NOTE

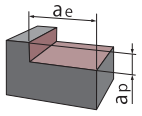
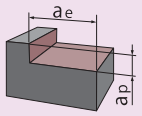
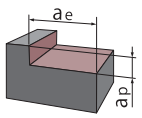
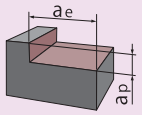
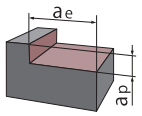
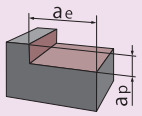
1) In case of side face finishing for improved productivity & efficiency, please increase ap and reduce ae. This will also help to reduce the heat generation.
2) In case of bottom face finishing for improved productivity & efficiency, recommended to use lower (shallow) depth of cut and increase feed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

Solid / multi-blade

S head (solid modular head) SMSA TYPE

RECOMMENDED CUTTING CONDITIONS

● SMSA type + MSN Carbide Shank Holder

Work Materials	Type of Machining	Tool dia. (mm)					
		25			30/32		
		ℓ (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	n (min⁻¹)	Vf (mm/min)
Carbon & Alloy steel S50C, S55C 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
Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC	 ae≦Dc ap≦0.03Dc	100	900	700	110	700	550
		150	800	600	160	600	500
		200	600	500	210	500	400
Austenitic stainless steel (SUS304, 316, 317)	 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
Aluminum alloy (A5052)	 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
Titanium alloy (Ti-6Al-4V) Hardness 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
Heat resistant alloy (INCO718) Hardness 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

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

NOTE

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

For solid aluminum machining

S head for aluminum (solid modular head) SMAL TYPE

For aluminum alloy

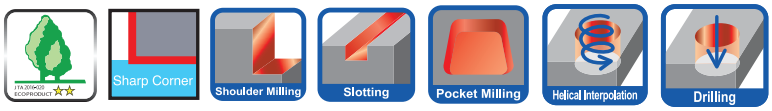
S Head SMAL type

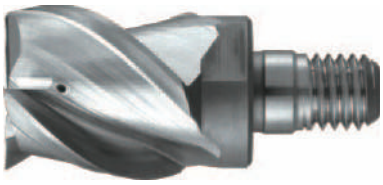
Features

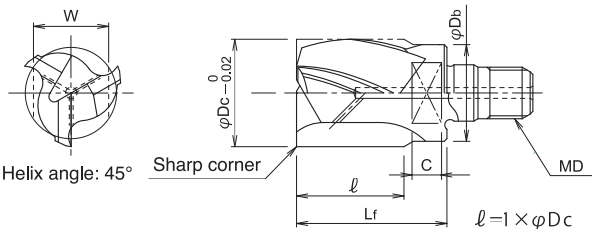
1. **Solid modular head** SMAL type showed the same performance as the solid end mill, by the combination with carbide shank MSN type. And, overhung length is of wide range, due to many variation in carbide shank MSN type.
2. Adopted the cutting edge geometry suitable for aluminum alloy machining. **Positive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

Through Coolant Hole

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







BODY

Cat. No.	Stock	Grade	No. of flutes	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
SMAL-3320-M16	●		3	32	32	42	29	M16	5.5	27

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.
4. Please refer page D16 for recommended tightening torque.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For solid aluminum machining

S head for aluminum (solid modular head) SMAL TYPE

Precautions when installing S head for aluminum

Since the cemented carbides are bonded together, tighten the tightening torque with a small force of about 1/5 of the normal force.

S head tightening torque for aluminum

Tool diameter φDc (mm)	Screw size	Width across flats W (mm)	Spanner model number	Recommended tightening torque
φ18	M8	14	DS-14	10～11N·m
φ20	M10	14	DS-14	10～16N·m
φ22	M10	17	DS-17	10～16N·m
φ25	M12	19	DS-19	15～20N·m
φ28	M12	22	DS-22	15～20N·m
φ32	M16	27	DS-27	20～25N·m

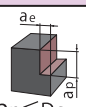
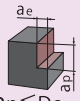
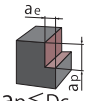
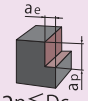
* The spanner is not included with the modular head body.

For solid aluminum machining

S head for aluminum (solid modular head) SMAL TYPE

■ RECOMMENDED CUTTING CONDITIONS

● Shoulder milling

Work Materials	Type of Machining	Tool dia. ϕDc (mm)											
		18		20		22		25		28		32	
		n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)	n (min⁻¹)	Vf (mm/min)
Aluminium alloy (A5052)	 ap≦Dc ae≦0.05Dc	3,200	800	2,800	700	2,600	650	2,300	570	2,050	510	1,800	450
Aluminium alloy (A7075)	 ap≦Dc ae≦0.05Dc	2,600	650	2,400	600	2,100	520	1,900	470	1,700	420	1,500	370
Cast aluminium alloy (Up to 13% Si)	 ap≦Dc ae≦0.05Dc	3,200	800	2,800	700	2,600	650	2,300	570	2,050	510	1,800	450
Copper (C1100)	 ap≦Dc ae≦0.05Dc	1,800	450	1,600	400	1,400	350	1,300	320	1,150	280	1,000	250

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

■ NOTE

(1) We recommend using water-soluble cutting oil.
(2) Please keep the proper gripping length when using the shank gripping allowance.
(3) In consideration of chip evacuation during ramping, the cutting conditions should be reduced by 30 to 60% in the above condition table as a guide.
(4) Please use in an environment where machine accuracy, rigidity, touring accuracy, work setting accuracy and rigidity are sufficient.
(5) If the maximum rotation speed of the machine is lower than the recommended condition, reduce the feed according to the rate of decreasing the rotation speed.
(6) Do not exceed the recommended rotation speed.

■ Reduction rate for SMAL type

In case of lengthening overhung length, the figures above read 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 / Dc	n (min⁻¹)	Vf mm/min	Note
~4Dc	0%	0%	–
5~6Dc	25% Reduction	30% Reduction	–
7~8Dc	40% Reduction	50% Reduction	In case of tool dia φ22 or more, not recommended

1. Slotting

L / Dc	n (min⁻¹)	Vf (mm/min)	ap
~4Dc	0%	0%	Upto 0.15D
5~6Dc	Not Recommended		
7~8Dc	Not Recommended		

2022-23

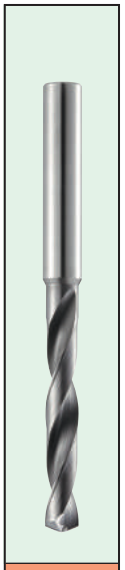
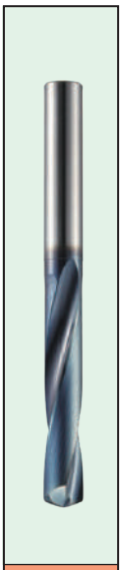
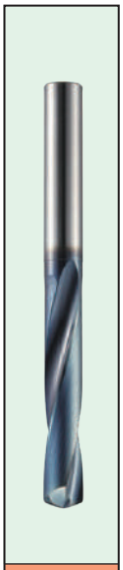
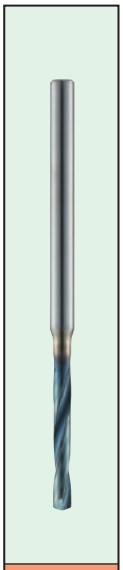
DIJET®

Products Guide Vol.4

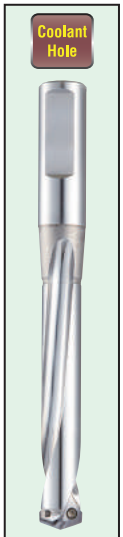
F
01

Drilling tool

List of drilling tools

Tool	Strike drill				EZ hard drill		
Type	Solid				Solid		
							
Page	F06	F08	F10	F12	F20	F24	F25
Cat. No.	EZN2D	EZN4D	EZN3D	EZN5D	EZH	EZH	EZH
Dia.	φ1～φ14	φ3～φ14	φ3～φ14	φ3～φ16	φ2～φ16.1	φ2.02～φ16.02	φ3～φ5
Drilling depth	2×Dc	4×Dc	3×Dc	5×Dc	5×Dc	5×Dc	5×Dc
Coolant hole	External	External	Internal	Internal	External	External	External
Coated	Value coat	Value coat	Value coat	Value coat	DH coat	DH coat	DH coat
Mild steel	◎	◎	◎	◎	○		
Carbon steel Alloy steel	◎	◎	◎	◎	○		
Hardened steel ～50HRC	○	○	○	○	◎	◎	◎
Hardened steel ～70HRC					◎	◎	◎
Heat resistant alloy Titanium alloy	○	○	○	○	○		
Stainless steel			◎	◎	○		
Cast iron	◎	◎	◎	◎	○		
Aluminium alloy	○	○	○	○	○		
Graphite Carbon Ceramics					○		

◎ : First choice, Good condition ○ : Moderate condition

TA-EZ drill					Spot facing drill	EZ hard drill	
Indexable					Solid	Solid	
							
F32	F32	F32	F38	F40	F50	F58	F66
TEZD-MS	TEZD-ML	TEZD-XL	TEZD-MT	TEZD-KMS	TLDM	TLZD	TLZD
φ13.6 ~φ32.1	φ13.6 ~φ32.1	φ13.6 ~φ32.1	φ13.6 ~φ32.1	φ24.5 ~φ26.7	φ1~φ14	φ14~φ32	φ14~φ32
3×Dc	5×Dc	8×Dc	4×Dc	3×Dc	2×Dc	1.5×Dc	0.7~1×Dc
Internal	Internal	Internal	External	Internal	External	Internal	Internal
Value coat	Value coat	Value coat	Value coat	JC7500 coat	DZ coat (TiAlN system)	JC7500 coat	JC7500 coat
◎	◎	◎	◎	◎	◎	◎	◎
◎	◎	◎	◎	◎	◎	◎	◎
○	○	○		○	○	◎ (~40HRC)	◎ (~40HRC)
◎	◎	◎		○	○	◎	◎
◎	◎	◎	◎	○	◎	◎	◎
					◎	○	○
					○		

◎ : First choice, Good condition ○ : Moderate condition

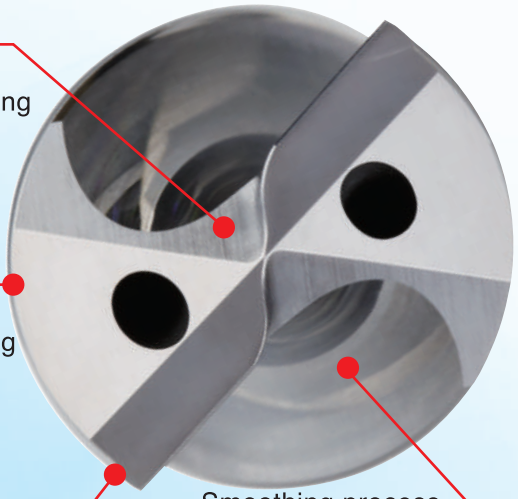
For drilling

Strike drill EZ Series EZN TYPE

STRIKE DRILL make a straight hole in the middle of various materials

New thinning shape
(Patent pending)

Because of low thrust, achieved excellent biting property



DV coating

Adopted micro-grain carbide and DV coating which is good for oxidation resistant

New margin shape

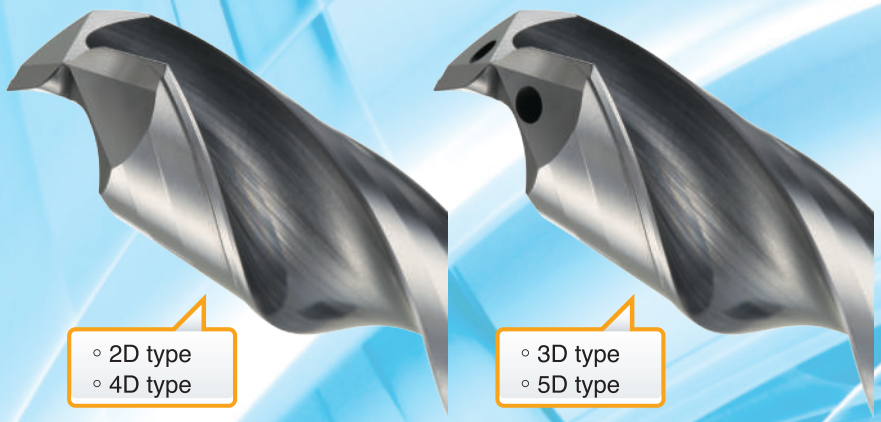
By reducing cutting force and cutting heat, attaining excellent surface roughness

Smoothing process for flute

Good chip discharge performance

■LINE UP

Without coolant hole	With coolant hole
◦ 2D type ◦ 4D type	◦ 3D type ◦ 5D type



* 5D type improved drill rigidity because of adopted double margin

For drilling

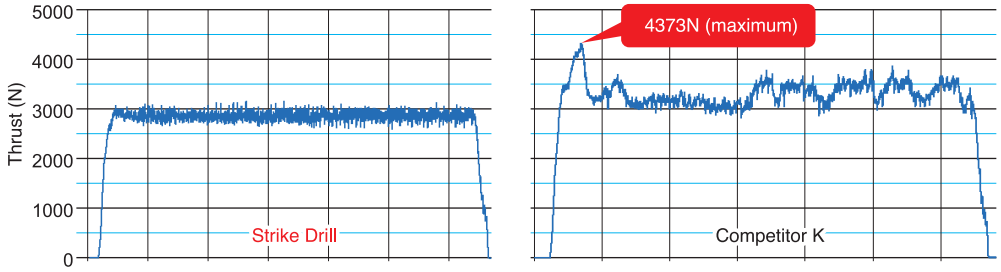
Strike drill EZ Series EZN TYPE

CUTTING PERFORMANCE

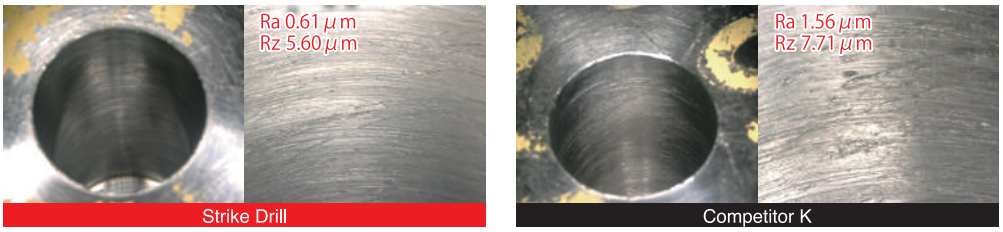
Cutting performance comparison (ϕ10)

- Because of low thrust, it achieved excellent biting property and stable drilling

Material : SUS304, Cat No. : EZN3DCH1000S10, Tool dia. : ϕ10
Cutting conditions : Vc=60m/min, f=0.30mm/rev
Drilling depth : 30mm (Blind hole), Overhung length : 60mm, Wet (Internal)



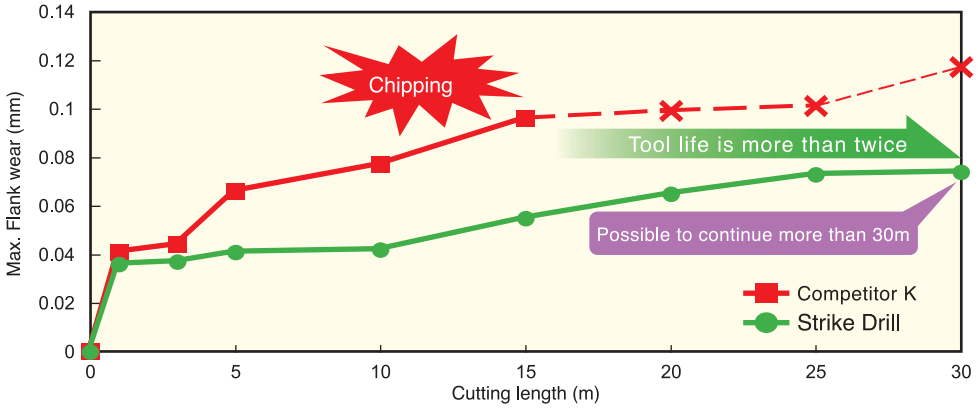
- By reducing cutting force and cutting heat, attaining excellent surface roughness



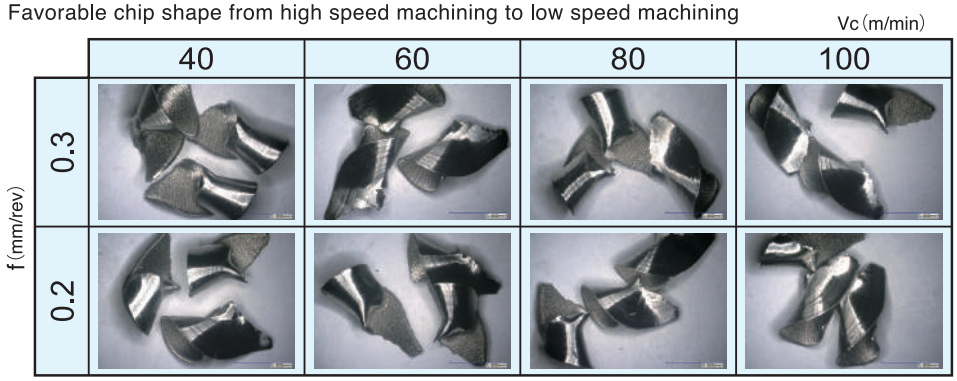
Tool life comparison (Stainless steel) (ϕ10)

- STRIKE DRILL achieved more than 2 times longer tool life compared with competitor K

Material : SUS316L, Cat No. : EZN3DCH1000S10 Tool dia. : ϕ10
Cutting conditions : Vc=60m/min, f=0.28mm/rev, Drilling depth : 22mm
(Through hole), Overhung length : 60mm, Wet (Internal)



- Favorable chip shape from high speed machining to low speed machining



For drilling

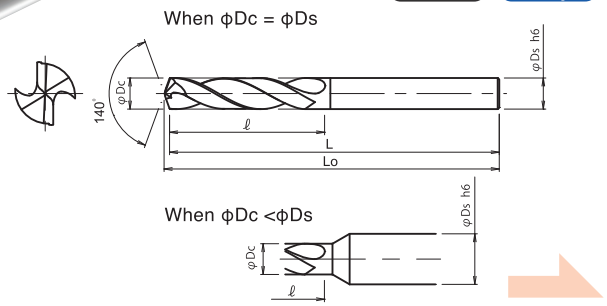
Strike drill (for 2D)

EZ Series **EZN2D** TYPE

- High accuracy solid drill
- Drilling depth 2xDc
- Helix angle : 30°
- Without coolant hole

DV Coated

Drilling



Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN2D0100S03	●	1.0	4	49	49.2	3
EZN2D0110S03	●	1.1	5	49	49.2	3
EZN2D0120S03	●	1.2	5	49	49.2	3
EZN2D0130S03	●	1.3	6	49	49.2	3
EZN2D0140S03	●	1.4	6	49	49.3	3
EZN2D0150S03	●	1.5	6	49	49.3	3
EZN2D0160S03	●	1.6	7	49	49.3	3
EZN2D0170S03	●	1.7	7	49	49.3	3
EZN2D0180S03	●	1.8	8	49	49.3	3
EZN2D0190S03	●	1.9	8	49	49.3	3
EZN2D0200S03	●	2.0	8	49	49.4	3
EZN2D0210S03	●	2.1	9	49	49.4	3
EZN2D0220S03	●	2.2	9	49	49.4	3
EZN2D0230S03	●	2.3	10	49	49.4	3
EZN2D0240S03	●	2.4	10	49	49.4	3
EZN2D0250S03	●	2.5	10	49	49.5	3
EZN2D0260S03	●	2.6	11	49	49.5	3
EZN2D0270S03	●	2.7	11	49	49.5	3
EZN2D0280S03	●	2.8	12	49	49.5	3
EZN2D0290S03	●	2.9	12	49	49.5	3
EZN2D0300S04	●	3.0	13	49	49.5	4
EZN2D0310S04	●	3.1	15	49	49.6	4
EZN2D0320S04	●	3.2	15	49	49.6	4
EZN2D0330S04	●	3.3	15	49	49.6	4
EZN2D0340S04	●	3.4	15	49	49.6	4
EZN2D0350S04	●	3.5	15	49	49.6	4
EZN2D0360S04	●	3.6	17	49	49.7	4
EZN2D0370S04	●	3.7	17	49	49.7	4
EZN2D0380S04	●	3.8	17	49	49.7	4
EZN2D0390S04	●	3.9	17	49	49.7	4
EZN2D0400S04	●	4.0	17	49	49.7	4
EZN2D0410S06	●	4.1	19	64	64.7	6
EZN2D0420S06	●	4.2	19	64	64.8	6

Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN2D0430S06	●	4.3	19	64	64.8	6
EZN2D0440S06	●	4.4	19	64	64.8	6
EZN2D0450S06	●	4.5	19	64	64.8	6
EZN2D0460S06	●	4.6	21	64	64.8	6
EZN2D0470S06	●	4.7	21	64	64.9	6
EZN2D0480S06	●	4.8	21	64	64.9	6
EZN2D0490S06	●	4.9	21	64	64.9	6
EZN2D0500S06	●	5.0	21	64	64.9	6
EZN2D0510S06	●	5.1	23	68	68.9	6
EZN2D0520S06	●	5.2	23	68	68.9	6
EZN2D0530S06	●	5.3	23	68	69.0	6
EZN2D0540S06	●	5.4	23	68	69.0	6
EZN2D0550S06	●	5.5	23	68	69.0	6
EZN2D0560S06	●	5.6	25	68	69.0	6
EZN2D0570S06	●	5.7	25	68	69.0	6
EZN2D0580S06	●	5.8	25	68	69.1	6
EZN2D0590S06	●	5.9	25	68	69.1	6
EZN2D0600S06	●	6.0	25	68	69.1	6
EZN2D0610S08	●	6.1	27	73	74.1	8
EZN2D0620S08	●	6.2	27	73	74.1	8
EZN2D0630S08	●	6.3	27	73	74.1	8
EZN2D0640S08	●	6.4	27	73	74.2	8
EZN2D0650S08	●	6.5	27	73	74.2	8
EZN2D0660S08	●	6.6	28	73	74.2	8
EZN2D0670S08	●	6.7	28	73	74.2	8
EZN2D0680S08	●	6.8	28	73	74.2	8
EZN2D0690S08	●	6.9	28	73	74.3	8
EZN2D0700S08	●	7.0	28	73	74.3	8
EZN2D0710S08	●	7.1	30	73	74.3	8
EZN2D0720S08	●	7.2	30	73	74.3	8
EZN2D0730S08	●	7.3	30	73	74.3	8
EZN2D0740S08	●	7.4	30	73	74.3	8
EZN2D0750S08	●	7.5	30	73	74.4	8

Note) Refer to pages F14 - F15 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

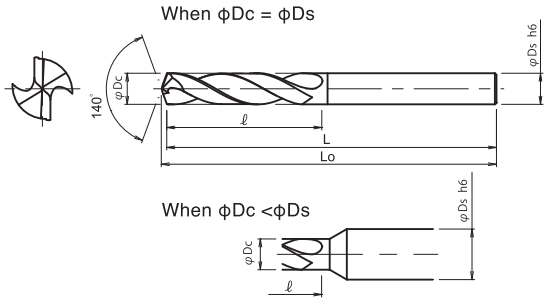
Strike drill (for 2D)

EZ Series

EZN2D TYPE

■ **Tolerance for ϕDc**

Tool dia. ϕDc	Tolerance
Upto 3	0 −0.014
Over 3 upto 6	0 −0.018
Over 6 upto 10	0 −0.022
Over 10 upto 14	0 −0.027



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Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN2D0760S08	●	7.6	32	73	74.4	8
EZN2D0770S08	●	7.7	32	73	74.4	8
EZN2D0780S08	●	7.8	32	73	74.4	8
EZN2D0790S08	●	7.9	32	73	74.4	8
EZN2D0800S08	●	8.0	32	73	74.5	8
EZN2D0810S10	●	8.1	34	78	79.5	10
EZN2D0820S10	●	8.2	34	78	79.5	10
EZN2D0830S10	●	8.3	34	78	79.5	10
EZN2D0840S10	●	8.4	34	78	79.5	10
EZN2D0850S10	●	8.5	34	78	79.5	10
EZN2D0860S10	●	8.6	36	78	79.6	10
EZN2D0870S10	●	8.7	36	78	79.6	10
EZN2D0880S10	●	8.8	36	78	79.6	10
EZN2D0890S10	●	8.9	36	78	79.6	10
EZN2D0900S10	●	9.0	36	78	79.6	10
EZN2D0910S10	●	9.1	38	88	89.7	10
EZN2D0920S10	●	9.2	38	88	89.7	10
EZN2D0930S10	●	9.3	38	88	89.7	10
EZN2D0940S10	●	9.4	38	88	89.7	10
EZN2D0950S10	●	9.5	38	88	89.7	10
EZN2D0960S10	●	9.6	40	88	89.7	10
EZN2D0970S10	●	9.7	40	88	89.8	10
EZN2D0980S10	●	9.8	40	88	89.8	10
EZN2D0990S10	●	9.9	40	88	89.8	10
EZN2D1000S10	●	10.0	40	88	89.8	10
EZN2D1010S12	●	10.1	42	98	99.8	12
EZN2D1020S12	●	10.2	42	98	99.9	12
EZN2D1030S12	●	10.3	42	98	99.9	12
EZN2D1040S12	●	10.4	42	98	99.9	12
EZN2D1050S12	●	10.5	42	98	99.9	12
EZN2D1060S12	●	10.6	44	98	99.9	12
EZN2D1070S12	●	10.7	44	98	99.9	12
EZN2D1080S12	●	10.8	44	98	100.0	12
EZN2D1090S12	●	10.9	44	98	100.0	12
EZN2D1100S12	●	11.0	44	98	100.0	12
EZN2D1150S12	●	11.5	46	98	100.1	12
EZN2D1200S12	●	12.0	48	98	100.2	12
EZN2D1250S14	●	12.5	52	110	112.3	14
EZN2D1300S14	●	13.0	52	110	112.4	14
EZN2D1350S14	●	13.5	56	115	117.5	14
EZN2D1400S14	●	14.0	56	115	117.5	14

Note) Refer to pages F14 - F15 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

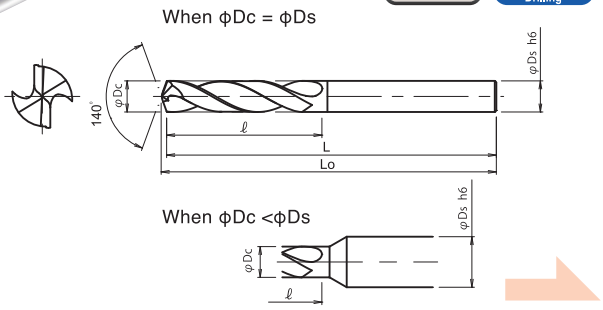
Strike drill (for 4D)

EZ Series **EZN4D** TYPE

- High accuracy solid drill
- Drilling depth 4xDc
- Helix angle : 30°
- Without coolant hole

DV Coated

Drilling



Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN4D0300S04	●	3.0	19	59	59.5	4
EZN4D0310S04	●	3.1	22	59	59.6	4
EZN4D0320S04	●	3.2	22	59	59.6	4
EZN4D0330S04	●	3.3	22	59	59.6	4
EZN4D0340S04	●	3.4	22	59	59.6	4
EZN4D0350S04	●	3.5	22	59	59.6	4
EZN4D0360S04	●	3.6	25	59	59.7	4
EZN4D0370S04	●	3.7	25	59	59.7	4
EZN4D0380S04	●	3.8	25	59	59.7	4
EZN4D0390S04	●	3.9	25	59	59.7	4
EZN4D0400S04	●	4.0	25	59	59.7	4
EZN4D0410S06	●	4.1	28	74	74.7	6
EZN4D0420S06	●	4.2	28	74	74.8	6
EZN4D0430S06	●	4.3	28	74	74.8	6
EZN4D0440S06	●	4.4	28	74	74.8	6
EZN4D0450S06	●	4.5	28	74	74.8	6
EZN4D0460S06	●	4.6	31	74	74.8	6
EZN4D0470S06	●	4.7	31	74	74.9	6
EZN4D0480S06	●	4.8	31	74	74.9	6
EZN4D0490S06	●	4.9	31	74	74.9	6
EZN4D0500S06	●	5.0	31	74	74.9	6
EZN4D0510S06	●	5.1	34	79	79.9	6
EZN4D0520S06	●	5.2	34	79	79.9	6
EZN4D0530S06	●	5.3	34	79	80.0	6
EZN4D0540S06	●	5.4	34	79	80.0	6
EZN4D0550S06	●	5.5	34	79	80.0	6
EZN4D0560S06	●	5.6	37	79	80.0	6
EZN4D0570S06	●	5.7	37	79	80.0	6
EZN4D0580S06	●	5.8	37	79	80.1	6
EZN4D0590S06	●	5.9	37	79	80.1	6
EZN4D0600S06	●	6.0	37	79	80.1	6
EZN4D0610S08	●	6.1	40	88	89.1	8
EZN4D0620S08	●	6.2	40	88	89.1	8

Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN4D0630S08	●	6.3	40	88	89.1	8
EZN4D0640S08	●	6.4	40	88	89.2	8
EZN4D0650S08	●	6.5	40	88	89.2	8
EZN4D0660S08	●	6.6	42	88	89.2	8
EZN4D0670S08	●	6.7	42	88	89.2	8
EZN4D0680S08	●	6.8	42	88	89.2	8
EZN4D0690S08	●	6.9	42	88	89.3	8
EZN4D0700S08	●	7.0	42	88	89.3	8
EZN4D0710S08	●	7.1	45	93	94.3	8
EZN4D0720S08	●	7.2	45	93	94.3	8
EZN4D0730S08	●	7.3	45	93	94.3	8
EZN4D0740S08	●	7.4	45	93	94.3	8
EZN4D0750S08	●	7.5	45	93	94.4	8
EZN4D0760S08	●	7.6	48	93	94.4	8
EZN4D0770S08	●	7.7	48	93	94.4	8
EZN4D0780S08	●	7.8	48	93	94.4	8
EZN4D0790S08	●	7.9	48	93	94.4	8
EZN4D0800S08	●	8.0	48	93	94.5	8
EZN4D0810S10	●	8.1	51	98	99.5	10
EZN4D0820S10	●	8.2	51	98	99.5	10
EZN4D0830S10	●	8.3	51	98	99.5	10
EZN4D0840S10	●	8.4	51	98	99.5	10
EZN4D0850S10	●	8.5	51	98	99.5	10
EZN4D0860S10	●	8.6	54	98	99.6	10
EZN4D0870S10	●	8.7	54	98	99.6	10
EZN4D0880S10	●	8.8	54	98	99.6	10
EZN4D0890S10	●	8.9	54	98	99.6	10
EZN4D0900S10	●	9.0	54	98	99.6	10
EZN4D0910S10	●	9.1	57	108	109.7	10
EZN4D0920S10	●	9.2	57	108	109.7	10
EZN4D0930S10	●	9.3	57	108	109.7	10
EZN4D0940S10	●	9.4	57	108	109.7	10
EZN4D0950S10	●	9.5	57	108	109.7	10

Note) Refer to pages F14 - F15 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

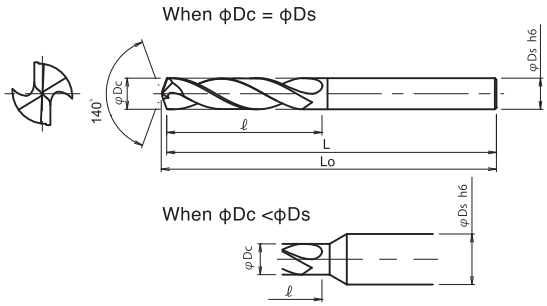
Strike drill (for 4D)

EZ Series

EZN4D TYPE

■ **Tolerance for ϕDc**

Tool dia. ϕDc	Tolerance
Upto 3	0 −0.014
Over 3 upto 6	0 −0.018
Over 6 upto 10	0 −0.022
Over 10 upto 14	0 −0.027



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Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN4D0960S10	●	9.6	60	108	109.7	10
EZN4D0970S10	●	9.7	60	108	109.8	10
EZN4D0980S10	●	9.8	60	108	109.8	10
EZN4D0990S10	●	9.9	60	108	109.8	10
EZN4D1000S10	●	10.0	60	108	109.8	10
EZN4D1010S12	●	10.1	63	118	119.8	12
EZN4D1020S12	●	10.2	63	118	119.9	12
EZN4D1030S12	●	10.3	63	118	119.9	12
EZN4D1040S12	●	10.4	63	118	119.9	12
EZN4D1050S12	●	10.5	63	118	119.9	12
EZN4D1060S12	●	10.6	66	118	119.9	12
EZN4D1070S12	●	10.7	66	118	119.9	12
EZN4D1080S12	●	10.8	66	118	120.0	12
EZN4D1090S12	●	10.9	66	118	120.0	12
EZN4D1100S12	●	11.0	66	118	120.0	12
EZN4D1150S12	●	11.5	69	118	120.1	12
EZN4D1200S12	●	12.0	72	118	120.2	12
EZN4D1250S14	●	12.5	78	137	139.3	14
EZN4D1300S14	●	13.0	78	137	139.4	14
EZN4D1350S14	●	13.5	84	147	149.5	14
EZN4D1400S14	●	14.0	84	147	149.5	14

Note) Refer to pages F14 - F15 for recommended cutting conditions.

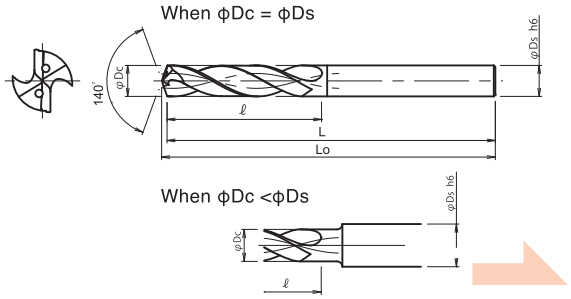
For drilling

Strike drill (for 3D)

EZ Series **EZN3D** TYPE

- High accuracy solid drill
- Drilling depth 3xDc
- Helix angle : 30°
- Through coolant hole

Coolant Hole | DV Coated | Drilling



Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN3DCH0300S03	●	3.0	15	68	68.5	3
EZN3DCH0310S04	●	3.1	18	71	71.6	4
EZN3DCH0320S04	●	3.2	18	71	71.6	4
EZN3DCH0330S04	●	3.3	18	71	71.6	4
EZN3DCH0340S04	●	3.4	18	71	71.6	4
EZN3DCH0350S04	●	3.5	18	71	71.6	4
EZN3DCH0360S04	●	3.6	20	73	73.7	4
EZN3DCH0370S04	●	3.7	20	73	73.7	4
EZN3DCH0380S04	●	3.8	20	73	73.7	4
EZN3DCH0390S04	●	3.9	20	73	73.7	4
EZN3DCH0400S04	●	4.0	20	73	73.7	4
EZN3DCH0410S05	●	4.1	23	78	78.7	5
EZN3DCH0420S05	●	4.2	23	78	78.8	5
EZN3DCH0430S05	●	4.3	23	78	78.8	5
EZN3DCH0440S05	●	4.4	23	78	78.8	5
EZN3DCH0450S05	●	4.5	23	78	78.8	5
EZN3DCH0460S05	●	4.6	25	80	80.8	5
EZN3DCH0470S05	●	4.7	25	80	80.9	5
EZN3DCH0480S05	●	4.8	25	80	80.9	5
EZN3DCH0490S05	●	4.9	25	80	80.9	5
EZN3DCH0500S05	●	5.0	25	80	80.9	5
EZN3DCH0510S06	●	5.1	28	82	82.9	6
EZN3DCH0520S06	●	5.2	28	82	82.9	6
EZN3DCH0530S06	●	5.3	28	82	83.0	6
EZN3DCH0540S06	●	5.4	28	82	83.0	6
EZN3DCH0550S06	●	5.5	28	82	83.0	6
EZN3DCH0560S06	●	5.6	30	82	83.0	6
EZN3DCH0570S06	●	5.7	30	82	83.0	6
EZN3DCH0580S06	●	5.8	30	82	83.1	6
EZN3DCH0590S06	●	5.9	30	82	83.1	6
EZN3DCH0600S06	●	6.0	30	82	83.1	6
EZN3DCH0610S07	●	6.1	33	86	87.1	7
EZN3DCH0620S07	●	6.2	33	86	87.1	7

Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN3DCH0630S07	●	6.3	33	86	87.1	7
EZN3DCH0640S07	●	6.4	33	86	87.2	7
EZN3DCH0650S07	●	6.5	33	86	87.2	7
EZN3DCH0660S07	●	6.6	35	88	89.2	7
EZN3DCH0670S07	●	6.7	35	88	89.2	7
EZN3DCH0680S07	●	6.8	35	88	89.2	7
EZN3DCH0690S07	●	6.9	35	88	89.3	7
EZN3DCH0700S07	●	7.0	35	88	89.3	7
EZN3DCH0710S08	●	7.1	38	92	93.3	8
EZN3DCH0720S08	●	7.2	38	92	93.3	8
EZN3DCH0730S08	●	7.3	38	92	93.3	8
EZN3DCH0740S08	●	7.4	38	92	93.3	8
EZN3DCH0750S08	●	7.5	38	92	93.4	8
EZN3DCH0760S08	●	7.6	40	94	95.4	8
EZN3DCH0770S08	●	7.7	40	94	95.4	8
EZN3DCH0780S08	●	7.8	40	94	95.4	8
EZN3DCH0790S08	●	7.9	40	94	95.4	8
EZN3DCH0800S08	●	8.0	40	94	95.5	8
EZN3DCH0810S09	●	8.1	43	100	101.5	9
EZN3DCH0820S09	●	8.2	43	100	101.5	9
EZN3DCH0830S09	●	8.3	43	100	101.5	9
EZN3DCH0840S09	●	8.4	43	100	101.5	9
EZN3DCH0850S09	●	8.5	43	100	101.5	9
EZN3DCH0860S09	●	8.6	45	100	101.6	9
EZN3DCH0870S09	●	8.7	45	100	101.6	9
EZN3DCH0880S09	●	8.8	45	100	101.6	9
EZN3DCH0890S09	●	8.9	45	100	101.6	9
EZN3DCH0900S09	●	9.0	45	100	101.6	9
EZN3DCH0910S10	●	9.1	48	106	107.7	10
EZN3DCH0920S10	●	9.2	48	106	107.7	10
EZN3DCH0930S10	●	9.3	48	106	107.7	10
EZN3DCH0940S10	●	9.4	48	106	107.7	10
EZN3DCH0950S10	●	9.5	48	106	107.7	10

Note) Refer to pages F16 - F17 for recommended cutting conditions.

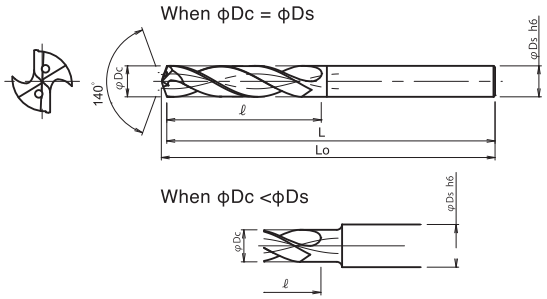
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

Strike drill (for 3D)

EZ Series

EZN3D TYPE



■ **Tolerance for ϕDc**

Tool dia. ϕDc	Tolerance
Upto 3	0 −0.014
Over 3 upto 6	0 −0.018
Over 6 upto 10	0 −0.022
Over 10	0 −0.027

(Continued from the previous page)

Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN3DCH0960S10	●	9.6	50	106	107.7	10
EZN3DCH0970S10	●	9.7	50	106	107.8	10
EZN3DCH0980S10	●	9.8	50	106	107.8	10
EZN3DCH0990S10	●	9.9	50	106	107.8	10
EZN3DCH1000S10	●	10.0	50	106	107.8	10
EZN3DCH1010S11	●	10.1	53	116	117.8	11
EZN3DCH1020S11	●	10.2	53	116	117.9	11
EZN3DCH1030S11	●	10.3	53	116	117.9	11
EZN3DCH1040S11	●	10.4	53	116	117.9	11
EZN3DCH1050S11	●	10.5	53	116	117.9	11
EZN3DCH1060S11	●	10.6	55	116	117.9	11
EZN3DCH1070S11	●	10.7	55	116	117.9	11
EZN3DCH1080S11	●	10.8	55	116	118.0	11
EZN3DCH1090S11	●	10.9	55	116	118.0	11
EZN3DCH1100S11	●	11.0	55	116	118.0	11
EZN3DCH1150S12	●	11.5	58	122	124.1	12
EZN3DCH1200S12	●	12.0	60	122	124.2	12
EZN3DCH1250S13	●	12.5	65	128	130.3	13
EZN3DCH1300S13	●	13.0	65	128	130.4	13
EZN3DCH1350S14	●	13.5	70	134	136.5	14
EZN3DCH1400S14	●	14.0	70	134	136.5	14
EZN3DCH1450S15	●	14.5	75	140	142.6	15
EZN3DCH1500S15	●	15.0	75	140	142.7	15
EZN3DCH1550S16	●	15.5	80	146	148.8	16
EZN3DCH1600S16	●	16.0	80	146	148.9	16

Note) Refer to pages F16 - F17 for recommended cutting conditions.

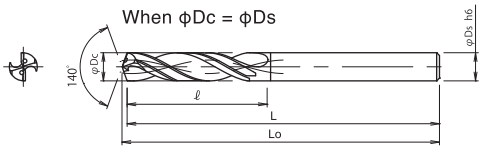
For drilling

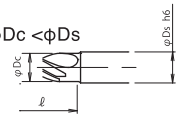
Strike drill (for 5D)

EZ Series **EZN5D** TYPE

- High accuracy solid drill
- Drilling depth 5xDc
- Helix angle : 30°
- Through coolant hole
- Double margin

Coolant Hole | DV Coated | Drilling





Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN5DCH0300S03	◎	3.0	24	77	77.5	3
EZN5DCH0310S04	◎	3.1	28	81	81.6	4
EZN5DCH0320S04	◎	3.2	28	81	81.6	4
EZN5DCH0330S04	◎	3.3	28	81	81.6	4
EZN5DCH0340S04	◎	3.4	28	81	81.6	4
EZN5DCH0350S04	◎	3.5	28	81	81.6	4
EZN5DCH0360S04	◎	3.6	32	85	85.7	4
EZN5DCH0370S04	◎	3.7	32	85	85.7	4
EZN5DCH0380S04	◎	3.8	32	85	85.7	4
EZN5DCH0390S04	◎	3.9	32	85	85.7	4
EZN5DCH0400S04	◎	4.0	32	85	85.7	4
EZN5DCH0410S05	◎	4.1	36	91	91.7	5
EZN5DCH0420S05	◎	4.2	36	91	91.8	5
EZN5DCH0430S05	◎	4.3	36	91	91.8	5
EZN5DCH0440S05	◎	4.4	36	91	91.8	5
EZN5DCH0450S05	◎	4.5	36	91	91.8	5
EZN5DCH0460S05	◎	4.6	40	94	94.8	5
EZN5DCH0470S05	◎	4.7	40	94	94.9	5
EZN5DCH0480S05	◎	4.8	40	94	94.9	5
EZN5DCH0490S05	◎	4.9	40	94	94.9	5
EZN5DCH0500S05	◎	5.0	40	94	94.9	5
EZN5DCH0510S06	◎	5.1	44	96	96.9	6
EZN5DCH0520S06	◎	5.2	44	96	96.9	6
EZN5DCH0530S06	◎	5.3	44	96	97.0	6
EZN5DCH0540S06	◎	5.4	44	96	97.0	6
EZN5DCH0550S06	◎	5.5	44	96	97.0	6
EZN5DCH0560S06	◎	5.6	48	100	101.0	6
EZN5DCH0570S06	◎	5.7	48	100	101.0	6
EZN5DCH0580S06	◎	5.8	48	100	101.1	6
EZN5DCH0590S06	◎	5.9	48	100	101.1	6
EZN5DCH0600S06	◎	6.0	48	100	101.1	6
EZN5DCH0610S07	◎	6.1	52	105	106.1	7
EZN5DCH0620S07	◎	6.2	52	105	106.1	7

Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN5DCH0630S07	◎	6.3	52	105	106.1	7
EZN5DCH0640S07	◎	6.4	52	105	106.2	7
EZN5DCH0650S07	◎	6.5	52	105	106.2	7
EZN5DCH0660S07	◎	6.6	56	109	110.2	7
EZN5DCH0670S07	◎	6.7	56	109	110.2	7
EZN5DCH0680S07	◎	6.8	56	109	110.2	7
EZN5DCH0690S07	◎	6.9	56	109	110.3	7
EZN5DCH0700S07	◎	7.0	56	109	110.3	7
EZN5DCH0710S08	◎	7.1	60	114	115.3	8
EZN5DCH0720S08	◎	7.2	60	114	115.3	8
EZN5DCH0730S08	◎	7.3	60	114	115.3	8
EZN5DCH0740S08	◎	7.4	60	114	115.3	8
EZN5DCH0750S08	◎	7.5	60	114	115.4	8
EZN5DCH0760S08	◎	7.6	64	118	119.4	8
EZN5DCH0770S08	◎	7.7	64	118	119.4	8
EZN5DCH0780S08	◎	7.8	64	118	119.4	8
EZN5DCH0790S08	◎	7.9	64	118	119.4	8
EZN5DCH0800S08	◎	8.0	64	118	119.5	8
EZN5DCH0810S09	◎	8.1	68	127	128.5	9
EZN5DCH0820S09	◎	8.2	68	127	128.5	9
EZN5DCH0830S09	◎	8.3	68	127	128.5	9
EZN5DCH0840S09	◎	8.4	68	127	128.5	9
EZN5DCH0850S09	◎	8.5	68	127	128.5	9
EZN5DCH0860S09	◎	8.6	72	127	128.6	9
EZN5DCH0870S09	◎	8.7	72	127	128.6	9
EZN5DCH0880S09	◎	8.8	72	127	128.6	9
EZN5DCH0890S09	◎	8.9	72	127	128.6	9
EZN5DCH0900S09	◎	9.0	72	127	128.6	9
EZN5DCH0910S10	◎	9.1	76	136	137.7	10
EZN5DCH0920S10	◎	9.2	76	136	137.7	10
EZN5DCH0930S10	◎	9.3	76	136	137.7	10
EZN5DCH0940S10	◎	9.4	76	136	137.7	10
EZN5DCH0950S10	◎	9.5	76	136	137.7	10

Note) Refer to pages F16 - F17 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

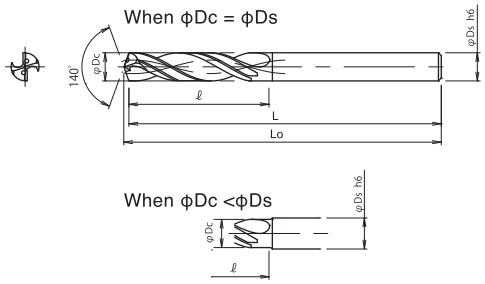
Strike drill (for 5D)

EZ Series

EZN5D TYPE

■ **Tolerance for ϕDc**

Tool dia. ϕDc	Tolerance
Upto 3	0 −0.014
Over 3 upto 6	0 −0.018
Over 6 upto 10	0 −0.022
Over 10 upto 16	0 −0.027



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Cat No.	Stock	Dimensions (mm)				
		φDc	ℓ	L	Lo	φDs
EZN5DCH0960S10	◎	9.6	80	136	137.7	10
EZN5DCH0970S10	◎	9.7	80	136	137.8	10
EZN5DCH0980S10	◎	9.8	80	136	137.8	10
EZN5DCH0990S10	◎	9.9	80	136	137.8	10
EZN5DCH1000S10	◎	10.0	80	136	137.8	10
EZN5DCH1010S11	◎	10.1	84	149	150.8	11
EZN5DCH1020S11	◎	10.2	84	149	150.9	11
EZN5DCH1030S11	◎	10.3	84	149	150.9	11
EZN5DCH1040S11	◎	10.4	84	149	150.9	11
EZN5DCH1050S11	◎	10.5	84	149	150.9	11
EZN5DCH1060S11	◎	10.6	88	149	150.9	11
EZN5DCH1070S11	◎	10.7	88	149	150.9	11
EZN5DCH1080S11	◎	10.8	88	149	151.0	11
EZN5DCH1090S11	◎	10.9	88	149	151.0	11
EZN5DCH1100S11	◎	11.0	88	149	151.0	11
EZN5DCH1150S12	◎	11.5	92	158	160.1	12
EZN5DCH1200S12	◎	12.0	96	158	160.2	12
EZN5DCH1250S13	◎	12.5	104	167	169.3	13
EZN5DCH1300S13	◎	13.0	104	167	169.4	13
EZN5DCH1350S14	◎	13.5	112	176	178.5	14
EZN5DCH1400S14	◎	14.0	112	176	178.5	14
EZN5DCH1450S15	◎	14.5	120	185	187.6	15
EZN5DCH1500S15	◎	15.0	120	185	187.7	15
EZN5DCH1550S16	◎	15.5	128	194	196.8	16
EZN5DCH1600S16	◎	16.0	128	194	196.9	16

Note) Refer to pages F16 - F17 for Recommended cutting conditions.

For drilling

Strike drill (for 2D-4D) EZ Series EZN2D/EZN4D TYPE

RECOMMENDED CUTTING CONDITIONS

Work material	Steel for structure below 180HB		Carbon steel (C50) below 280HB		Alloy steel (1.7223) 280-350HB	
Vc (m/min)	15～45 (φ1～φ1.9) 40～100 (φ2～φ7) 60～120 (φ7.1～φ14)		15～45 (φ1～φ1.9) 40～100 (φ2～φ7) 60～120 (φ7.1～φ14)		15～45 (φ1～φ1.9) 40～80 (φ2～φ14)	
f (mm/rev)	0.02～0.06 (φ1～φ2.9) 0.08～0.18 (φ3～φ5) 0.08～0.22 (φ5.1～φ7) 0.15～0.28 (φ7.1～φ12) 0.20～0.33 (φ12.1～φ14)		0.02～0.06 (φ1～φ2.9) 0.08～0.18 (φ3～φ5) 0.08～0.22 (φ5.1～φ7) 0.15～0.28 (φ7.1～φ12) 0.20～0.33 (φ12.1～φ14)		0.02～0.06 (φ1～φ2.9) 0.08～0.18 (φ3～φ5) 0.08～0.22 (φ5.1～φ7) 0.15～0.28 (φ7.1～φ12) 0.18～0.33 (φ12.1～φ14)	
Drill dia. (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
1	9,550	390	9,550	390	9,550	390
2	8,760	360	8,760	360	8,760	360
3	7,430	970	7,430	970	6,370	830
4	5,580	790	5,580	790	4,780	670
5	4,460	670	4,460	670	3,820	580
6	3,720	620	3,720	620	3,190	530
7	3,530	610	3,530	610	2,730	470
8	3,190	580	3,190	580	2,390	440
9	3,010	560	3,010	560	2,130	400
10	2,710	560	2,710	560	1,910	400
11	2,460	560	2,460	560	1,740	400
12	2,390	540	2,260	510	1,600	360
13	2,330	540	2,210	510	1,470	340
14	2,160	520	2,050	500	1,370	330

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) Above cutting conditions are for drilling flat surface. Please adjust cutting conditions according to machine rigidity, work clamping and shape of machining part
2) Above cutting conditions are for drilling with water soluble (internal coolant)
3) We expect 2D type's depth of hole is less than 2D. 4D type is less than 4D
4) In case of long chips evacuated, adjust above conditions by increasing feed speed or using step feed for breaking chips.
5) When it is difficult to reach the cutting fluid such as using horizontal machining corners, EZN3D and EZN5D type with internal cooling is recommended.
6) When machining austenitic stainless steel, EZN3D and EZN5D types with inernal coolant is recommended. When machining with external lubrication, please be sure to follow the following precautions.
   - When machining with external lubrication, using an oil-based cutting oil is recommended.
   - When machining with φ10 or more, or machining more than 2D with 4D type, step machining back to the top of the hole is recommended

For drilling

Strike drill (for 2D-4D) EZ Series EZN2D/EZN4D TYPE

RECOMMENDED CUTTING CONDITIONS

Work material	Mold steel (P21) (NAK80) Hardness 38-43HRC		Gray cast iron (FC250) Tensile strength 350MPa or less		Nodular cast iron (FCD400) Tensile strength 450MPa or less	
Vc (m/min)	15～45 (φ1～φ1.9) 30～60 (φ2～φ14)		15～45 (φ1～φ1.9) 40～100 (φ2～φ7) 80～120 (φ7.1～φ14)		15～45 (φ1～φ1.9) 40～80 (φ2～φ7) 50～100 (φ7.1～φ14)	
f (mm/rev)	0.02～0.05 (φ1～φ2.9) 0.08～0.18 (φ3～φ5) 0.08～0.22 (φ5.1～φ7) 0.10～0.28 (φ7.1～φ12) 0.13～0.30 (φ12.1～φ14)		0.02～0.06 (φ1～φ2.9) 0.10～0.18 (φ3～φ5) 0.12～0.22 (φ5.1～φ7) 0.15～0.28 (φ7.1～φ12) 0.20～0.33 (φ12.1～φ14)		0.02～0.06 (φ1～φ2.9) 0.10～0.18 (φ3～φ5) 0.12～0.22 (φ5.1～φ7) 0.15～0.28 (φ7.1～φ12) 0.20～0.30 (φ12.1～φ14)	
Drill dia. (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
1	9,550	290	9,550	390	9,550	390
2	7,170	220	8,760	360	8,760	360
3	4,780	630	9,020	1,220	6,370	860
4	3,590	510	6,770	990	4,780	700
5	2,870	440	5,420	850	3,820	600
6	2,390	400	4,510	770	3,190	550
7	2,050	340	3,870	660	2,730	470
8	1,800	300	3,590	650	2,590	470
9	1,600	270	3,540	640	2,300	420
10	1,440	240	3,190	640	2,070	420
11	1,310	220	2,900	630	1,890	410
12	1,200	200	2,660	600	1,860	420
13	1,110	200	2,450	570	1,720	400
14	1,030	190	2,280	550	1,600	390

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) Above cutting conditions are for drilling flat surface. Please adjust cutting conditions according to machine rigidity, work clamping and shape of machining part
2) Above cutting conditions are for drilling with water soluble (internal coolant)
3) We expect 2D type's depth of hole is less than 2D. 4D type is less than 4D
4) In case of long chips evacuated, adjust above conditions by increasing feed speed or using step feed for breaking chips.

For drilling

Strike drill (for 3D-5D) EZ Series EZN3D/EZN5D TYPE

RECOMMENDED CUTTING CONDITIONS

Work material	Steel for structure below 180HB		Carbon steel (C50) below 280HB		Alloy steel (1.7223) 280-350HB		Mold steel (P21) (NAK80) Hardness 38-43HRC	
Vc (m/min)	50~120 (ϕ3~ϕ7) 80~160 (ϕ7.1~ϕ16)		50~120 (ϕ3~ϕ7) 80~140 (ϕ7.1~ϕ16)		40~80 (ϕ3~ϕ7) 50~100 (ϕ7.1~ϕ16)		30~60 (ϕ3~ϕ7) 40~70 (ϕ7.1~ϕ16)	
f (mm/rev)	0.10~0.20 (ϕ3~ϕ5) 0.13~0.25 (ϕ5.1~ϕ7) 0.15~0.32 (ϕ7.1~ϕ12) 0.20~0.35 (ϕ12.1~ϕ16)		0.10~0.20 (ϕ3~ϕ5) 0.13~0.25 (ϕ5.1~ϕ7) 0.15~0.32 (ϕ7.1~ϕ12) 0.20~0.35 (ϕ12.1~ϕ16)		0.10~0.20 (ϕ3~ϕ5) 0.12~0.23 (ϕ5.1~ϕ7) 0.15~0.32 (ϕ7.1~ϕ12) 0.20~0.35 (ϕ12.1~ϕ16)		0.10~0.18 (ϕ3~ϕ5) 0.12~0.23 (ϕ5.1~ϕ7) 0.15~0.28 (ϕ7.1~ϕ12) 0.15~0.30 (ϕ12.1~ϕ16)	
Drill dia. (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)
3	9,020	1,360	9,020	1,360	6,370	960	4,780	670
4	6,770	1,020	6,770	1,020	4,780	720	3,590	530
5	5,420	950	5,420	950	3,820	640	2,870	460
6	4,780	910	4,780	910	3,450	610	2,390	420
7	4,550	870	4,550	870	3,190	600	2,280	400
8	4,380	880	4,380	880	2,990	600	1,990	360
9	3,900	820	3,900	820	2,660	580	1,770	340
10	3,510	780	3,510	780	2,390	550	1,680	340
11	3,190	750	3,190	750	2,180	520	1,520	330
12	3,060	750	3,060	750	1,990	500	1,460	320
13	2,940	740	2,700	680	1,960	500	1,350	310
14	2,730	690	2,510	630	1,820	470	1,260	290
15	2,550	670	2,340	610	1,700	450	1,170	270
16	2,390	660	2,190	610	1,600	450	1,100	250

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) Above cutting conditions are for drilling flat surface. Please adjust cutting conditions according to machine rigidity, work clamping and shape of machining part
2) Above cutting conditions are for drilling with water soluble (internal coolant)
3) We expect 2D type's depth of hole is less than 2D. 4D type is less than 4D
4) In case of long chips evacuated, adjust above conditions by increasing feed speed or using step feed for breaking chips.

For drilling

Strike drill (for 3D-5D) EZ Series EZN3D/EZN5D TYPE

RECOMMENDED CUTTING CONDITIONS

Work material	Stainless steel below 280HB		Gray cast iron (FC250) Tensile strength 350MPa or less		Nodular cast iron (FCD400) Tensile strength 450MPa or less	
Vc (m/min)	40～80 (φ3～φ7) 60～100 (φ7.1～φ16)		70～120 (φ3～φ7) 80～160 (φ7.1～φ16)		40～80 (φ3～φ7) 50～100 (φ7.1～φ16)	
f (mm/rev)	0.10～0.15 (φ3～φ5) 0.12～0.23 (φ5.1～φ7) 0.15～0.28 (φ7.1～φ12) 0.18～0.30 (φ12.1～φ16)		0.12～0.20 (φ3～φ5) 0.15～0.25 (φ5.1～φ7) 0.18～0.32 (φ7.1～φ12) 0.20～0.35 (φ12.1～φ16)		0.10～0.20 (φ3～φ5) 0.12～0.23 (φ5.1～φ7) 0.15～0.30 (φ7.1～φ12) 0.20～0.33 (φ12.1～φ16)	
Drill dia. (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
3	6,370	760	10,080	1,620	6,370	960
4	4,780	720	7,560	1,210	4,780	720
5	3,820	650	6,050	1,090	3,820	640
6	3,190	560	5,040	1,010	3,450	610
7	2,960	550	4,550	1,010	3,190	600
8	2,790	520	4,380	990	2,990	600
9	2,480	490	3,900	900	2,660	540
10	2,230	470	3,510	830	2,390	540
11	2,030	470	3,190	770	2,180	500
12	1,990	460	3,060	770	1,990	470
13	1,960	460	2,940	770	1,960	470
14	1,820	430	2,730	730	1,820	440
15	1,700	410	2,660	720	1,700	450
16	1,600	390	2,590	720	1,600	430

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) Above cutting conditions are for drilling flat surface. Please adjust cutting conditions according to machine rigidity, work clamping and shape of machining part
2) Above cutting conditions are for drilling with water soluble (internal coolant)
3) We expect 2D type's depth of hole is less than 2D. 4D type is less than 4D
4) In case of long chips evacuated, adjust above conditions by increasing feed speed or using step feed for breaking chips.

For drilling

EZ Hard Drill

EZ Series

EZH TYPE

EZ Hard Drill

■ Features

Features 1

New coating layer for high hardness materials (DH1) And high toughness base material enables stable drilling of 70HRC high hardness material

- Improved wear resistance and long life by adopting a hard coating "DH1" coat with significantly improved hardness and oxidation resistance.
- High toughness ultra fine grain carbide is used for the drill material to improve fracture resistance.

Features 2

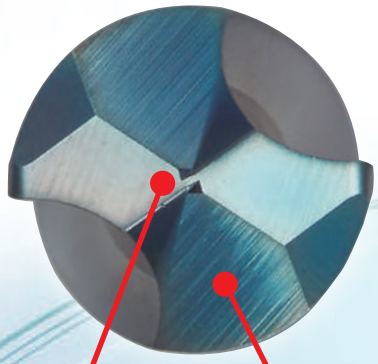
High body rigidity

- The core thickness is 1.6 times or more that of a general carbide drill.

Features 3

Greatly improved fracture resistance

- Adopts a weak twist of 15 °
- A corner R is provided on the outer shoulder to eliminate chipping at the corner.
- Improved chip resistance and chip evacuation in the center due to the thinning shape suitable for high hardness materials.



For drilling

EZ Hard Drill

EZ Series

EZH TYPE

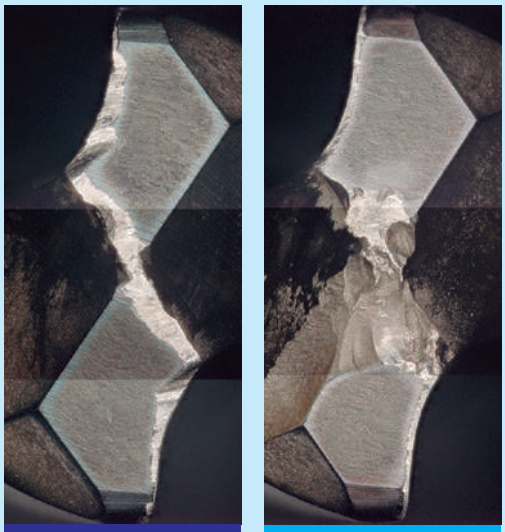
New PVD coating <DH1 coat>

Since it has higher hardness and higher oxidation start temperature than the conventional coating layer, it demonstrates stable cutting performance in high-speed machining of high-hardness materials.

● Characteristics of each PVD coating film

	DH1 coat (hard coat)	DV coat (value coat)	DZ coat (TiAlN)
Vickers hardness (Hv)	3,500～3,700	3,300～3,500	2,800～2,900
Oxidation start temperature (° C)	1,100～1,200	1,000～1,100	700～800
Coefficient of friction	0.5	0.65	0.6

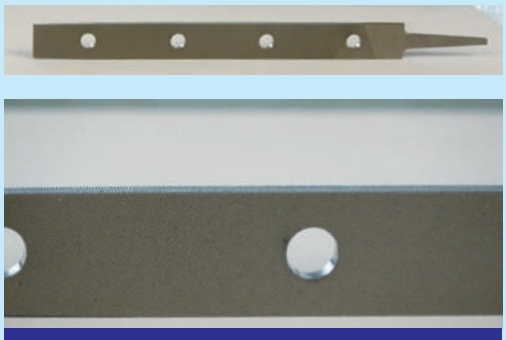
Cutting performance



EZH5D0700S08
After 180 holes

Conventional product
After 110 holes are machined

Work Material : SKD11 (60HRC)
Machine used : Vertical MC
- Tool diameter : ϕ7 (EZH5D0700S08)
- Recommended cutting conditions : n=455min^{-1}, Vc=10m/min, Vf=23mm/min, f=0.05mm/rev
- Drilling depth : 23 mm (penetration)
- Coolant : Water soluble



Can be processed without burrs

Work Material : File (68HRC)
Machine used : Vertical MC
- Tool diameter : ϕ10(EZH5D1000S10)
- Recommended cutting conditions : n=382min^{-1}, Vc=12m/min, f=0.04mm/rev
- Drilling depth : 6 mm (penetration)
- Coolant : External mist

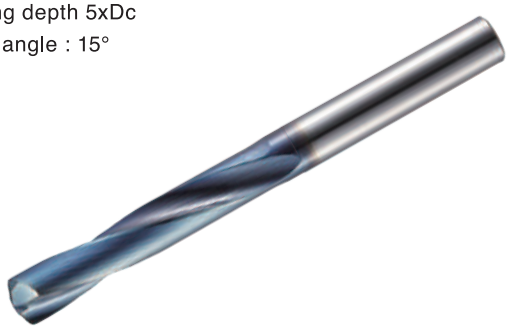
For drilling

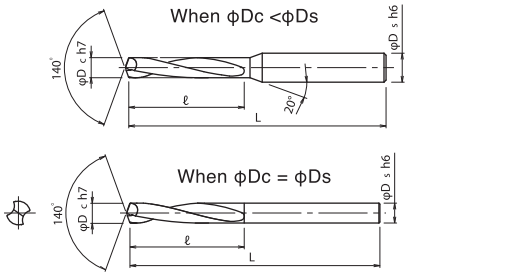
EZ Hard Drill

EZ Series

EZH TYPE

- Solid drill for processing high hardness materials
- Drilling depth 5xDc
- Helix angle : 15°





Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0200S03	●	2	16	55	3
EZH5D0200S03-12	●	2	12	55	3
EZH5D0200S03-21	●	2	21	55	3
EZH5D0205S03	□	2.05	16	55	3
EZH5D0210S03	●	2.1	16	55	3
EZH5D0215S03	□	2.15	16	55	3
EZH5D0220S03	●	2.2	16	55	3
EZH5D0225S03	□	2.25	16	55	3
EZH5D0230S03	●	2.3	16	55	3
EZH5D0235S03	□	2.35	16	55	3
EZH5D0240S03	●	2.4	16	55	3
EZH5D0245S03	□	2.45	16	55	3
EZH5D0250S03	●	2.5	16	55	3
EZH5D0250S03-21	●	2.5	21	55	3
EZH5D0255S03	□	2.55	16	55	3
EZH5D0260S03	●	2.6	16	55	3
EZH5D0265S03	□	2.65	16	55	3
EZH5D0270S03	●	2.7	16	55	3
EZH5D0275S03	□	2.75	16	55	3
EZH5D0280S03	●	2.8	16	55	3
EZH5D0285S03	□	2.85	16	55	3
EZH5D0290S03	●	2.9	16	55	3
EZH5D0295S04	□	2.95	21	59	4
EZH5D0300S04	●	3	21	59	4
EZH5D0305S04	□	3.05	24	59	4
EZH5D0310S04	□	3.1	24	59	4
EZH5D0315S04	□	3.15	24	59	4

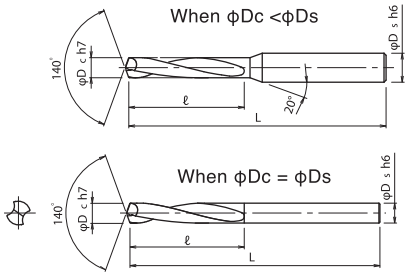
Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0320S04	□	3.2	24	59	4
EZH5D0325S04	□	3.25	24	59	4
EZH5D0330S04	●	3.3	24	59	4
EZH5D0335S04	□	3.35	24	59	4
EZH5D0340S04	●	3.4	24	59	4
EZH5D0345S04	□	3.45	24	59	4
EZH5D0350S04	●	3.5	24	59	4
EZH5D0355S04	□	3.55	27	59	4
EZH5D0360S04	□	3.6	27	59	4
EZH5D0365S04	□	3.65	27	59	4
EZH5D0370S04	□	3.7	27	59	4
EZH5D0375S04	□	3.75	27	59	4
EZH5D0380S04	●	3.8	27	59	4
EZH5D0385S04	□	3.85	27	59	4
EZH5D0390S04	●	3.9	27	59	4
EZH5D0395S04	□	3.95	27	59	4
EZH5D0400S04	●	4	27	59	4
EZH5D0405S06	□	4.05	29	74	6
EZH5D0410S06	□	4.1	29	74	6
EZH5D0415S06	□	4.15	29	74	6
EZH5D0420S06	●	4.2	29	74	6
EZH5D0425S06	□	4.25	29	74	6
EZH5D0430S06	●	4.3	29	74	6
EZH5D0435S06	□	4.35	29	74	6
EZH5D0440S06	●	4.4	29	74	6
EZH5D0445S06	□	4.45	29	74	6
EZH5D0450S06	●	4.5	29	74	6

Note) Refer to pages F27 for recommended cutting conditions.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For drilling

EZ Hard Drill EZ Series EZH TYPE



■ **Tolerance for φDc**

Tool dia. φDc	Tolerance
Upto 3	0 −0.01
Over 3 upto 6	0 −0.012
Over 6 upto 10	0 −0.015
Over 10 upto 18	0 −0.018

(Continued from the previous page)

Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0455S06	□	4.55	32	74	6
EZH5D0460S06	□	4.6	32	74	6
EZH5D0465S06	□	4.65	32	74	6
EZH5D0470S06	□	4.7	32	74	6
EZH5D0475S06	□	4.75	32	74	6
EZH5D0480S06	□	4.8	32	74	6
EZH5D0485S06	□	4.85	32	74	6
EZH5D0490S06	●	4.9	32	74	6
EZH5D0495S06	□	4.95	32	74	6
EZH5D0500S06	●	5	32	74	6
EZH5D0505S06	□	5.05	34	79	6
EZH5D0510S06	●	5.1	34	79	6
EZH5D0515S06	□	5.15	34	79	6
EZH5D0520S06	□	5.2	34	79	6
EZH5D0525S06	□	5.25	34	79	6
EZH5D0530S06	□	5.3	34	79	6
EZH5D0535S06	□	5.35	34	79	6
EZH5D0540S06	□	5.4	34	79	6
EZH5D0545S06	□	5.45	34	79	6
EZH5D0550S06	□	5.5	34	79	6
EZH5D0555S06	□	5.55	36	79	6
EZH5D0560S06	□	5.6	36	79	6
EZH5D0565S06	□	5.65	36	79	6
EZH5D0570S06	□	5.7	36	79	6
EZH5D0575S06	□	5.75	36	79	6
EZH5D0580S06	□	5.8	36	79	6
EZH5D0585S06	□	5.85	36	79	6
EZH5D0590S06	●	5.9	36	79	6
EZH5D0595S06	□	5.95	41	79	6

Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0600S06	●	6	41	79	6
EZH5D0605S08	□	6.05	41	88	8
EZH5D0610S08	□	6.1	41	88	8
EZH5D0615S08	□	6.15	41	88	8
EZH5D0620S08	□	6.2	41	88	8
EZH5D0625S08	□	6.25	41	88	8
EZH5D0630S08	□	6.3	41	88	8
EZH5D0635S08	□	6.35	41	88	8
EZH5D0640S08	□	6.4	41	88	8
EZH5D0645S08	□	6.45	41	88	8
EZH5D0650S08	□	6.5	41	88	8
EZH5D0655S08	□	6.55	43	88	8
EZH5D0660S08	□	6.6	43	88	8
EZH5D0665S08	□	6.65	43	88	8
EZH5D0670S08	□	6.7	43	88	8
EZH5D0675S08	□	6.75	43	88	8
EZH5D0680S08	●	6.8	43	88	8
EZH5D0685S08	□	6.85	43	88	8
EZH5D0690S08	●	6.9	43	88	8
EZH5D0695S08	□	6.95	43	88	8
EZH5D0700S08	●	7	43	88	8
EZH5D0705S08	□	7.05	45	93	8
EZH5D0710S08	□	7.1	45	93	8
EZH5D0715S08	□	7.15	45	93	8
EZH5D0720S08	□	7.2	45	93	8
EZH5D0725S08	□	7.25	45	93	8
EZH5D0730S08	□	7.3	45	93	8
EZH5D0735S08	□	7.35	45	93	8

Note) Refer to pages F27 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

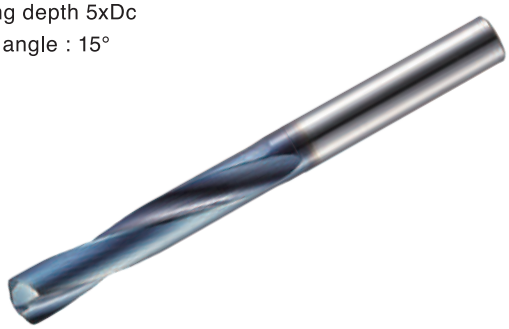
For drilling

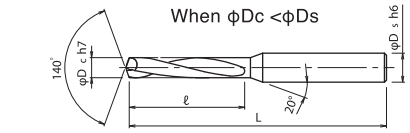
EZ Hard Drill

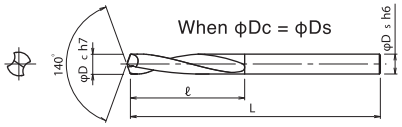
EZ Series

EZH TYPE

- Solid drill for processing high hardness materials
- Drilling depth 5xDc
- Helix angle : 15°







Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0740S08	□	7.4	45	93	8
EZH5D0745S08	□	7.45	45	93	8
EZH5D0750S08	□	7.5	45	93	8
EZH5D0755S08	□	7.55	48	93	8
EZH5D0760S08	□	7.6	48	93	8
EZH5D0765S08	□	7.65	48	93	8
EZH5D0770S08	□	7.7	48	93	8
EZH5D0775S08	□	7.75	48	93	8
EZH5D0780S08	□	7.8	48	93	8
EZH5D0785S08	□	7.85	48	93	8
EZH5D0790S08	●	7.9	48	93	8
EZH5D0795S08	□	7.95	48	93	8
EZH5D0800S08	●	8	48	93	8
EZH5D0805S10	□	8.05	53	98	10
EZH5D0810S10	□	8.1	53	98	10
EZH5D0815S10	□	8.15	53	98	10
EZH5D0820S10	□	8.2	53	98	10
EZH5D0825S10	□	8.25	53	98	10
EZH5D0830S10	□	8.3	53	98	10
EZH5D0835S10	□	8.35	53	98	10
EZH5D0840S10	□	8.4	53	98	10
EZH5D0845S10	□	8.45	53	98	10
EZH5D0850S10	●	8.5	53	98	10
EZH5D0855S10	□	8.55	55	98	10
EZH5D0860S10	●	8.6	55	98	10
EZH5D0865S10	□	8.65	55	98	10
EZH5D0870S10	□	8.7	55	98	10
EZH5D0875S10	□	8.75	55	98	10
EZH5D0880S10	□	8.8	55	98	10

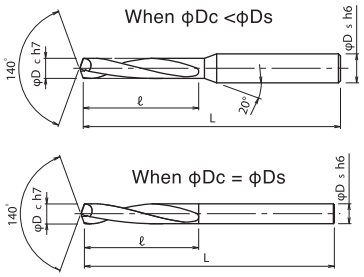
Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0885S10	□	8.85	55	98	10
EZH5D0890S10	□	8.9	55	98	10
EZH5D0895S10	□	8.95	55	98	10
EZH5D0900S10	●	9	55	98	10
EZH5D0905S10	□	9.05	58	108	10
EZH5D0910S10	□	9.1	58	108	10
EZH5D0915S10	□	9.15	58	108	10
EZH5D0920S10	□	9.2	58	108	10
EZH5D0925S10	□	9.25	58	108	10
EZH5D0930S10	□	9.3	58	108	10
EZH5D0935S10	□	9.35	58	108	10
EZH5D0940S10	□	9.4	58	108	10
EZH5D0945S10	□	9.45	58	108	10
EZH5D0950S10	□	9.5	58	108	10
EZH5D0955S10	□	9.55	60	108	10
EZH5D0960S10	□	9.6	60	108	10
EZH5D0965S10	□	9.65	60	108	10
EZH5D0970S10	□	9.7	60	108	10
EZH5D0975S10	□	9.75	60	108	10
EZH5D0980S10	□	9.8	60	108	10
EZH5D0985S10	□	9.85	60	108	10
EZH5D0990S10	●	9.9	60	108	10
EZH5D0995S10	□	9.95	60	108	10
EZH5D1000S10	●	10	60	108	10
EZH5D1005S12	□	10.05	66	117	12
EZH5D1010S12	□	10.1	66	117	12
EZH5D1015S12	□	10.15	66	117	12
EZH5D1020S12	□	10.2	66	117	12

Note) Refer to pages F27 for recommended cutting conditions.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For drilling

EZ Hard Drill EZ Series EZH TYPE



■ **Tolerance for ϕDc**

Tool dia. ϕDc	Tolerance
Upto 3	$^{0}_{-0.01}$
Over 3 upto 6	$^{0}_{-0.012}$
Over 6 upto 10	$^{0}_{-0.015}$
Over 10 upto 18	$^{0}_{-0.018}$

(Continued from the previous page)

Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D1025S12	□	10.25	66	117	12
EZH5D1030S12	●	10.3	66	117	12
EZH5D1035S12	□	10.35	66	117	12
EZH5D1040S12	●	10.4	66	117	12
EZH5D1045S12	□	10.45	66	117	12
EZH5D1050S12	□	10.5	66	117	12
EZH5D1055S12	□	10.55	68	117	12
EZH5D1060S12	□	10.6	68	117	12
EZH5D1065S12	□	10.65	68	117	12
EZH5D1070S12	□	10.7	68	117	12
EZH5D1075S12	□	10.75	68	117	12
EZH5D1080S12	□	10.8	68	117	12
EZH5D1085S12	□	10.85	68	117	12
EZH5D1090S12	□	10.9	68	117	12
EZH5D1095S12	□	10.95	68	117	12
EZH5D1100S12	●	11	68	117	12
EZH5D1105S12	□	11.05	71	117	12
EZH5D1110S12	□	11.1	71	117	12
EZH5D1120S12	□	11.2	71	117	12
EZH5D1130S12	□	11.3	71	117	12
EZH5D1140S12	□	11.4	71	117	12
EZH5D1150S12	□	11.5	71	117	12
EZH5D1160S12	□	11.6	73	117	12
EZH5D1170S12	□	11.7	73	117	12
EZH5D1180S12	□	11.8	73	117	12
EZH5D1190S12	●	11.9	73	117	12
EZH5D1200S12	●	12	73	117	12
EZH5D1205S14	□	12.05	74	130	14

Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D1210S14	□	12.1	74	130	14
EZH5D1220S14	□	12.2	74	130	14
EZH5D1250S14	□	12.5	74	130	14
EZH5D1260S14	□	12.6	74	135	14
EZH5D1270S14	□	12.7	74	135	14
EZH5D1280S14	□	12.8	74	135	14
EZH5D1290S14	□	12.9	74	135	14
EZH5D1300S14	□	13	74	135	14
EZH5D1305S14	□	13.05	78	140	14
EZH5D1310S14	□	13.1	78	140	14
EZH5D1350S14	□	13.5	78	140	14
EZH5D1400S14	□	14	80	140	14
EZH5D1410S15	□	14.1	82	145	15
EZH5D1450S15	□	14.5	82	145	15
EZH5D1460S15	□	14.6	82	150	15
EZH5D1500S15	□	15	85	150	15
EZH5D1510S16	□	15.1	90	155	16
EZH5D1550S16	□	15.5	90	155	16
EZH5D1560S16	□	15.6	95	160	16
EZH5D1580S16	□	15.8	95	160	16
EZH5D1590S16	□	15.9	95	160	16
EZH5D1600S16	□	16	95	160	16
EZH5D1610S16	□	16.1	100	165	16

Note) Refer to pages F27 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

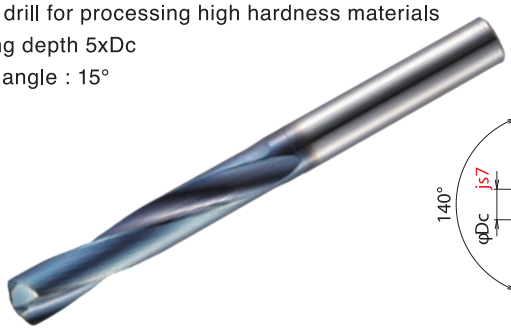
For drilling

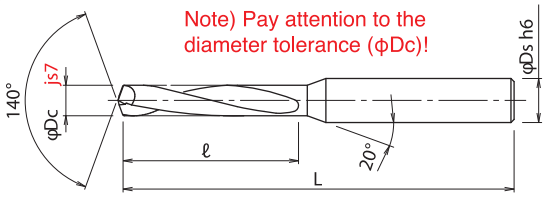
EZ Hard Drill

EZ Series

EZH TYPE

- EZ Hard Drill 0.02 Over Series
- Solid drill for processing high hardness materials
- Drilling depth 5xDc
- Helix angle : 15°





Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0202S03	□	2.02	16	55	3
EZH5D0252S03	□	2.52	16	55	3
EZH5D0302S04	□	3.02	24	59	4
EZH5D0352S04	□	3.52	27	59	4
EZH5D0402S06	□	4.02	29	74	6
EZH5D0452S06	□	4.52	32	74	6
EZH5D0502S06	□	5.02	34	79	6
EZH5D0602S08	□	6.02	41	88	8
EZH5D0702S08	□	7.02	45	93	8
EZH5D0802S10	□	8.02	53	98	10
EZH5D0902S10	□	9.02	58	108	10

Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D1002S12	□	10.02	66	117	12
EZH5D1102S12	□	11.02	71	117	12
EZH5D1202S14	□	12.02	74	130	14
EZH5D1302S14	□	13.02	78	140	14
EZH5D1402S15	□	14.02	82	145	15
EZH5D1502S15	□	15.02	85	155	15
EZH5D1602S16	□	16.02	100	165	16

Note) Refer to pages F27 for recommended cutting conditions.

■ Tolerance for ϕDc

Tool dia. ϕDc	Tolerance
Upto 3	0 −0.005
Over 3 upto 6	0 −0.006
Over 6 upto 10	0 −0.007
Over 10	0 −0.009

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

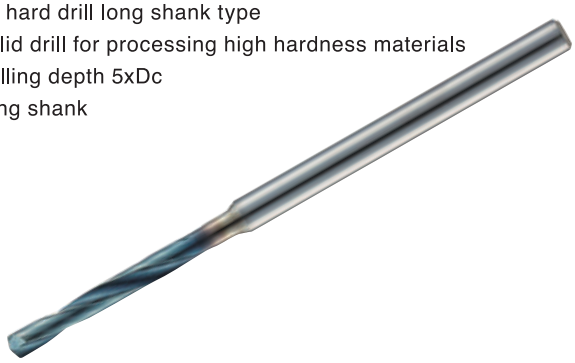
For drilling

EZ Hard Drill

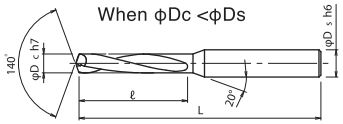
EZ Series

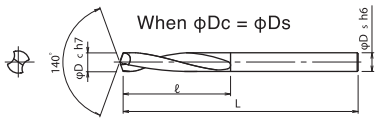
EZH TYPE

- EZ hard drill long shank type
- Solid drill for processing high hardness materials
- Drilling depth 5xDc
- Long shank



70 HRC | DH Coated | Drilling





Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0300S04-LS	●	3	25	69	4
EZH5D0310S04-LS	□	3.1	25	69	4
EZH5D0320S04-LS	□	3.2	25	69	4
EZH5D0330S04-LS	●	3.3	25	79	4
EZH5D0340S04-LS	□	3.4	25	79	4
EZH5D0350S04-LS	□	3.5	25	79	4
EZH5D0360S04-LS	□	3.6	30	79	4
EZH5D0370S04-LS	□	3.7	30	79	4
EZH5D0380S04-LS	●	3.8	30	79	4
EZH5D0390S04-LS	□	3.9	30	79	4
EZH5D0400S04-LS	●	4	30	79	4

Cat No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
EZH5D0410S05-LS	□	4.1	30	85	5
EZH5D0420S05-LS	□	4.2	30	85	5
EZH5D0430S05-LS	□	4.3	30	85	5
EZH5D0440S05-LS	□	4.4	30	85	5
EZH5D0450S05-LS	□	4.5	30	85	5
EZH5D0460S05-LS	□	4.6	35	85	5
EZH5D0470S05-LS	□	4.7	35	85	5
EZH5D0480S05-LS	□	4.8	35	85	5
EZH5D0490S05-LS	□	4.9	35	85	5
EZH5D0500S05-LS	□	5	35	85	5

Note) Refer to pages F27 for recommended cutting conditions.

■ Tolerance for ϕDc

Tool dia. ϕDc	Tolerance
Upto 3	0 −0.01
Over 3 upto 6	0 −0.012
Over 6 upto 10	0 −0.015
Over 10 upto 18	0 −0.018

For drilling

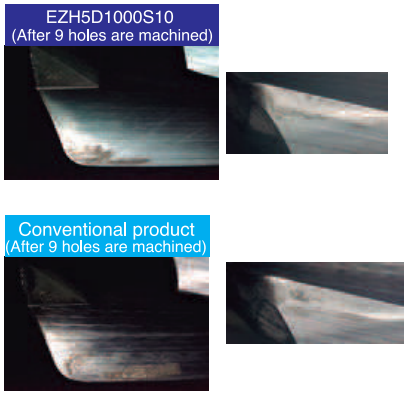
EZ Hard Drill

EZ Series

EZH TYPE

■ CUTTING DATA

1. Drilling of die steel after quenching



Work	Part name	Test piece	
	Material	DC53 (with heat treatment)	
	Hardness	59.5HRC	
Tool	Tool No.	EZH5D1000S10 (ϕ10)	
	Insert No.	DH coat (hard coat)	
Cutting conditions	Cutting speed	n	299 (min^{-1})
		Vc	9.4 (m/min)
	Feed speed	Vf	15 (mm/min)
		f	0.05 (mm/rev)
	Drilling depth	30mm (Stop)	
	Coolant	Water-soluble cutting oil	
	Machine	Vertical MC	

Result

EZH5D1000S10 can be drilled without burrs even after the 9th hole. Stable drilling is possible even if it exceeds the 100th hole.

2. Drilling of high hardness materials

Work	Part name	Test piece	
	Material	Tool steel (SKD11)	
	Hardness	60HRC	
Tool	Tool No.	EZH5D1200S10 (ϕ12)	
	Insert No.	DH coat (hard coat)	
Cutting conditions	Cutting speed	n	345 (min^{-1})
		Vc	13 (m/min)
	Feed speed	Vf	26 (mm/min)
		f	0.075 (mm/rev)
	Drilling depth	40mm (penetration)	
	Coolant	Water-soluble cutting oil	
	Machine	Vertical MCDrilling depth	

Result

By changing from helical machining with a conventional end mill to drilling, the machining time could be shortened by about 2.5 hours. With through holes, 82 holes can be continuously machined, achieving a lifespan four times that of other competitor's equivalent drills.

For drilling

EZ Hard Drill EZ Series EZH TYPE

RECOMMENDED CUTTING CONDITIONS

Work material	Hardened steel (SKD61, DAC, DHA) Hardness 48-56HRC		Hardened steel (SKD11, SLD, DC11) Hardness 57-62HRC		High Speed Tool Steel (SKH, HAP) Hardness 63-70HRC	
Vc (m/min)	15～20 (φ2) 15～25 (φ2.5～φ12) 10～20 (φ13～φ16)		10～15 (φ 2～φ12) 7～13 (φ13～φ16)		5～10 (φ2) 7～12 (φ2.5～φ12) 6～10 (φ13～φ16)	
f (mm/rev)	0.03～0.05 (φ 3～φ 4) 0.04～0.06 (φ 5) 0.06～0.08 (φ 6～φ 7) 0.06～0.09 (φ 8～φ 9) 0.06～0.10 (φ10～φ11) 0.07～0.12 (φ12～φ16)		0.03～0.05 (φ 2～φ 4) 0.04～0.06 (φ 5) 0.05～0.07 (φ 6～φ 7) 0.05～0.08 (φ 8～φ 9) 0.05～0.09 (φ10～φ11) 0.05～0.10 (φ12～φ13) 0.07～0.12 (φ14～φ16)		0.02～0.04 (φ 2～φ 4) 0.03～0.05 (φ 5) 0.04～0.06 (φ 6～φ 9) 0.04～0.07 (φ10～φ11) 0.05～0.08 (φ12～φ13) 0.06～0.09 (φ14～φ16)	
Drill dia. (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
2	2,860	115	2,070	86	1,270	38
2.5	2,550	102	1,660	66	1,270	38
3	2,100	84	1,380	55	1,060	31
4	1,590	63	1,035	41	795	23
5	1,270	62	830	41	635	25
6	1,060	74	690	41	530	26
7	910	63	590	35	455	22
8	795	60	520	34	400	20
9	710	54	460	30	355	18
10	640	51	415	29	320	17
11	580	46	375	26	290	16
12	530	47	345	26	265	16
13	370	33	250	20	200	13
14	330	30	220	20	180	13
15	320	30	210	20	170	13
16	320	30	200	19	160	12

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) Please use a water-soluble cutting fluid.
2) It is not suitable for high-speed machining of raw materials of general steel and may cause chip clogging. It is recommended to use a strike drill (EZN type) for processing raw materials.
3) Please use in an environment where the precision, rigidity, touring accuracy, work setting accuracy and rigidity of the processing machine are sufficient. To bring out the performance of this drill
4) The above cutting conditions assume a drilling depth of 3Dc. If the drilling depth exceeds 3Dc, perform step feed.
5) Sudden torque at the time of pulling out may lead to breakage, so take preventive measures such as receiving metal to prevent penetration processing.
6) The above cutting conditions are for the EZH type. For the long shank type (EZH5D-LS type), use it on the low condition side of the above conditions.

For drilling

TA-EZ Drill

EZ Series

TEZD TYPE

Easy assembly and high cutting performances

Coolant Hole | DV Coated | JC7500 Coated | Drilling

EZ cutting edge geometry reduce power consumption by 30%.

High rigid body achieves longer tool life of holder and insert.

Unique cooling system achieve surely coolant supply to cutting edge.

■ Lineup

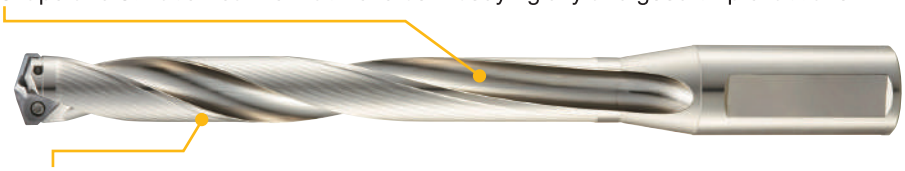
Body (holder)	Effective processing depth	Applicable diameter
TEZD-MS type	3×Dc	φ13.6～φ32.1
TEZD-ML type	5×Dc	
TEZD-XL type	8×Dc	
TEZD-MT type (MT shank)	4×Dc	
TEZD-KMS type (For bridges)	3×Dc	φ24.5, φ24.7 φ26.5, φ26.7

For drilling

TA-EZ Drill EZ Series TEZD TYPE

● TEZD-XL type (8D type)

◦ The optimized flute shape and surface treatment achieve both body rigidity and good chip evacuation.



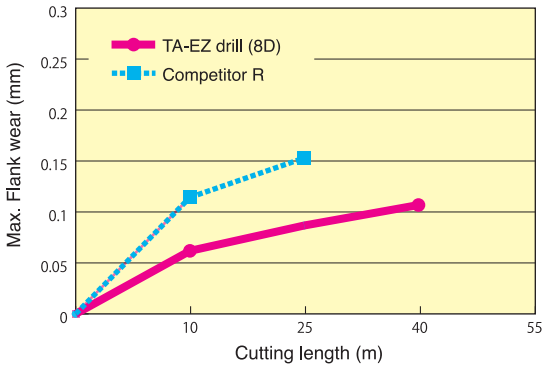
◦ By taking a second step (relief of the outer peripheral part), welding of chips to the outer peripheral part of the drill is suppressed. Achieves a longer life of the main body by reducing drilling resistance.

■ Cutting Data

Life comparison <①S25C>

- Tools used:
- TEZD1900S25-XL,
Insert: TEZ1900 (ϕ19mm)
- Made by R: ϕ19 mm
- Work material: S25C
- Machine: Vertical MC (BT50)
- Cutting oil: Water-soluble cutting oil (internal refueling)
- Cutting conditions:
n = 1,000min-1, Vf = 350mm / min,
Vc = 60m / min, f = 0.35mm / rev, H = 130mm (through hole)

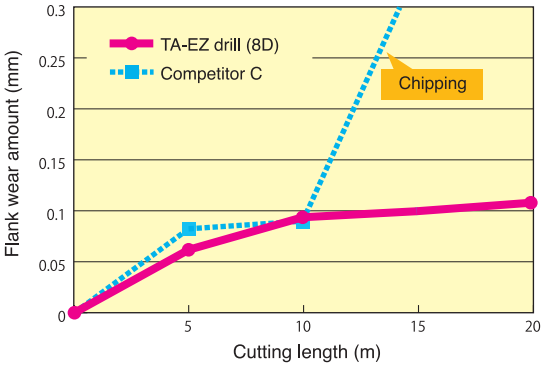
* Before this machining, use the 3D main body (TEZD1900S25-MS) to a depth of 9.5 mm. (0.5 x Dc) guide hole has been machined (under the same conditions and using the same insert).



Life comparison <②SUS304>

- Tools used
- TEZD1900S25-XL,
Insert: TEZ1930 (ϕ19.3mm)
- Made by C company: ϕ19 mm
- Work material: SUS304
- Machine: Vertical MC (BT50)
- Cutting oil: Water-soluble cutting oil (internal refueling)
- Cutting conditions:
n = 660min-1, Vf = 165mm / min,
Vc = 40m / min, f = 0.25mm / rev, H = 150mm (through hole)

* Before this machining, use the 3D main body (TEZD1900S25-MS) to a depth of 9.5 mm. (0.5 x Dc) guide hole has been machined (under the same conditions and using the same insert).



● **Machined hole**

TA-EZ drill

Rifle mark none

Competitor C

Rifle mark

For drilling

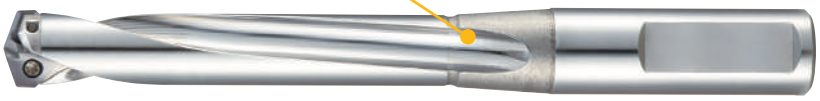
TA-EZ Drill

EZ Series

TEZD TYPE

● TEZD-ML type (5D type)

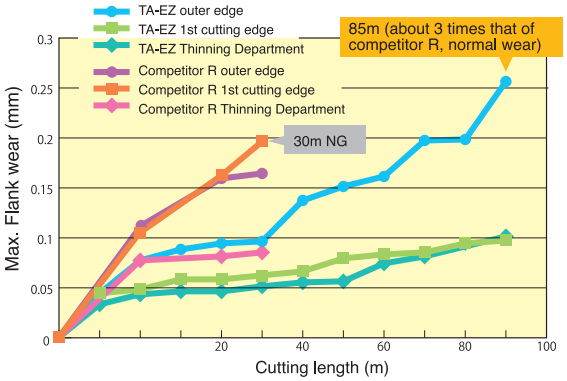
Optimized flute shape and surface treatment realize highly efficient drilling.



■ Cutting Data

Life comparison <①S25C>

- Tools used:
・TEZD1900S25-ML,
Insert: TEZ1930 (ϕ19.3mm)
・Made by R: ϕ19 mm
- Work material: S25C
- Machine: Vertical MC (BT50)
- Cutting oil: Water-soluble cutting oil (internal refueling)
- Cutting conditions:
Vc = 75m / min, f = 0.35mm / rev, H = 95mm (through hole)

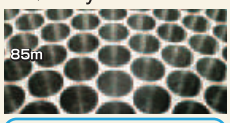


TA-EZD type

- Shape of chips

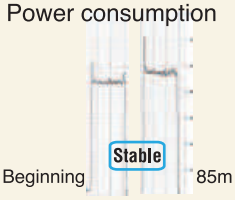
Compelely breaking chips

- Quality of holes

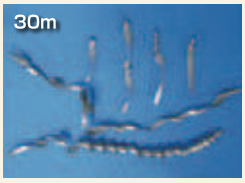


Good surface finish

- Power consumption



Competitor R

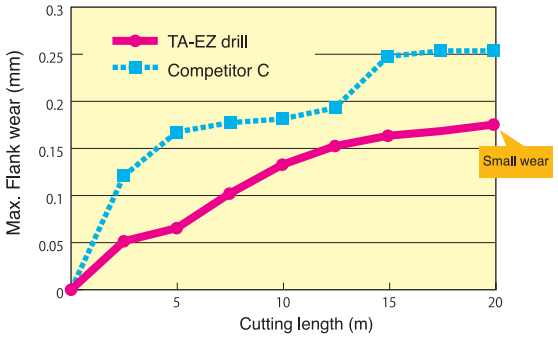


- Shape of chips

Uncontrolled long chips came out at machining 25m and impossible to continue at machining 30m because chips tangle in holder.

Life comparison <②SUS304>

- Tools used:
・TEZD1900S25-ML,
Insert: TEZ1930 (ϕ19.3mm)
・Made by competitor C: ϕ19 mm
- Work material: SUS304
- Machine: Vertical MC (BT50)
- Cutting oil: Water-soluble cutting oil (internal refueling)
- Cutting conditions:
・TA-EZ drill / Vc = 50m / min, f = 0.25mm / rev,
n = 826min-1, Vf = 207mm / min
・Made by competitor C (recommended) / Vc = 60m / min,
f = 0.20mm / rev, n = 1,005min-1, Vf = 201mm / min



For drilling

TA-EZ Drill EZ Series TEZD TYPE

● TEZD-MT type (4D type / MT shank)

Suitable for drilling holes with long out sticks, and for drilling large mold products such as tap holes and pilot holes for knock holes. Improved drilling efficiency.

◦ The insert exchange type allows the tools to be exchanged on the machine, providing excellent workability.
◦ Because of the MT shank, the out stick length can be easily changed by the extension.

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 of insert (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

Please change clamp screw after use of 10 inserts on drill bodies

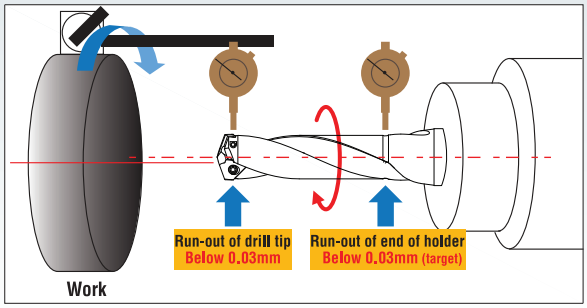
Clamp screw

Instructions for using at NC lathe

1. Adjust run-out of drill tip below 0.03mm (off set of center below 0.015mm) and run-out of end of holder below 0.03mm (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. (Page E024). In case of long chips come out, recommend to increase feed rate only.



For drilling

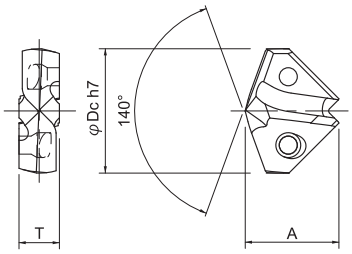
TA-EZ Drill

EZ Series

TEZD-MS / TEZD-ML TEZD-XL TYPE

- With coolant hole
- Effective machining depth: 3 × Dc / 5 × Dc / 8 × Dc

* Insert can be reground
(At the time of normal wear)



- MS type (3D) / ML type (5D)

- XL type (8D)

■Insert　　■Body

Drill dia. (mm)	Insert				Body									
	Insert No.	PVD Coated	Dimensions (mm)		Applicable dia.		MS type 3D							
φDc		JC8050	A	T	Over	Under	Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs
13.6	TEZ1360	●	11.4	4.5	13.5	14.5	TEZD1400S16-MS	●	51	65	48	113	16
13.8	TEZ1380	●											
14	TEZ1400	●											
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	●											

Inserts are included in one case.

●: Standard stock items　□: Stock in Japan　◎: Soon to be stocked　○: Soon to be deleted　※: Production after order received

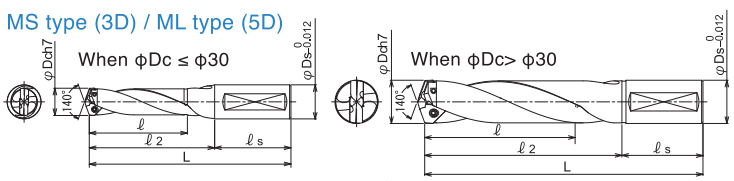
For drilling

TA-EZ Drill

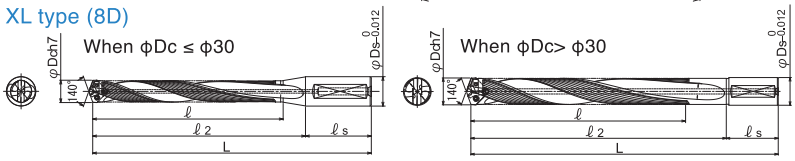
EZ Series

TEZD-MS / TEZD-ML TEZD-XL TYPE

MS type (3D) / ML type (5D)



XL type (8D)



Coolant Hole

DV Coated

Drilling

Clamp screw	Recommended torque (N·m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

■Body ■Body ■Parts

Body ML type (5D)							Body XL type (8D)							Parts	
Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs	Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs	Clamp screw	Wrench (Not included)
TEZD1400S16-ML	●	80	97	48	145	16	TEZD1400S16-XL	●	119	133	48	181	16	DSW-2045H	A-07
TEZD1500S20-ML	●	85	103	50	153	20	TEZD1500S20-XL	●	128	143	50	193	20	DSW-2045H	A-07
TEZD1600S20-ML	●	91	110	50	160	20	TEZD1600S20-XL	●	136	152	50	202	20	TSW-2556H	A-08
TEZD1700S20-ML	●	96	117	50	167	20	TEZD1700S20-XL	●	145	162	50	212	20	TSW-2556H	A-08
TEZD1800S20-ML	●	102	123	50	173	20	TEZD1800S20-XL	●	153	171	50	221	20	TSW-2556H	A-08

Note) 1. The insert is not installed in the holder. 2. Refer to pages F43 - F45 for recommended cutting conditions. 3. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

TA-EZ Drill

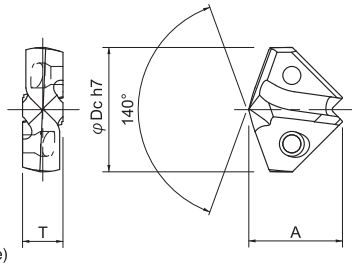
EZ Series

TEZD-MS / TEZD-ML TEZD-XL TYPE

- With coolant hole
- Effective machining depth: 3 × Dc / 5 × Dc / 8 × Dc

* Insert can be reground
(At the time of normal wear)

(Continued from the previous page)



- MS type (3D) / ML type (5D)

- XL type (8D)

■Insert ■Body

Drill dia. (mm) φDc	Insert No.	PVD Coated JC8050	Dimensions (mm) A	T	Applicable dia. Over	Under	Body: MS type 3D Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs
18.2	TEZ1820	●	13.5	5.8	17.5	18.5	TEZD1800S20-MS	●	65	83	50	133	20
18.3	TEZ1830	●											
18.4	TEZ1840	●											
18.5	TEZ1850	●											
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	●											
19.4	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	●											
20.1	TEZ2010	●											
20.5	TEZ2050	●											
20.6	TEZ2060	●	15.7	6.7	20.5	21.5	TEZD2100S25-MS	●	75	96	56	152	25
21	TEZ2100	●											
21.1	TEZ2110	●											
21.2	TEZ2120	●											
21.5	TEZ2150	●											
21.6	TEZ2160	●	16.6	7.5	21.5	22.5	TEZD2200S25-MS	●	79	101	56	157	25
21.9	TEZ2190	●											
22	TEZ2200	●											
22.1	TEZ2210	●											
22.3	TEZ2230	●											
22.5	TEZ2250	●											
22.6	TEZ2260	●	17.4	7.5	22.5	23.5	TEZD2300S25-MS	●	82	105	56	161	25
22.7	TEZ2270	●											
23	TEZ2300	●											
23.1	TEZ2310	●											
23.5	TEZ2350	●											
23.6	TEZ2360	●	18.2	8.0	23.5	24.5	TEZD2400S32-MS	●	86	110	60	170	32
24	TEZ2400	●											
24.1	TEZ2410	●											
24.2	TEZ2420	●											
24.5	TEZ2450	●											
25	TEZ2500	●	19.1	8.0	24.5	25.5	TEZD2500S32-MS	●	89	114	60	174	32
25.1	TEZ2510	●											

Inserts are included in one case.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

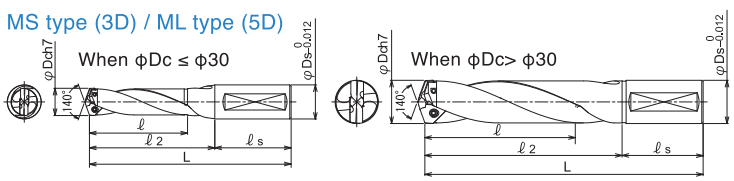
For drilling

TA-EZ Drill

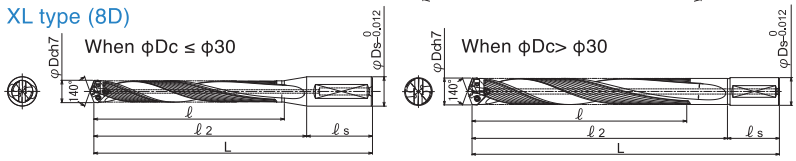
EZ Series

TEZD-MS / TEZD-ML TEZD-XL TYPE

MS type (3D) / ML type (5D)



XL type (8D)



Coolant Hole

DV Coated

Drilling

Clamp screw	Recommended torque (N·m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

■Body

■Body

■Parts

Body							Body							Parts	
ML type (5D)							XL type (8D)							Clamp screw	Wrench (Not included)
Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs	Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs		
TEZD1800S20-ML	●	102	123	50	173	20	TEZD1800S20-XL	●	153	171	50	221	20	TSW-2556H	A-08
TEZD1900S25-ML	●	107	130	56	186	25	TEZD1900S25-XL	●	162	181	56	237	25	TSW-2567H	A-08
TEZD2000S25-ML	●	113	137	56	193	25	TEZD2000S25-XL	●	170	190	56	246	25	TSW-2567H	A-08
TEZD2100S25-ML	●	118	143	56	199	25	TEZD2100S25-XL	●	179	200	56	256	25	TSW-2567H	A-08
TEZD2200S25-ML	●	124	150	56	206	25	TEZD2200S25-XL	●	187	209	56	265	25	DSW-307H	A-10
TEZD2300S25-ML	●	129	157	56	213	25	TEZD2300S25-XL	●	196	219	56	275	25	DSW-307H	A-10
TEZD2400S32-ML	●	135	164	60	224	32	TEZD2400S32-XL	●	204	228	60	288	32	DSW-307H	A-10
TEZD2500S32-ML	●	140	170	60	230	32	TEZD2500S32-XL	●	213	238	60	298	32	DSW-309H	A-10

Note) 1. The insert is not installed in the holder. 2. Refer to pages F43 - F45 for recommended cutting conditions. 3. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

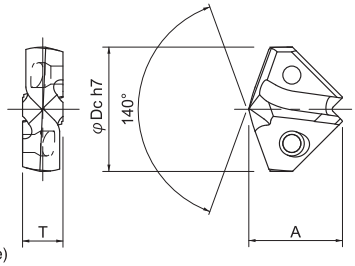
TA-EZ Drill

EZ Series

TEZD-MS / TEZD-ML TEZD-XL TYPE

- With coolant hole
- Effective machining depth: 3 × Dc / 5 × Dc / 8 × Dc

* Insert can be reground
(At the time of normal wear)



- MS type (3D) / ML type (5D)

- XL type (8D)

(Continued from the previous page)

■Insert ■Body

Drill dia. (mm) φDc	Insert No.	PVD Coated JC8050	Dimensions (mm) A	T	Applicable dia. Over	Under	Tool no.	Stock	MS type 3D Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs
25.5	TEZ2550	●	19.1	8.0	24.5	25.5	TEZD2500S32-MS	●	89	114	60	174	32
25.6	TEZ2560	●	19.7	8.5	25.5	26.5	TEZD2600S32-MS	●	93	119	60	179	32
25.7	TEZ2570	●											
26	TEZ2600	●											
26.1	TEZ2610	●											
26.5	TEZ2650	●											
26.6	TEZ2660	●	20.4	8.5	26.5	27.5	TEZD2700S32-MS	●	96	123	60	183	32
26.7	TEZ2670	●											
27	TEZ2700	●											
27.1	TEZ2710	●											
27.4	TEZ2740	●											
27.5	TEZ2750	●											
28	TEZ2800	●	21.2	9.0	27.5	28.5	TEZD2800S32-MS	●	100	128	60	188	32
28.1	TEZ2810	●											
28.5	TEZ2850	●											
28.6	TEZ2860	●	22.1	9.0	28.5	29.5	TEZD2900S32-MS	●	103	132	60	192	32
28.7	TEZ2870	●											
29	TEZ2900	●											
29.1	TEZ2910	●											
29.5	TEZ2950	●											
30	TEZ3000	●	22.5	9.5	29.5	30.5	TEZD3000S32-MS	●	107	137	60	197	32
30.1	TEZ3010	●											
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
32.1	TEZ3210	●											

Inserts are included in one case.

About drilling of exotic materials by indexable drills

We have already developed the new grades and geometry for drilling the exotic materials by indexable drills, we are under process of building up the stocks of the same in Osaka, Japan.
Very soon it will be available for sale from ϕ13.5 to ϕ32.5

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

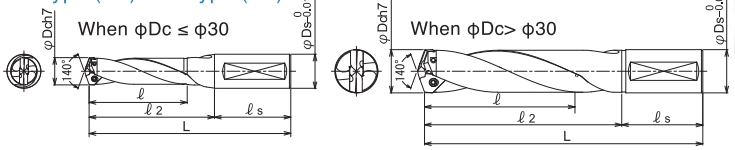
For drilling

TA-EZ Drill

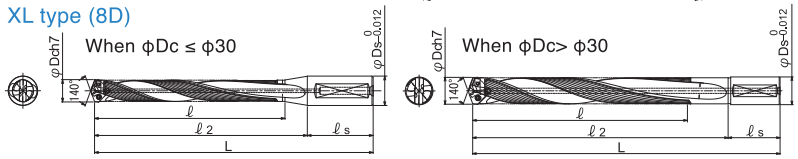
EZ Series

TEZD-MS / TEZD-ML TEZD-XL TYPE

MS type (3D) / ML type (5D)



XL type (8D)



Coolant Hole

DV Coated

Drilling

Clamp screw	Recommended torque (N·m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

■Body ■Body ■Parts

Body ML type (5D)							Body XL type (8D)							Parts	
Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs	Tool no.	Stock	Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs	Clamp screw	Wrench (Not included)
TEZD2500S32-ML	●	140	170	60	230	32	TEZD2500S32-XL	●	213	238	60	298	32	DSW-309H	A-10
TEZD2600S32-ML	●	146	177	60	237	32	TEZD2600S32-XL	●	221	247	60	307	32	DSW-309H	A-10
TEZD2700S32-ML	●	151	184	60	244	32	TEZD2700S32-XL	●	230	257	60	317	32	DSW-309H	A-10
TEZD2800S32-ML	●	157	190	60	250	32	TEZD2800S32-XL	●	238	266	60	326	32	TSW-3510H	A-15
TEZD2900S32-ML	●	162	197	60	257	32	TEZD2900S32-XL	●	247	276	60	336	32	TSW-3510H	A-15
TEZD3000S32-ML	●	168	204	60	264	32	TEZD3000S32-XL	●	255	285	60	345	32	TSW-3510H	A-15
TEZD3100S32-ML	●	173	210	60	270	32	TEZD3100S32-XL	●	248	295	60	355	32	TSW-3512H	A-15
TEZD3200S32-ML	●	179	217	60	277	32	TEZD3200S32-XL	●	256	304	60	364	32	TSW-3512H	A-15

Note) 1. The insert is not installed in the holder. 2. Refer to pages F43 - F45 for recommended cutting conditions. 3. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

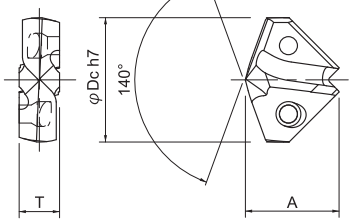
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

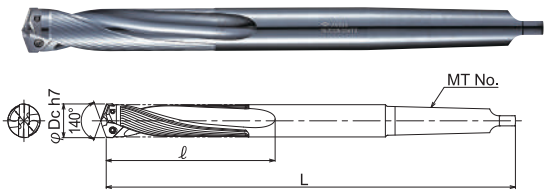
For drilling

TA-EZ Drill (MT shank) EZ Series TEZD-MT TYPE

● Effective machining depth: 4 × Dc

* Insert can be reground
(At the time of normal wear)





Clamp screw	Recommended torque (N·m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

■Insert ■Body ■Parts

Drill dia. (mm) φDc	Insert No.	Insert PVD Coated JC8050	Insert Dimensions (mm) A	Insert Dimensions (mm) T	Body Applicable dia. Over	Body Applicable dia. Under	Body MT type 4D Tool no.	Body MT type 4D Stock	Body MT type 4D Dimensions (mm) ℓ	Body MT type 4D Dimensions (mm) L	Body MT type 4D Dimensions (mm) MT	Parts Clamp screw	Parts Wrench (Not included)
13.6	TEZ1360	●	11.4	4.5	13.5	14.5	TEZD1400MT1	●	71	205	MT1	DSW-2045H	A-07
13.8	TEZ1380	●											
14	TEZ1400	●											
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	TEZD1500MT2	●	76	228	MT2	DSW-2045H	A-07
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	●											
16.6	TEZ1660	●	13.2	5.5	16.5	17.5	TEZD1700MT2	●	86	240	MT2	TSW-2556H	A-08
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	TEZD1800MT2	●	91	240	MT2	TSW-2556H	A-08
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	●											

Inserts are included in one case.

Note) 1. The insert is not installed in the holder. 2. Refer to pages F43 - F45 for recommended cutting conditions. 3. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

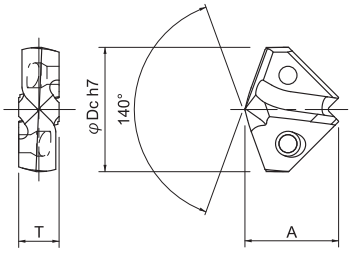
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

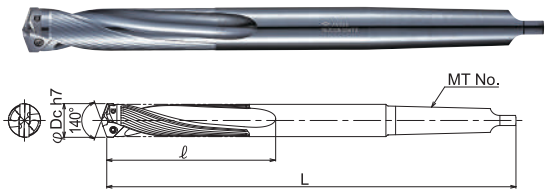
For drilling

TA-EZ Drill (MT shank) EZ Series TEZD-MT TYPE

● Effective machining depth: 4 × Dc

* Insert can be reground
(At the time of normal wear)





Clamp screw	Recommended torque (N•m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

■Insert ■Body ■Parts

Drill dia. (mm)	Insert		Dimensions (mm)		Body						Parts	
					Applicable dia.		MT type 4D				Clamp screw	Wrench (Not included)
							Tool no.	Stock	Dimensions (mm)			
φDc	Insert No.	PVD Coated JC8050	A	T					ℓ	L	MT		
20.6	TEZ2060	●	15.7	6.7	20.5	21.5	TEZD2100MT2	●	105	255	MT2	TSW-2567H	A-08
21	TEZ2100	●											
21.1	TEZ2110	●											
21.2	TEZ2120	●											
21.5	TEZ2150	●											
21.6	TEZ2160	●	16.6	7.5	21.5	22.5	TEZD2200MT2	●	111	260	MT2	DSW-307H	A-10
21.9	TEZ2190	●											
22	TEZ2200	●											
22.1	TEZ2210	●											
22.3	TEZ2230	●											
22.5	TEZ2250	●											
25	TEZ2500	●	19.1	8.0	24.5	25.5	TEZD2500MT3	●	124	285	MT3	DSW-309H	A-10
25.1	TEZ2510	●											
25.5	TEZ2550	●											
25.6	TEZ2560	●	19.7	8.5	25.5	26.5	TEZD2600MT3	●	130	290	MT3	DSW-309H	A-10
25.7	TEZ2570	●											
26	TEZ2600	●											
26.1	TEZ2610	●											
26.5	TEZ2650	●											
31	TEZ3100	●	23.4	10.0	30.5	31.5	TEZD3100MT3	●	157	310	MT3	TSW-3512H	A-15
31.5	TEZ3150	●											
32	TEZ3200	●	24.3	10.0	31.5	32.5	TEZD3200MT3	●	162	315	MT3	TSW-3512H	A-15
32.1	TEZ3210	●											

Inserts are included in one case.

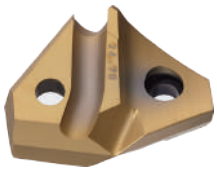
Note) 1. The insert is not installed in the holder. 2. Refer to pages F43 - F45 for recommended cutting conditions. 3. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

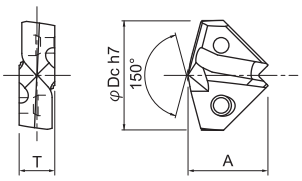
For drilling

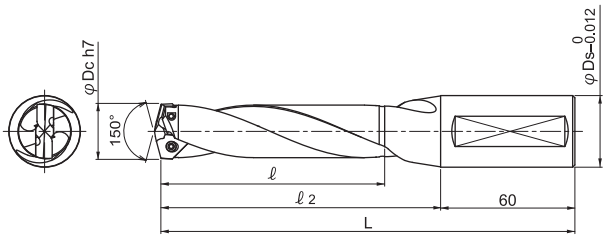
TA-EZ Drill (for bridges) EZ Series TEZD-KMS TYPE

- For bridge material machining
- With coolant hole
- Effective machining depth: 3 × Dc



* Insert can be reground
(At the time of normal wear)





■Insert ■Body ■Parts

Drill dia. (mm) φDc	Insert No.	Insert PVD Coated JC7550	Insert Dimensions (mm) A	Insert Dimensions (mm) T	Body Tool no.	Body Stock	Body KMS type 3D Dimensions (mm) ℓ	ℓ2	L	φDs	Parts Clamp screw	Parts Wrench (Not included)
24.5	TEZ2450K	●	17.4	8.0	TEZD2450S32-KMS	●	100	125	185	32	DSW-309H	A-10
24.7	TEZ2470K	●										
26.5	TEZ2650K	●	18.8	8.5	TEZD2650S32-KMS	●	108	135	195	32	DSW-309H	A-10
26.7	TEZ2670K	●										

Inserts are included in one case.

Note) 1. The insert is not installed in the holder.
2. Please use the bridge insert (~ K) for the main body of the bridge. Not compatible for bridges and general use.
3. Refer to page F45 for standard cutting conditions.
4. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

Clamp screw	Recommended torque (N·m)
DSW-309H	2.1

New PVD coating grade <JC7550>

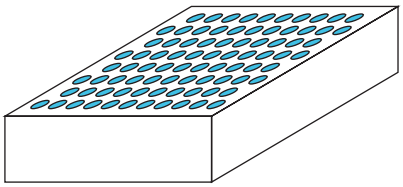
By adopting a coating film with excellent welding resistance and low friction resistance, sudden chipping due to welding and chip flow near the cutting edge are improved compared to conventional grades, achieving stable and long life.

For drilling

TA-EZ Drill EZ Series TEZD TYPE

■ CASE STUDIES

1. Drilling of tube plate for air conditioner. **Long tool life**

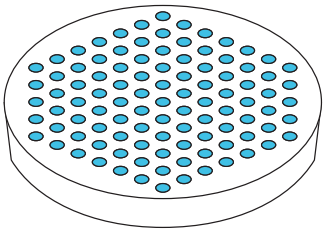


Work	Part name	Tube plate for air conditioner
	Material	Structural steel (Low carbon steel)
	Hardness	–
Tool	Tool no.	TEZD1600S20-MS
	Grade	TEZ1630 (JC8050)
Cutting conditions	Spindle speed Cutting speed	n=1,450min^{-1}, Vc=73.76m/min
	Feed speed Feed rate	Vf=362.5mm/min, f=0.25mm/rev
	Drilling depth	28mm (Through hole)
	Clamp	Good
	Coolant	Water soluble
	Machine	Vertical MC

Result

Double spindle machine :
No. 1 : 4,040 holes (113m)
No. 2 : 3,922 holes (110m)

2. Drilling of heat exchanger. **High efficiency**



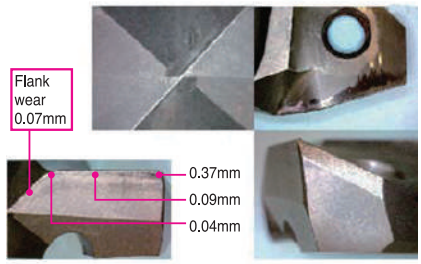
Work	Part name	Heat excahnger
	Material	Stainless steel
	Hardness	250HB
Tool	Tool no.	TEZD1900S25-MS
	Grade	TEZ1930 (JC8050)
Cutting conditions	Spindle speed Cutting speed	n=1,000min^{-1}, Vc=60.3m/min
	Feed speed Feed rate	Vf=300mm/min, f=0.3mm/rev
	Drilling depth	45mm (Through hole)
	Clamp	Good
	Coolant	Water soluble
	Machine	Double column MC

Result

TEZD increased feed speed by 2 times and chip removal rate compared with competitors.

3. Drilling of weather proof steel sheet. **Long tool life**

Condition after machining 99m



Work	Part name	Splice plate
	Material	Weather proof steel SMA490AW SMA490AW SMA570QW+SMA490AW
Tool	Tool no.	TEZD2450S32-KMS
	Grade	TEZ2470K (JC8050)
Cutting conditions	Spindle speed Cutting speed	n=790min^{-1}, Vc=61.27m/min n=590min^{-1}, Vc=45.75m/min
	Feed speed Feed rate	f=0.379mm/rev f=0.3mm/rev
	Drilling depth	t=9mm x 2pcs. (Stack plate, Through) t=23mm x 2pcs. (Stack plate, Through)
	Clamp	Good
	Coolant	Water soluble
	Machine	Vertical MC

Result

TEZD could cut total 99m by one insert. Insert showed normal wear.

For drilling

TA-EZ Drill

EZ Series

TEZD TYPE

■ CASE STUDIES

4. Improvement of machining efficiency by switching from HSS to carbide drill (1)

High efficiency

Overhung length: 130mm
Tap pilot hole machining

Result

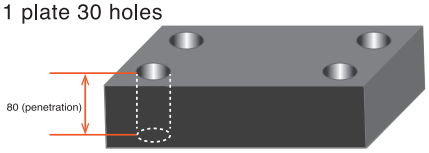
Step machining with the current high speed drill. The TA-EZ drill has a feed rate of about 1.4 times and can be machined in a non-step manner, and has good hole accuracy and surface accuracy. Achieves a significant improvement in machining efficiency.

Work	Part name	Press die
	Material	FCD540
	Hardness	–
Tool	Tool no.	TEZD1400MT1
	Grade	TEZ1400 (JC8050)
Cutting conditions	Spindle speed Cutting speed	n = 1,800min-1, Vc = 79m / min
	Feed speed Feed rate	Vf = 396mm / min, f = 0.22mm / rev
	Drilling depth	60mm (stop)
	Clamp	Good
	Coolant	Air blow
	Machine	Gate MC

5. Improvement of machining efficiency by switching from HSS to carbide drill (2)

High efficiency

Overhung length: 100mm
Tap pilot hole machining
(2 mm step machining)
1 plate 30 holes



Result

The current K company high speed drill has 30 holes per work and the cutting edge wears. The TA-EZ drill has good hole accuracy and surface accuracy and can be used continuously.

Work	Part name	Plate
	Material	SS400
	Hardness	–
Tool	Tool no.	TEZD2100MT2
	Grade	TEZ2100 (JC8050)
Cutting conditions	Spindle speed Cutting speed	n = 840min-1, Vc = 55.4m / min
	Feed speed Feed rate	Vf = 176mm / min, f = 0.21mm / rev
	Drilling depth	80mm (penetration)
	Clamp	Good
	Coolant	Water-soluble cutting oil
	Machine	Gate MC

For drilling

TA-EZ Drill

EZ Series

TEZD TYPE

RECOMMENDED CUTTING CONDITIONS

TEZD-MS / ML / XL type

Work Materials	Structural steel Carbon steel SS400, S50C (C50) Below 280HB		Alloy steel SCM440 (1.7223) 280～350HB		Tool steel (SKD61, SKD11) Hardness 255HB or less	
Vc (m/min)	75～90		70～90		70～90	
f (mm/rev)	0.3～0.35		0.22～0.25		0.22～0.25	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
14	1,700	510	1,600	350	1,600	350
15	1,600	480	1,500	350	1,500	350
16	1,500	450	1,400	340	1,400	340
17	1,400	450	1,300	330	1,300	330
18	1,300	450	1,250	310	1,250	310
19	1,250	440	1,200	300	1,200	300
20	1,200	420	1,100	280	1,100	280
21	1,200	420	1,100	280	1,100	280
22	1,200	420	1,050	260	1,050	260
23	1,200	420	1,050	260	1,050	260
24	1,200	420	1,050	260	1,050	260
25	1,150	400	1,050	260	1,050	260
26	1,110	390	1,050	260	1,050	260
27	1,070	370	1,000	250	1,000	250
28	1,030	360	1,000	250	1,000	250
29	990	350	950	240	950	240
30	960	340	950	240	950	240
31	930	330	900	225	900	225
32	900	315	900	225	900	225

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) The recommended cutting conditions in the above table show general guideline conditions.
2) If there is no mounting rigidity for the machine or workpiece, or adjust the conditions according to the machining shape and purpose.
3) When using for 8D, reduce the cutting conditions by about 20% for both the rotation speed and feed speed in the above table. In addition, it is recommended to drill a guide hole (depth = diameter x 0.5) of the same diameter using the 3D main body before machining.

For drilling

TA-EZ Drill

EZ Series

TEZD TYPE

● TEZD-MS / ML / XL type

Work Materials	Stainless steel (SUS304) Hardness 280HB or less		Gray cast iron (FC250) Tensile strength 350MPa or less		Ductile cast iron (FCD400) Tensile strength 450MPa or less	
Vc (m/min)	45		85～110		60～90	
f (mm/rev)	0.25		0.3～0.4		0.15～0.28	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
14	1,000	250	1,900	570	1,500	450
15	950	240	1,900	570	1,400	420
16	890	220	1,900	570	1,350	400
17	840	210	1,800	570	1,250	400
18	790	200	1,700	570	1,000	350
19	750	190	1,600	560	1,000	350
20	710	180	1,600	560	1,000	350
21	680	170	1,550	540	1,000	350
22	650	160	1,500	530	1,000	350
23	620	155	1,450	510	1,000	350
24	600	150	1,400	490	1,000	350
25	570	140	1,350	470	1,000	350
26	550	140	1,300	460	1,000	350
27	530	135	1,250	460	950	330
28	510	130	1,200	460	950	330
29	495	125	1,150	460	950	330
30	480	120	1,150	460	950	330
31	460	115	1,100	440	850	300
32	445	110	1,100	440	850	300

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

■ NOTE

1) The recommended cutting conditions in the above table show general guideline conditions.
2) If there is no mounting rigidity for the machine or workpiece, or adjust the conditions according to the machining shape and purpose.
3) When using for 8D, reduce the cutting conditions by about 20% for both the rotation speed and feed speed in the above table. In addition, it is recommended to drill a guide hole (depth = diameter x 0.5) of the same diameter using the 3D main body before machining.

For drilling

TA-EZ Drill EZ Series TEZD TYPE

RECOMMENDED CUTTING CONDITIONS

TEZD-MT type (MT shank)

Work Materials	Structural steel, carbon steel (SS400, S50C) Hardness 280HB or less		Gray cast iron (FC250) Tensile strength 350MPa or less		Ductile cast iron (FCD400) Tensile strength 450MPa or less	
Vc (m/min)	50		60		50	
f (mm/rev)	0.25		0.3		0.25	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
14	1,100	270	1,360	400	1,100	270
15	1,050	260	1,270	380	1,050	260
17	950	240	1,120	340	950	240
18	880	220	1,060	320	880	220
21	760	200	910	270	760	200
22	720	180	870	260	720	180
25	640	160	760	230	640	160
26	620	160	740	220	620	160
31	520	130	620	190	520	130
32	500	130	600	190	500	130

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) The recommended cutting conditions in the above table show general standard non-step machining conditions when using a machining center. We do not recommend using it on a drilling machine.
2) If there is no mounting rigidity for the machine or workpiece, or adjust the conditions according to the machining shape and purpose.
3) Be sure to use water-soluble cutting oil when machining structural steel, carbon steel, cast steel, etc. Water-soluble cutting oil is also used in machining gray cast iron and ductile cast iron. We recommend it.
4) By using a gantry machining machine, add an extension holder to the Morse taper holder.
   - If the protrusion length exceeds 300 mm, reduce the cutting conditions by about 20% for both the rotation speed and feed speed in the above table.
   - If the protruding length exceeds 500 mm, we do not recommend machining structural steel, carbon steel, cast steel, etc. In gray cast iron and ductile cast iron machining, positioning is performed by center machining, etc., and the cutting conditions are reduced by about 30 to 40% for both the rotation speed and feed speed in the above table. Please machine it.

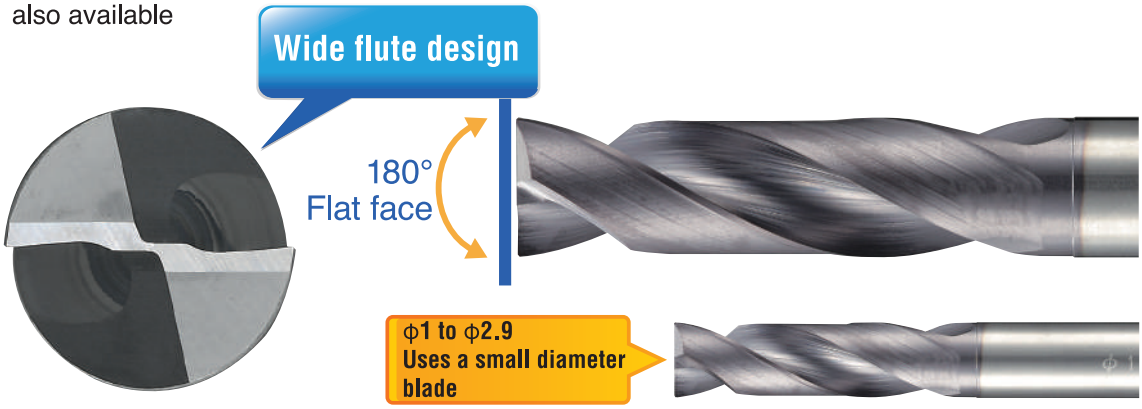
TEZD-KMS type (for bridges)

Work Materials	Rolled steel (SS400, SM400) Tensile strength 400-510 N / mm^2		Rolled steel (SM490) Tensile strength 490-610 N / mm^2		Rolled steel (SM520) Tensile strength 520-640 N / mm^2		Rolled steel (SM570) Tensile strength 570-720 N / mm^2	
Vc (m/min)	50～60～70		50～60～70		40～50～60		30～40～50	
f (mm/rev)	0.30～0.30～0.35		0.25～0.30～0.35		0.25～0.30～0.35		0.25～0.25～0.30	
Drill diameter (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)
24.5	770	230	770	230	640	190	510	130
24.7	770	230	770	230	640	190	510	130
26.5	720	220	720	220	600	180	480	120
26.7	720	220	720	220	600	180	480	120

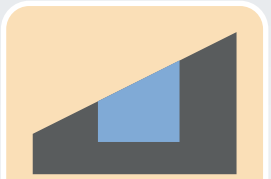
For drilling

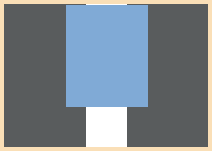
Spot Facing Drill TLDM TYPE

- Spot facing drill with 180° point angle.
- Stable drilling without pilot hole is possible even if inclined surface and crossed hole drilling.
- Excellent chip control due to wide flute.
- Burr control at drilling of thin plate.
- Reduce cutting force by 20% compared with competitor's.
- High accuracy and long life
- From carbon steel to pre-hardened steel, difficult-to-cut materials such as high-hardness materials, titanium alloys and stainless steel,Compatible with a wide range of work materials, including aluminum alloys
- Insert exchange type (shank integrated type and modular head type) (Pages F56 to F75) are also available

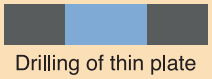


Applications


Spot facing of inclined surface


Spot facing

Spot facing of chamfered part


Drilling of thin plate

Drilling of crossed hole

Correction of hole

Work material	Mild steel	Carbon steel	Alloy steel	Mold steel	Hardened die steel	Titanium alloy	Heat resistant alloy	Stainless steel	Cast Iron	Aluminium alloy
	SS400	S50C	SCM440	NAK80	over 50HRC SKD61	Ti-6Al-4V	INCO718	SUS304	FC/FCD	AC/ADC
Application	◎	◎	◎	◎	○	○	○	◎	◎	○

◎: Optimal ○: Appropriate

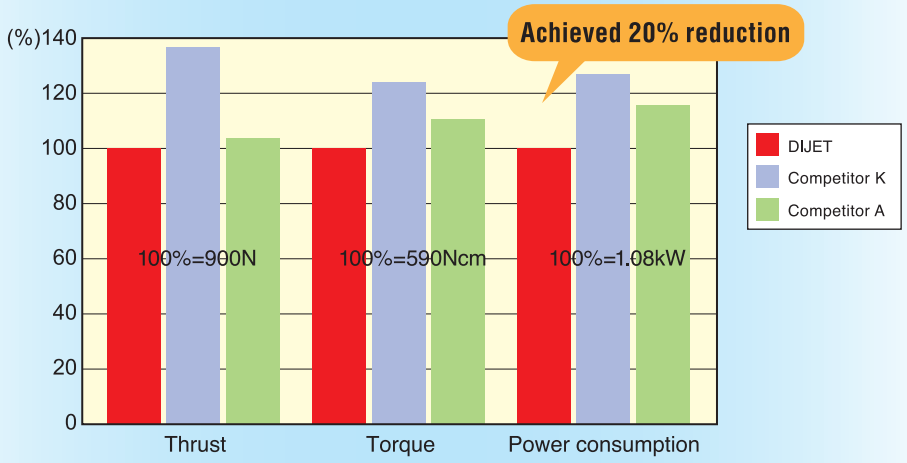
For drilling

Spot Facing Drill TLDM TYPE

■ CUTTTING PERFORMANCE

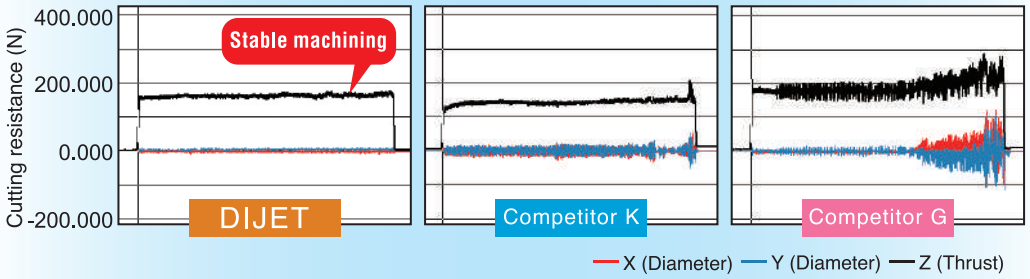
①-1 Cutting resistance comparison (ϕ10)

Work Material: S50C Tool Diameter: ϕ10 (TLDM100) Cutting Conditions: n = 1,910min-1, Vc = 60m / min, Vf = 382mm / min, f = 0.2mm / rev, Drilling depth: H = 20 mm (stop) Coolant: External water solubility



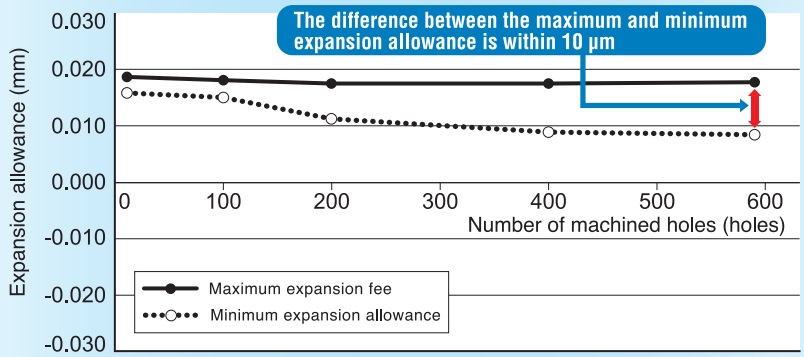
①-2 Cutting resistance comparison (ϕ3.5 <ϕ6 shank>)

Work material: SUS304 Machine used: Vertical MC Tool diameter: ϕ3.5 (TLDM035-S6) Cutting conditions: n = 2,502min-1, Vc = 27.5m / min, Vf = 50mm / min, f = 0.02mm / rev, Drilling depth: H = 3.5 mm (stop) Coolant: External water solubility



② Hole accuracy

Work material: S50C Machine used: Vertical MC Tool diameter: ϕ10 (TLDM100) Cutting conditions: n = 2,548min-1, Vc = 80m / min, Vf = 254mm / min, f = 0.1mm / rev, Drilling depth: H = 15 mm (stop) Coolant: External water solubility

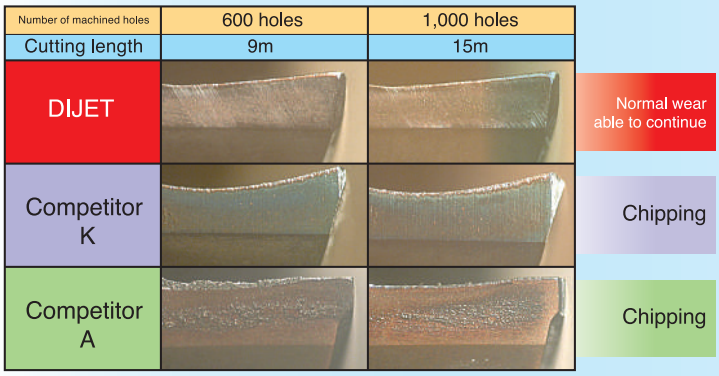


For drilling

Spot Facing Drill TLDM TYPE

■ CUTTTING PERFORMANCE

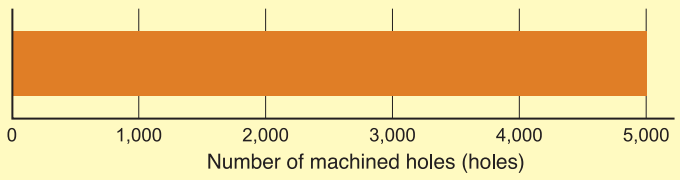
③-1 Tool life for carbon steel (ϕ10)



Work material: S50C
Machine used: Vertical MC
Tool diameter: ϕ10 (TLDM100)
Cutting conditions:
n = 2,548min-1, Vc = 80m / min,
Vf = 254mm / min, f = 0.1mm / rev
Drilling depth: H = 15 mm (stop)
Coolant: External water solubility

③-2 Tool life for carbon steel (ϕ1)

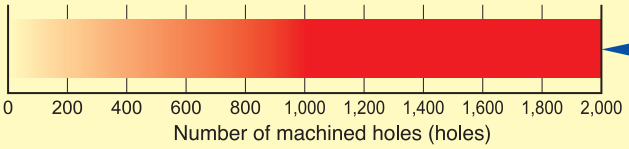
Spot facing drill ϕ1



Work material: S50C
Machine used: Vertical MC
Tool diameter: ϕ1 (TLDM010)
Cutting conditions:
n = 12,700min-1, Vc = 40m / min,
Vf = 254mm / min, f = 0.02mm / rev
Drilling depth: H = 2 mm (stop)
Coolant: External water solubility

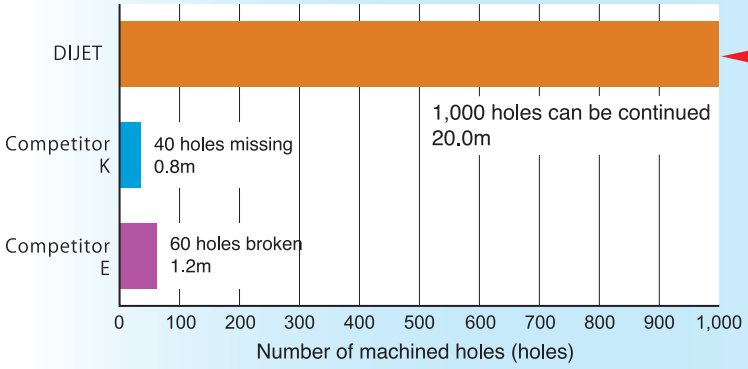
④-1 Tool life for pre-hardened steel (ϕ3)

Spot facing drill ϕ3



Work material: NAK80 (40HRC) Machine used: Vertical MC Tool diameter: ϕ3 (TLDM030)
Cutting conditions: n = 3,185min-1, Vc = 30m / min, Vf = 191mm / min, f = 0.06mm / rev
Drilling depth: H = 6 mm (stop) Coolant: External water solubility

④-2 Tool life for pre-hardened steel (ϕ10)



Even with pre-hardened steel Long life!

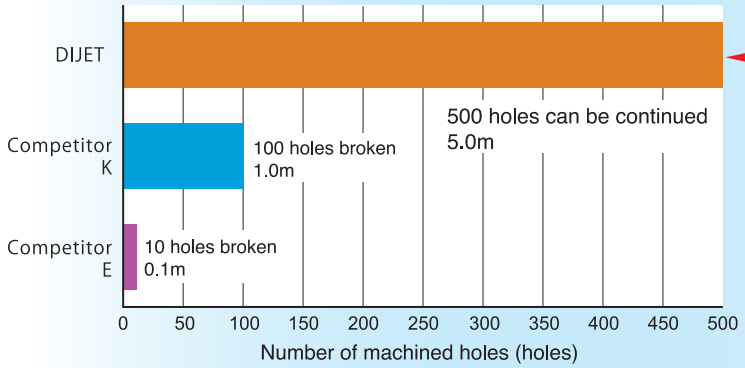
Work Material: NAK80 (39HRC)
Machine used: Vertical MC
Tool diameter: ϕ10 (TLDM100)
Cutting conditions:
n = 955min-1, Vc = 30m / min,
Vf = 96mm / min, f = 0.1mm / rev
Drilling depth: H = 20 mm (stop)
Coolant: External water solubility

For drilling

Spot Facing Drill TLDM TYPE

■ CUTTTING PERFORMANCE

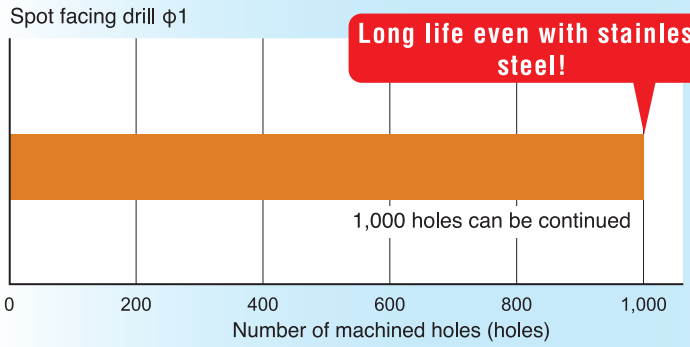
⑤-1 Tool life for stainless steel (ϕ10)



Even with stainless steel Long life!

Work material: SUS304
Machine used: Vertical MC
Tool diameter: ϕ10 (TLDM100)
Cutting conditions:
n = 955min-1, Vc = 30m / min,
Vf = 76mm / min, f = 0.08mm / rev
Drilling depth: H = 10 mm (stop)
Coolant: External water solubility

⑤-2 Tool life for stainless steel (ϕ1)

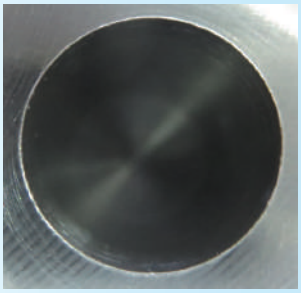


Work material: SUS304
Machine used: Vertical MC
Tool diameter: ϕ1 (TLDM010)
Cutting conditions:
n = 10,000min-1, Vc = 31.4m / min,
Vf = 50mm / min, f = 0.005mm / rev
Drilling depth: H = 1mm (stop)
Coolant: External water solubility

⑥ Titanium alloy processing (ϕ10.7)

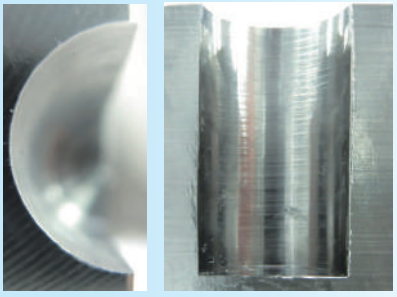
Work material: Ti-6Al-4V (36HRC) Machine used: Vertical MC Tool diameter: ϕ10.7 (TLDM107) Cutting conditions: n = 900min-1, Vc = 30.3m / min, Vf = 90mm / min, f = 0.10mm / rev (Vf = 30mm / min, f = 0.033mm / rev when half-cracked surface is machined) Drilling depth: H = 20 mm (stop) Coolant: External water solubility

<Hole accuracy>



Hole diameter expansion at tool diameter ϕ10.7
Good within 10 μm.

<Processing of half-cracked surface>

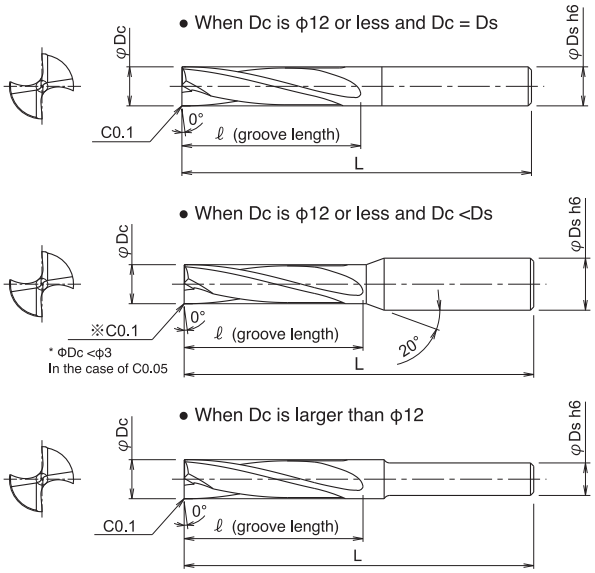


Even half-machined surfaces can be processed without problems!

For drilling

Spot Facing Drill TLDM TYPE

- Drill for spot face machining with a flat tip angle of 180 °
- Effective processing depth 2 x Dc
- Twist angle 30 °



■ TOLERANCE (mm)

Diameter ϕDc	Tolerance
Upto 3 mm	0 −0.010
Over 3 mm to 6 mm	0 −0.012
Over 6 mm to 10 mm	0 −0.015
Over 10 mm	0 −0.018

Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
TLDM010	●	1	3	60	3
TLDM011	●	1.1	3.3	60	3
TLDM012	●	1.2	3.6	60	3
TLDM013	●	1.3	3.9	60	3
TLDM014	●	1.4	4.2	60	3
TLDM015	●	1.5	4.5	60	3
TLDM016	●	1.6	4.8	60	3
TLDM017	●	1.7	5.1	60	3
TLDM018	●	1.8	5.4	60	3
TLDM019	●	1.9	5.7	60	3
TLDM020	●	2	7	60	4
TLDM021	●	2.1	7.5	60	4
TLDM022	●	2.2	8	60	4
TLDM023	●	2.3	8.5	60	4
TLDM024	●	2.4	9	60	4
TLDM025	●	2.5	9.5	60	4
TLDM026	●	2.6	10	60	4
TLDM027	●	2.7	10.5	60	4
TLDM028	●	2.8	11	60	4
TLDM029	●	2.9	11.5	60	4
TLDM030	●	3	12	60	4

Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
TLDM030-S6	●	3	12	60	6
TLDM031	●	3.1	12	60	4
TLDM031-S6	●	3.1	12	60	6
TLDM032	●	3.2	12	60	4
TLDM032-S6	●	3.2	12	60	6
TLDM033	●	3.3	13	60	4
TLDM033-S6	●	3.3	13	60	6
TLDM034	●	3.4	13	60	4
TLDM034-S6	●	3.4	13	60	6
TLDM035	●	3.5	13	60	4
TLDM035-S6	●	3.5	13	60	6
TLDM036	●	3.6	14	60	4
TLDM036-S6	●	3.6	14	60	6
TLDM037	●	3.7	14	60	4
TLDM037-S6	●	3.7	15	60	6
TLDM038	●	3.8	15	60	4
TLDM038-S6	●	3.8	15	60	6
TLDM039	●	3.9	15	60	4
TLDM039-S6	●	3.9	15	60	6
TLDM040	●	4	15	60	4
TLDM040-S6	●	4	15	60	6

Note) Please refer page F53 - F54 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

Spot Facing Drill TLDM TYPE

(Continued from the previous page)

Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
TLDM041	●	4.1	16	60	6
TLDM042	●	4.2	16	60	6
TLDM043	●	4.3	17	60	6
TLDM044	●	4.4	17	60	6
TLDM045	●	4.5	17	60	6
TLDM046	●	4.6	18	65	6
TLDM047	●	4.7	18	65	6
TLDM048	●	4.8	18	65	6
TLDM049	●	4.9	19	65	6
TLDM050	●	5	19	65	6
TLDM051	●	5.1	20	65	6
TLDM052	●	5.2	20	65	6
TLDM053	●	5.3	20	65	6
TLDM054	●	5.4	21	65	6
TLDM055	●	5.5	21	65	6
TLDM056	●	5.6	22	70	6
TLDM057	●	5.7	22	70	6
TLDM058	●	5.8	22	70	6
TLDM059	●	5.9	23	70	6
TLDM060	●	6	23	70	6
TLDM061	●	6.1	23	70	8
TLDM062	●	6.2	24	70	8
TLDM063	●	6.3	24	70	8
TLDM064	●	6.4	25	70	8
TLDM065	●	6.5	25	70	8
TLDM066	●	6.6	25	75	8
TLDM067	●	6.7	26	75	8
TLDM068	●	6.8	26	75	8
TLDM069	●	6.9	27	75	8
TLDM070	●	7	27	75	8
TLDM071	●	7.1	27	75	8
TLDM072	●	7.2	28	75	8
TLDM073	●	7.3	28	75	8
TLDM074	●	7.4	28	75	8
TLDM075	●	7.5	29	75	8
TLDM076	●	7.6	29	75	8
TLDM077	●	7.7	30	75	8
TLDM078	●	7.8	30	75	8
TLDM079	●	7.9	30	75	8
TLDM080	●	8	31	75	8
TLDM081	●	8.1	31	75	10
TLDM082	●	8.2	32	75	10

Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
TLDM083	●	8.3	32	75	10
TLDM084	●	8.4	32	75	10
TLDM085	●	8.5	32	75	10
TLDM086	●	8.6	33	80	10
TLDM087	●	8.7	33	80	10
TLDM088	●	8.8	34	80	10
TLDM089	●	8.9	34	80	10
TLDM090	●	9	35	80	10
TLDM091	●	9.1	35	80	10
TLDM092	●	9.2	35	80	10
TLDM093	●	9.3	36	80	10
TLDM094	●	9.4	36	80	10
TLDM095	●	9.5	37	80	10
TLDM096	●	9.6	37	80	10
TLDM097	●	9.7	37	80	10
TLDM098	●	9.8	38	80	10
TLDM099	●	9.9	38	80	10
TLDM100	●	10	39	80	10
TLDM101	●	10.1	39	85	12
TLDM102	●	10.2	39	85	12
TLDM103	●	10.3	40	85	12
TLDM104	●	10.4	40	85	12
TLDM105	●	10.5	40	85	12
TLDM106	●	10.6	41	85	12
TLDM107	●	10.7	41	85	12
TLDM108	●	10.8	42	85	12
TLDM109	●	10.9	42	85	12
TLDM110	●	11	42	85	12
TLDM111	●	11.1	43	85	12
TLDM112	●	11.2	43	85	12
TLDM113	●	11.3	44	85	12
TLDM114	●	11.4	44	85	12
TLDM115	●	11.5	44	85	12
TLDM116	●	11.6	45	90	12
TLDM117	●	11.7	45	90	12
TLDM118	●	11.8	45	90	12
TLDM119	●	11.9	46	90	12
TLDM120	●	12	46	90	12
TLDM125	●	12.5	48	95	12
TLDM130	●	13	50	100	12
TLDM135	●	13.5	52	100	12
TLDM140	●	14	54	100	12

Note) Please refer page F53 - F54 for recommended cutting conditions.

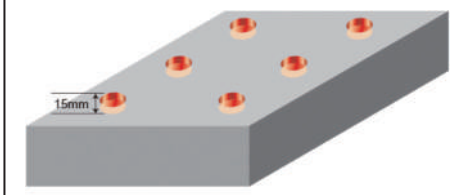
●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

Spot Facing Drill TLDM TYPE

CASE STUDIES

1. Stainless steel counterbore machining

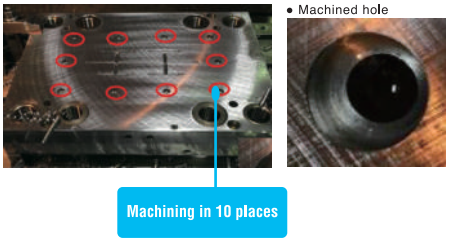


Result

Uses the current E company's high-speed steel counterbore end mill. Tyler drill can be machined even with stainless steel without any problem.

Work	Part name	Test piece
	Material	Stainless steel (SUS304)
	Hardness	-
Tool	Tool no.	TLDM110 (ϕ11)
	Grade	DZ coat (TiAlN system)
Cutting conditions	Spindle speed Cutting speed	n = 875min-1 Vc = 30m / min
	Feed speed Feed rate	Vf = 87mm / min f = 0.1mm / rev
	Drilling depth	15mm (stop)
	Clamp	Good
	Coolant	Water-soluble cutting oil
	Machine	Gate MC

2. Carbon steel counterbore machining

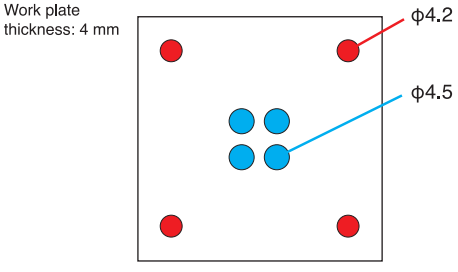


Result

In 1-work 10-hole counterbore machining, the Tyler drill can shorten the machining time by 6 times or more compared to the end mill for high-speed steel counterbore manufactured by E company, and has good hole accuracy and surface roughness (continuous use is possible).

Work	Part name	Die plate
	Material	Carbon steel (S55C)
	Hardness	-
Tool	Tool no.	TLDM110 (ϕ11)
	Grade	DZ coat (TiAlN system)
Cutting conditions	Spindle speed Cutting speed	n = 2,325min-1 Vc = 80m / min
	Feed speed Feed rate	Vf = 510mm / min f = 0.22mm / rev
	Drilling depth	7mm (with ϕ7 pilot hole)
	Clamp	Good
	Coolant	Water-soluble cutting oil
	Machine	Vertical MC

3. Drilling of stainless steel



Result

The existing drill does not have a long life and accuracy, so it is thrust and unfolded with the current 3-flute solid end mill manufactured by Company A. The Tyler drill can process 400 workpieces, has small burrs, and has good hole accuracy (can be used continuously). Machining time has also been reduced from 15 seconds per hole to 2 seconds. Φ4.5 is also adopted because of good results.

Work	Part name	plate
	Material	Stainless steel (SUS304)
Tool	Tool no.	-
	Grade	TLDM042 (ϕ4.2)
Cutting conditions	Spindle speed Cutting speed	DZ coat (TiAlN series) n = 2,300min-1
	Feed speed Feed rate	Vc = 30m / min Vf = 150mm / min
	Drilling depth	f = 0.065mm / rev 4mm (penetration)
	Clamp	Good
	Coolant	Water-soluble cutting oil
	Machine	Vertical MC

For drilling

Spot Facing Drill TLDM TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Structural steel (SS400) Hardness 180HB or less		Carbon steel (S50C) Hardness 280HB or less		Alloy steel (SCM440) Hardness 280-350HB	
Vc (m/min)	50～100		50～100		30～70	
f (mm/rev)	0.01～0.05 (φ1～φ2) 0.06～0.24 (φ3～φ14)		0.01～0.05 (φ1～φ2) 0.06～0.24 (φ3～φ14)		0.01～0.04 (φ1～φ2) 0.06～0.24 (φ3～φ14)	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
1	19,100	380	19,100	380	12,700	250
2	11,100	380	11,100	380	8,000	250
3	8,500	510	8,500	510	6,375	380
4	6,375	510	6,375	510	4,775	380
5	5,100	510	5,100	510	3,825	380
6	4,250	510	4,250	510	3,175	380
7	3,650	510	3,650	510	2,725	380
8	3,175	510	3,175	510	2,375	380
9	2,825	510	2,825	510	2,125	380
10	2,550	510	2,550	510	1,900	380
11	2,325	465	2,325	465	1,725	345
12	2,125	425	2,125	425	1,600	320
13	1,950	390	1,950	390	1,475	295
14	1,825	365	1,825	365	1,375	275

Work Materials	Pre-hardened steel (NAK80) Hardness 38-43HRC		Hardened steel (SKD61) Hardness 50HRC or less		Titanium alloy (Ti-6Al-4V) Hardness 30-42HRC	
Vc (m/min)	20～40 (φ1～φ2) 20～50 (φ3～φ14)		15～30		20～40 (φ1～φ2) 20～50 (φ3～φ14)	
f (mm/rev)	0.005～0.03 (φ1～φ2) 0.06～0.20 (φ3～φ14)		0.005～0.03 (φ1～φ2) 0.03～0.12 (φ3～φ14)		0.005～0.03 (φ1～φ2) 0.06～0.20 (φ3～φ14)	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
1	9,500	100	6,400	50	9,500	100
2	4,800	100	3,200	50	4,800	100
3	3,175	320	2,125	100	3,175	320
4	2,375	240	1,600	80	2,375	240
5	1,900	200	1,275	70	1,900	200
6	1,600	170	1,050	60	1,600	170
7	1,375	150	900	60	1,375	150
8	1,200	140	800	50	1,200	140
9	1,050	120	700	50	1,050	120
10	950	110	625	50	950	110
11	875	110	575	50	875	110
12	800	100	525	40	800	100
13	725	90	500	40	725	90
14	675	90	450	40	675	90

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) The above standard cutting conditions indicate the conditions for flat surface machining. For inclined surface machining, reduce the feed rate to 40-80% if the inclination angle is less than 30 °. Also, if the tilt angle is 30 ° or more, reduce the feed rate to 20 to 50%.
2) The above standard cutting conditions are the conditions when a water-soluble cutting fluid is used. If it is a dry type, use air blow to remove chips.
3) Use with a hole depth of 2D or less. Drilling beyond 2D is not recommended.
4) Horizontal feed is not possible.
5) For heat-resistant alloy machining, perform 0.5 mm step machining.
6) Chips may grow long depending on the nature of the work material and the shape of the work. Since there is a possibility of "increasing the hole diameter", "scratching the wall surface", and "tool damage due to chip clogging", perform "feed up", "step machining", etc. to divide the chips.

For drilling

Spot Facing Drill TLDM TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Heat resistant alloy (INCO718) Hardness 30-42HRC		Stainless steel (SUS304) Hardness 280HB or less		Gray cast iron (FC250) Tensile strength 350MPa or less	
Vc (m/min)	10～20		10～40 (φ1～φ2) 10～50 (φ3～φ14)		50～100	
f (mm/rev)	0.005～0.03 (φ1～φ2) 0.01～0.04 (φ3～φ14)		0.005～0.03 (φ1～φ2) 0.06～0.20 (φ3～φ14)		0.01～0.05 (φ1～φ2) 0.06～0.24 (φ3～φ14)	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
1	3,800	38	9,500	100	19,100	380
2	1,900	19	4,800	100	11,100	380
3	1,275	26	3,175	320	8,500	510
4	950	19	2,375	240	6,375	510
5	775	16	1,900	200	5,100	510
6	625	13	1,600	170	4,250	510
7	550	11	1,375	150	3,650	510
8	475	10	1,200	140	3,175	510
9	425	9	1,050	120	2,825	510
10	375	8	950	110	2,550	510
11	350	7	875	110	2,325	465
12	325	7	800	100	2,125	425
13	300	6	725	90	1,950	390
14	275	6	675	90	1,825	365

Work Materials	Ductile cast iron (FCD400) Tensile strength 450MPa or less		Aluminum alloy			
Vc (m/min)	50～100		50～150			
f (mm/rev)	0.01～0.05 (φ1～φ2) 0.06～0.24 (φ3～φ14)		0.01～0.08 (φ1～φ2) 0.06～0.24 (φ3～φ14)			
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)		
1	19,100	380	25,500	800		
2	11,100	380	15,900	800		
3	8,500	510	12,725	770		
4	6,375	510	9,550	770		
5	5,100	510	7,650	770		
6	4,250	510	6,375	770		
7	3,650	510	5,450	770		
8	3,175	510	4,775	770		
9	2,825	510	4,250	770		
10	2,550	510	3,825	770		
11	2,325	465	3,475	695		
12	2,125	425	3,175	635		
13	1,950	390	2,950	590		
14	1,825	365	2725	545		

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

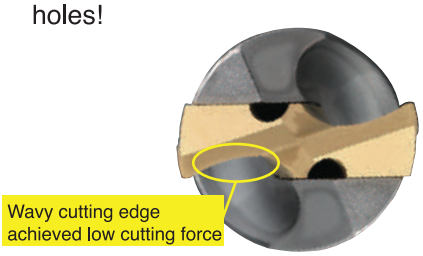
1) The above standard cutting conditions indicate the conditions for flat surface machining. For inclined surface machining, reduce the feed rate to 40-80% if the inclination angle is less than 30 °. Also, if the tilt angle is 30 ° or more, reduce the feed rate to 20 to 50%.
2) The above standard cutting conditions are the conditions when a water-soluble cutting fluid is used. If it is a dry type, use air blow to remove chips.
3) Use with a hole depth of 2D or less. Drilling beyond 2D is not recommended.
4) Horizontal feed is not possible.
5) For heat-resistant alloy machining, perform 0.5 mm step machining.
6) Chips may grow long depending on the nature of the work material and the shape of the work. Since there is a possibility of "increasing the hole diameter", "scratching the wall surface", and "tool damage due to chip clogging", perform "feed up", "step machining", etc. to divide the chips.

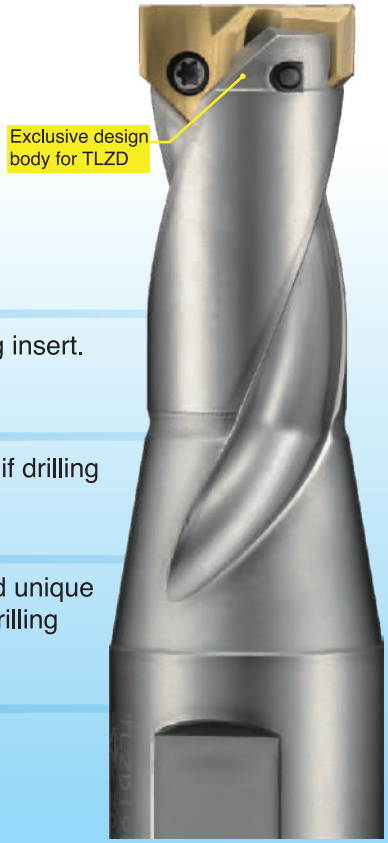
Note :

For drilling

Indexable Spot Facing Drill TLZD TYPE

- Indexable spot facing drill with point angle of 180°(flat face)
- Size range : φ14～φ32 dia. (Drilling depth : 1.5D)
- Non-step machining is possible without pilot holes on inclined surfaces or crossed holes!

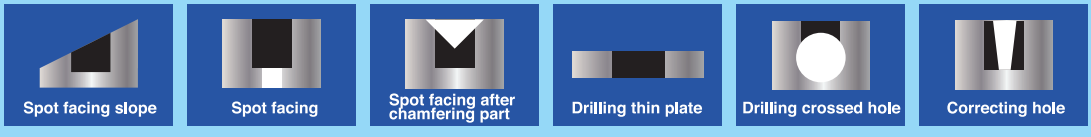




■ Features

1. TLZD can be used repeatedly only by exchanging insert. Easy assembly of insert & body.
2. Achieved non-stop drilling without pilot hole even if drilling slope surface and crossed hole.
3. By adopting new PVD coated grade “JC7550” and unique coolant system, achieved longer tool life even if drilling mold steel or stainless steel.
4. Controlled burr in case of drilling thin plate.

■ Application



For drilling

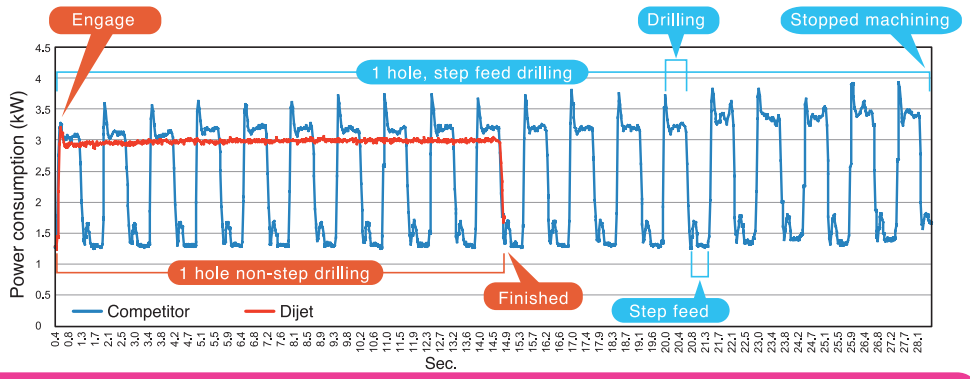
Indexable Spot Facing Drill TLZD TYPE

■ Cutting performace

① Cutting performance (Stainless steel)

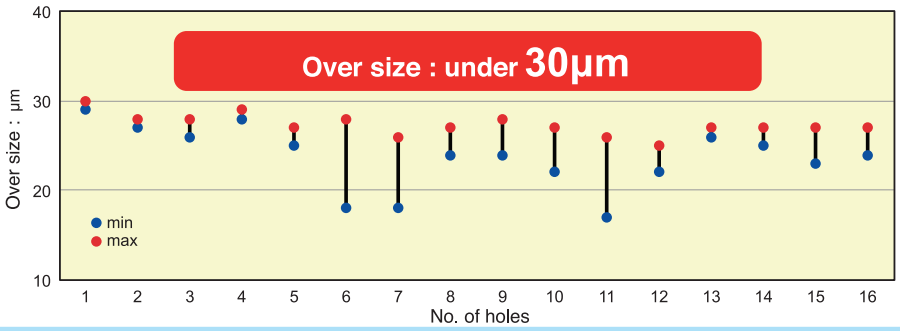
Material : Stainless steel SUS304, Machine : Vertical MC
Cutting conditions : n=1,840min^{-1}, Vc=110m/min, Vf=80mm/min, f=0.043mm/rev
Drilling dia. :ϕ19, Drilling depth : 19mm (1D, blind)
Tool no. : TLZD1900S25-SS, Insert No. : TLZ1900 (JC7550) Water soluble (Internal)

Power consumption



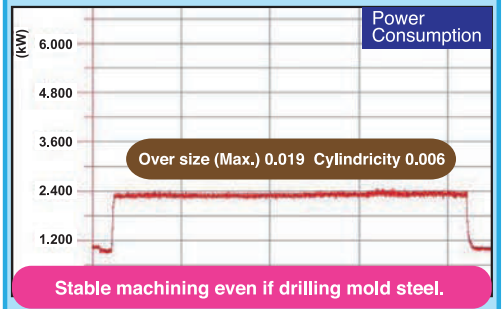
Dijet reduced power consumption and achieved stable machining & good hole accuracy. Competitor stopped machining at the first hole due to clogging with chips

Hole accuracy



② Cutting performance (Mold steel)

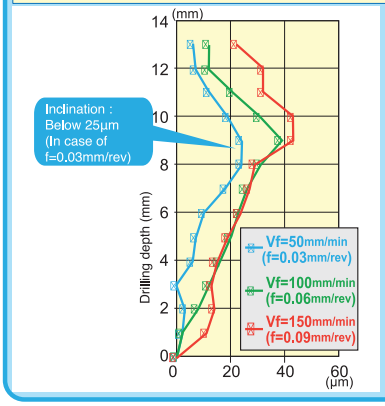
Material : Mold steel NAK80 P21,
Cutting conditions : n=300min^{-1}, Vc=30m/min,
Vf=24mm/min, f=0.08mm/rev
Drilling dia. :ϕ32, Drilling depth : 32mm (1D)
Tool no. : TLZD3200S32-SS,
Insert No. : TLZ3200 (JC7550)
Water soluble (Internal)

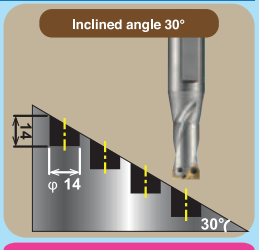


Stable machining even if drilling mold steel.

③ Drilling inclined surface (Inclined angle : 30°)

Material : S50C C50, Machine : Vertical MC
Cutting conditions : n=1,590min^{-1}, Vc=70m/min,
Vf=50-150mm/min, f=0.03-0.09mm/rev
Drilling dia. :ϕ14, Drilling depth : 14mm, Inclined angle : 30°
Tool no. : TLZD1400S16-SS,
Insert No. : TLZ1400 (JC7550),
Mist coolant
※ But, in case of actual machining, recommend wet coolant.



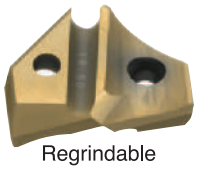


Stable machining even if drilling inclined surface (inclined angle 30°) In case of f=0.03mm/rev, inclination was below 25 μm

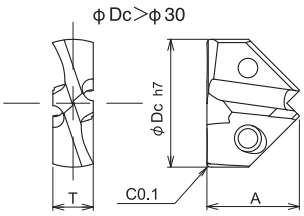
For drilling

Indexable Spot Facing Drill TLZD TYPE

● Drilling depth : 1.5 x Dc



Regrindable



Coolant Hole | JC7500 Coated | Drilling | Spot facing

SS type(1.5D)

■ Insert ■ Body ■ Parts

Drill dia. (mm)	Insert				Body										Tool no.	
	Insert No.	PVD coated	Dimensions (mm)		Applicable dia.		SS type (1.5D)								Clamp screw	Wrench (Not Included)
							Parts	Stock	Dimensions (mm)							
φDc		JC7550	A	T	Over	Under			ℓ	ℓ2	ℓs	L	φDs			
14	TLZ1400	●	10.6	4.5	13.5	14.5	TLZD1400S16-SS	●	29	43	48	91	16		DSW-2045H	A-07
14.1	TLZ1410	●														
14.2	TLZ1420	●														
14.3	TLZ1430	●														
14.4	TLZ1440	●														
14.5	TLZ1450	●														
14.6	TLZ1460	●	11.3	4.8	14.5	15.5	TLZD1500S20-SS	●	31	46	50	96	20		DSW-2045H	A-07
14.7	TLZ1470	●														
14.8	TLZ1480	●														
14.9	TLZ1490	●														
15	TLZ1500	●														
15.1	TLZ1510	●														
15.2	TLZ1520	●														
15.3	TLZ1530	●														
15.4	TLZ1540	●														
15.5	TLZ1550	●														
15.6	TLZ1560	●	12.1	5.0	15.5	16.5	TLZD1600S20-SS	●	33	49	50	99	20		TSW-2556H	A-08
15.7	TLZ1570	●														
15.8	TLZ1580	●														
15.9	TLZ1590	●														
16	TLZ1600	●														
16.1	TLZ1610	●														
16.2	TLZ1620	●														
16.3	TLZ1630	●														
16.4	TLZ1640	●														
16.5	TLZ1650	●														
16.6	TLZ1660	●	12.6	5.5	16.5	17.5	TLZD1700S20-SS	●	35	52	50	102	20		TSW-2556H	A-08
16.7	TLZ1670	●														
16.8	TLZ1680	●														
16.9	TLZ1690	●														
17	TLZ1700	●														
17.1	TLZ1710	●														
17.2	TLZ1720	●														
17.3	TLZ1730	●														
17.4	TLZ1740	●														
17.5	TLZ1750	●														
17.6	TLZ1760	●	13.2	5.8	17.5	18.5	TLZD1800S20-SS	●	37	55	50	105	20		TSW-2556H	A-08
17.7	TLZ1770	●														
17.8	TLZ1780	●														
17.9	TLZ1790	●														
18	TLZ1800	●														
18.1	TLZ1810	●														
18.2	TLZ1820	●														
18.3	TLZ1830	●														
18.4	TLZ1840	●														
18.5	TLZ1850	●														

1 insert per case

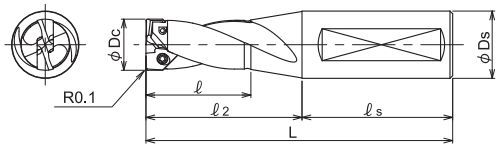
Note) All holders are supplied without insert

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

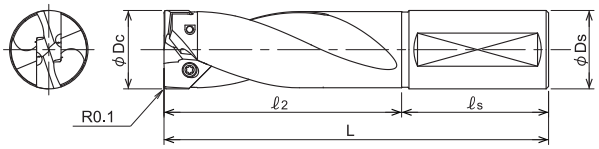
For drilling

Indexable Spot Facing Drill TLZD TYPE

φDc>φ30



φDc>φ30



■ Insert ■ Body ■ Parts

Drill dia. (mm) φDc	Insert No.	PVD coated JC7550	Dimensions (mm) A	Dimensions (mm) T	Applicable dia. Over	Applicable dia. Under	Body Parts	Body Stock	Body SS type (1.5D) Dimensions (mm) ℓ	ℓ2	ℓs	L	φDs	Tool no. Clamp screw	Tool no. Wrench
18.6	TLZ1860	●	13.6	6.0	18.5	19.5	TLZD1900S25-SS		39	58	56	114	25	TSW-2567H	A-08
18.7	TLZ1870	●													
18.8	TLZ1880	●													
18.9	TLZ1890	●													
19	TLZ1900	●													
19.1	TLZ1910	●													
19.2	TLZ1920	●													
19.3	TLZ1930	●													
19.4	TLZ1940	●													
19.5	TLZ1950	●													
19.6	TLZ1960	●	14.6	6.5	19.5	20.5	TLZD2000S25-SS		41	61	56	117	25	TSW-2567H	A-08
19.7	TLZ1970	●													
19.8	TLZ1980	●													
19.9	TLZ1990	●													
20	TLZ2000	●													
20.5	TLZ2050	●													
21	TLZ2100	●	15.2	6.7	20.5	21.5	TLZD2100S25-SS		43	64	56	120	25	TSW-2567H	A-08
21.5	TLZ2150	●													
22	TLZ2200	●	15.9	7.5	21.5	22.5	TLZD2200S25-SS		45	67	56	123	25	DSW-307H	A-10
22.5	TLZ2250	●													
23	TLZ2300	●	16.7	7.5	22.5	23.5	TLZD2300S25-SS		47	70	56	126	25	DSW-307H	A-10
23.5	TLZ2350	●													
24	TLZ2400	●	17.4	8.0	23.5	24.5	TLZD2400S32-SS		49	73	60	133	32	DSW-307H	A-10
24.5	TLZ2450	●													
25	TLZ2500	●	18.3	8.0	24.5	25.5	TLZD2500S32-SS		51	76	60	136	32	DSW-309H	A-10
25.5	TLZ2550	●													
26	TLZ2600	●	18.8	8.5	25.5	26.5	TLZD2600S32-SS		53	79	60	139	32	DSW-309H	A-10
26.5	TLZ2650	●													
27	TLZ2700	●	19.5	8.5	26.5	27.5	TLZD2700S32-SS		55	82	60	142	32	DSW-309H	A-10
27.5	TLZ2750	●													
28	TLZ2800	●	20.3	9.0	27.5	28.5	TLZD2800S32-SS		57	85	60	145	32	TSW-3510H	A-15
28.5	TLZ2850	●													
29	TLZ2900	●	21.1	9.0	28.5	29.5	TLZD2900S32-SS		59	88	60	148	32	TSW-3510H	A-15
29.5	TLZ2950	●													
30	TLZ3000	●	21.5	9.5	29.5	30.5	TLZD3000S32-SS		61	91	60	151	32	TSW-3510H	A-15
30.5	TLZ3050	●													
31	TLZ3100	●	22.3	10.0	30.5	31.5	TLZD3100S32-SS		※	94	60	154	32	TSW-3512H	A-15
31.5	TLZ3150	●													
32	TLZ3200	●	23.1	10.0	31.5	32.5	TLZD3200S32-SS		※	97	60	157	32	TSW-3512H	A-15

1 insert per case

Note) All holders are supplied without insert

*** About changing the specifications of the Spot facing drill**

The Spot facing drill TLZD type is used to improve the rigidity and durability of the main body. As soon as the current product runs out, the appearance will change as follows.

Change before

Change

After change

* The appearance of the main body has been changed to a silver glossy color.
There is no change in the dimensional specifications.

Clamp screw	Recommended torque (N·m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

Indexable Spot Facing Drill TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Structural steel (SS400) Hardness 180HB or less		Carbon steel (S50C) Hardness 280HB or less		Tool steel (SKD61, SKD11) Hardness 255HB or less	
Vc (m/min)	50～100 (φ14～φ32)		50～100 (φ14～φ32)		30～70 (φ14～φ32)	
f (mm/rev)	0.06～0.20 (φ14～φ16) 0.07～0.21 (φ17～φ20) 0.08～0.22 (φ21～φ25) 0.09～0.23 (φ26～φ29) 0.10～0.24 (φ30～φ32)		0.06～0.20 (φ14～φ16) 0.07～0.21 (φ17～φ20) 0.08～0.22 (φ21～φ25) 0.09～0.23 (φ26～φ29) 0.10～0.24 (φ30～φ32)		0.06～0.20 (φ14～φ16) 0.07～0.21 (φ17～φ20) 0.08～0.22 (φ21～φ25) 0.09～0.23 (φ26～φ29) 0.10～0.24 (φ30～φ32)	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
14	1,590	190	1,590	190	1,140	140
15	1,490	180	1,490	180	1,060	130
16	1,390	170	1,390	170	990	120
17	1,310	170	1,310	170	940	120
18	1,240	160	1,240	160	880	110
19	1,170	150	1,170	150	840	110
20	1,110	150	1,110	150	800	110
21	1,060	150	1,060	150	760	110
22	1,010	140	1,010	140	720	100
23	970	140	970	140	690	100
24	930	130	930	130	660	90
25	890	130	890	130	640	90
26	860	130	860	130	610	90
27	830	120	830	120	590	90
28	800	120	800	120	570	90
29	770	120	770	120	550	80
30	740	120	740	120	530	80
31	720	120	720	120	510	80
32	700	110	700	110	500	80

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) The above standard cutting conditions indicate the conditions for flat surface machining. For inclined surface machining, reduce the feed rate to 40-80% if the inclination angle is less than 30 °. Also, if the tilt angle is 30 ° or more, reduce the feed rate to 20 to 50%.
2) The above standard cutting conditions are the conditions when a water-soluble cutting fluid is used. If it is a dry type, use air blow to remove chips.
3) Use with a hole depth of 1.5D or less. We do not recommend drilling more than 1.5D.
4) Horizontal feed is not possible.
5) Chips may grow long depending on the nature of the work material and the shape of the work. Since there is a possibility of "increasing the hole diameter", "scratching the wall surface", and "tool damage due to chip clogging", perform "feed up", "step machining", etc. to divide the chips. However, in the case of stainless steel machining, machining that raises the feed and divides chips is not suitable, so increase the cutting speed and lower the feed to generate connected chips.
6) During machining, uncut parts will be left on the bottom surface.

For drilling

Indexable Spot Facing Drill TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Alloy steel (SCM440) Hardness 280-350HB		Pre-hardened steel (NAK80) Hardness about 40HRC		Cast iron (FC / FCD)	
Vc (m/min)	30～70 (φ14～φ32)		20～40 (φ14～φ32)		50～100 (φ14～φ32)	
f (mm/rev)	0.06～0.20 (φ14～φ16) 0.07～0.21 (φ17～φ20) 0.08～0.22 (φ21～φ25) 0.09～0.23 (φ26～φ29) 0.10～0.24 (φ30～φ32)		0.04～0.10 (φ14～φ16) 0.04～0.11 (φ17～φ18) 0.05～0.11 (φ19～φ20) 0.05～0.12 (φ21～φ25) 0.05～0.13 (φ26～φ27) 0.06～0.13 (φ28～φ29) 0.06～0.14 (φ30～φ32)		0.06～0.20 (φ14～φ16) 0.07～0.21 (φ17～φ20) 0.08～0.22 (φ21～φ25) 0.09～0.23 (φ26～φ29) 0.10～0.24 (φ30～φ32)	
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)
14	1,140	140	680	40	1,590	190
15	1,060	130	640	40	1,490	180
16	990	120	600	40	1,390	170
17	940	120	560	40	1,310	170
18	880	110	530	40	1,240	160
19	840	110	500	40	1,170	150
20	800	110	480	40	1,110	150
21	760	110	450	40	1,060	150
22	720	100	430	30	1,010	140
23	690	100	420	30	970	140
24	660	90	400	30	930	130
25	640	90	380	30	890	130
26	610	90	370	30	860	130
27	590	90	350	30	830	120
28	570	90	340	30	800	120
29	550	80	330	30	770	120
30	530	80	320	30	740	120
31	510	80	310	30	720	120
32	500	80	300	30	700	110

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) The above standard cutting conditions indicate the conditions for flat surface machining. For inclined surface machining, reduce the feed rate to 40-80% if the inclination angle is less than 30 °. Also, if the tilt angle is 30 ° or more, reduce the feed rate to 20 to 50%.
2) The above standard cutting conditions are the conditions when a water-soluble cutting fluid is used. If it is a dry type, use air blow to remove chips.
3) Use with a hole depth of 1.5D or less. We do not recommend drilling more than 1.5D.
4) Horizontal feed is not possible.
5) Chips may grow long depending on the nature of the work material and the shape of the work. Since there is a possibility of "increasing the hole diameter", "scratching the wall surface", and "tool damage due to chip clogging", perform "feed up", "step machining", etc. to divide the chips. However, in the case of stainless steel machining, machining that raises the feed and divides chips is not suitable, so increase the cutting speed and lower the feed to generate connected chips.
6) During machining, uncut parts will be left on the bottom surface.

For drilling

Indexable Spot Facing Drill TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Stainless steel (SUS304)		Aluminum alloy (AC / ADC)			
Vc (m/min)	80～140 (φ14～φ32)		50～150 (φ14～φ32)			
f (mm/rev)	0.02～0.06 (φ14～φ18) 0.03～0.07 (φ19～φ25) 0.04～0.08 (φ26～φ31) 0.05～0.09 (φ32)		0.06～0.20 (φ14～φ16) 0.07～0.21 (φ17～φ20) 0.08～0.22 (φ21～φ25) 0.09～0.23 (φ26～φ29) 0.10～0.24 (φ30～φ32)			
Drill diameter (mm)	n (min^{-1})	Vf (mm/min)	n (min^{-1})	Vf (mm/min)		
14	2,270	90	2,270	270		
15	2,120	90	2,120	250		
16	1,990	80	1,990	240		
17	1,870	80	1,870	240		
18	1,770	80	1,770	240		
19	1,840	80	1,840	240		
20	1,750	80	1,750	230		
21	1,670	80	1,670	230		
22	1,590	80	1,590	220		
23	1,520	80	1,520	210		
24	1,460	80	1,460	200		
25	1,400	80	1,400	200		
26	1,350	80	1,350	200		
27	1,300	80	1,300	200		
28	1,360	80	1,360	200		
29	1,320	80	1,320	200		
30	1,270	80	1,270	200		
31	1,230	80	1,230	200		
32	1,190	80	1,190	190		

Vc: Cutting speed n: Rotation speed Vf: Feed speed f: Feed amount

NOTE

1) The above standard cutting conditions indicate the conditions for flat surface machining. For inclined surface machining, reduce the feed rate to 40-80% if the inclination angle is less than 30 °. Also, if the tilt angle is 30 ° or more, reduce the feed rate to 20 to 50%.
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6) During machining, uncut parts will be left on the bottom surface.

For drilling

Indexable Spot Facing Drill TLZD 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 of insert (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.

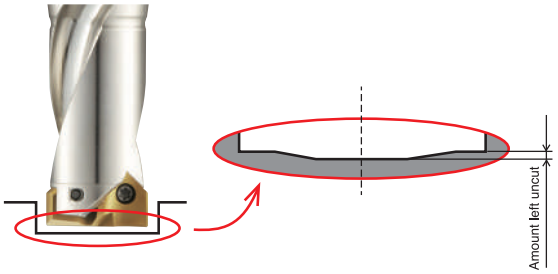
Anti-seizure paste “MOLY”

Attention

Please change the clamp screw after use of 10 inserts on drill body

Clamp screw

■ Uncut shape



Tool diameter (mm)	Amount left uncut (mm)
ϕ14～ϕ20.5	0.04～0.06
ϕ21～ϕ26.5	0.05～0.07
ϕ27～ϕ32.0	0.06～0.08

For drilling

Spot Facing Drill Modular Head TLZD TYPE

Coolant Hole

JC7500 Coated

Drilling

Spot facing

TLZD

180 ° flat tip
Drill for counterbore machining with replaceable cutting edge
For "Spot Face Drill"
Modular type
Additional lineup.

Bolt counterbore for press dies and large structures
For hole machining and seating surface considering interfering substances
Ideal for machining.

Features

1 The main body modular head has a lineup of ϕ14 to ϕ32 (effective processing depth 0.7 to 1D). Inserts with a tool diameter of ϕ20 or less have a step over of 0.1 mm, and inserts with a tool diameter of more than ϕ20 have a step over of 0.5 mm. In combination with the all-carbide shank arbor "Anti-Vibration", which has a wide variety of variations, it can be used for machining with long extensions.

TLZ D type + MSN type All Carbide Shank Arbor "Anti-Vibration"

2 Counterbore / drilling and cross-drilling on unstable work material shapes such as inclined surfaces and cylindrical surfaces can be performed non-step from the state without pilot holes.

3 PVD coating grade "JC7550" is used for the insert grade, and the original internal lubrication method achieves a long life even for pre-hardened steel and stainless steel.

4 Effective machining depth is up to tool diameter x 0.7 to 1 times.

For drilling

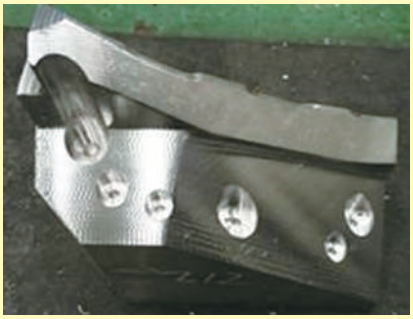
Spot Facing Drill Modular Head TLZD TYPE

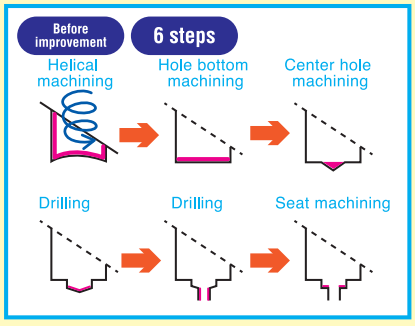
Proposal for improving machining efficiency

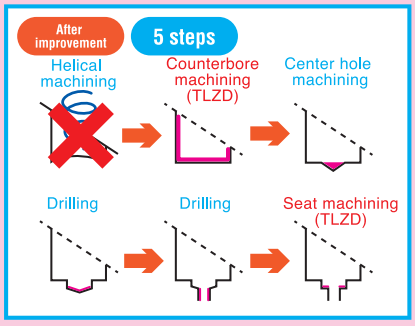
1 Process consolidation

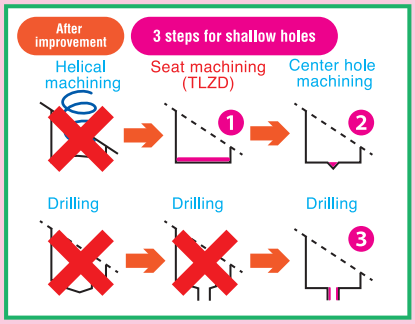
Machining location: Press die (bolt hole for nesting fixing)

Work material: SKD11 (raw material), alloy steel (SCM, etc.), ductile cast iron (FCD)



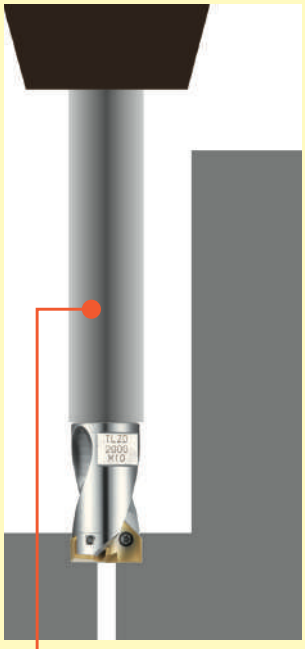






2 Machining with long extensions

(Machining of counterbore holes in large structures, etc.)



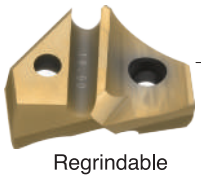
All Carbide Shank Arbor "Anti-Vibration"

⬇

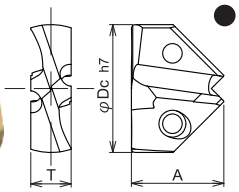
Increased rigidity & long extensions
Also supports machining

For drilling

Spot Facing Drill Modular Head TLZD TYPE



Regrindable



● Drilling depth : 0.7-1 x Dc

Coolant Hole

JC7500 Coated

■ Insert ■ Body ■ Parts ■ Recommended Anti Vibration Shank

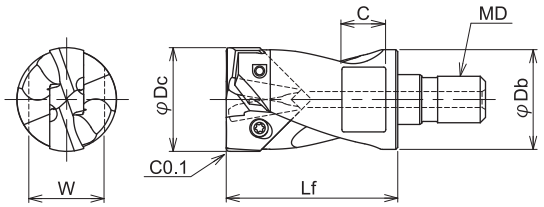
Drill dia. (mm)	Insert				Body										Tool no.		All Carbide Shank Arbor
		PVD coated	Dimensions (mm)		Applicable dia.		TLZD type (0.7 ~ 1D)								Clamp screw	Wrench (Not Included)	Anti Vibration model number Dimension details See pages E448 - E450
							Parts	Stock	Dimensions (mm)								
φDc	Insert No.	JC7550	A	T	Over	Under			Lf	φDb	MD	C	W				
14	TLZ1400	●	10.6	4.5	13.5	14.5	TLZD1400-M6	●	27.5	13.1	M6	7	10	DSW-2045H	A-07	MSN-M6-＊＊-S16C
14.1	TLZ1410	●														
14.2	TLZ1420	●														
14.3	TLZ1430	●														
14.4	TLZ1440	●														
14.5	TLZ1450	●														
14.6	TLZ1460	●	11.3	4.8	14.5	15.5	TLZD1500-M8	●	29.5	14	M8	8	12	DSW-2045H	A-07	MSN-M8-＊＊S-S14C
14.7	TLZ1470	●														
14.8	TLZ1480	●														
14.9	TLZ1490	●														
15	TLZ1500	●														
15.1	TLZ1510	●														
15.2	TLZ1520	●														
15.3	TLZ1530	●														
15.4	TLZ1540	●														
15.5	TLZ1550	●														
15.6	TLZ1560	●	12.1	5.0	15.5	16.5	TLZD1600-M8	●	29.5	15	M8	8	12	TSW-2556H	A-08	MSN-M8-＊＊S-S15C
15.7	TLZ1570	●														
15.8	TLZ1580	●														
15.9	TLZ1590	●														
16	TLZ1600	●														
16.1	TLZ1610	●														
16.2	TLZ1620	●														
16.3	TLZ1630	●														
16.4	TLZ1640	●														
16.5	TLZ1650	●														
16.6	TLZ1660	●	12.6	5.5	16.5	17.5	TLZD1700-M8	●	30.5	16	M8	8	12	TSW-2556H	A-08	MSN-M8-＊＊S-S16C
16.7	TLZ1670	●														
16.8	TLZ1680	●														
16.9	TLZ1690	●														
17	TLZ1700	●														
17.1	TLZ1710	●														
17.2	TLZ1720	●														
17.3	TLZ1730	●														
17.4	TLZ1740	●														
17.5	TLZ1750	●														
17.6	TLZ1760	●	13.2	5.8	17.5	18.5	TLZD1800-M8	●	30.5	17	M8	8	12	TSW-2556H	A-08	MSN-M8-＊＊S-S16C
17.7	TLZ1770	●														
17.8	TLZ1780	●														
17.9	TLZ1790	●														
18	TLZ1800	●														
18.1	TLZ1810	●														
18.2	TLZ1820	●														
18.3	TLZ1830	●														
18.4	TLZ1840	●														
18.5	TLZ1850	●														

1 insert per case

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

For drilling

Spot Facing Drill Modular Head TLZD TYPE



Insert / Body / Parts / Recommended Anti Vibration Shank

Drill dia. (mm)	Insert				Body											Tool no.		All Carbide Shank Arbor
					Applicable dia.		TLZD type (0.7 ~ 1D)									Clamp screw	Wrench (Not Included)	
		PVD coated	Dimensions (mm)						Dimensions (mm)									
φDc	Insert No.	JC7550	A	T	Over	Under	Parts	Stock	Lf	φDb	MD	C	W					Anti Vibration model number Dimension details See pages E448 - E450
18.6	TLZ1860	●	13.6	6.0	18.5	19.5	TLZD1900-M10	●	38.5	18	M10	9	14	TSW-2567H	A-08	MSN-M10-＊＊S-S18C
18.7	TLZ1870	●														
18.8	TLZ1880	●														
18.9	TLZ1890	●														
19	TLZ1900	●														
19.1	TLZ1910	●														
19.2	TLZ1920	●														
19.3	TLZ1930	●														
19.4	TLZ1940	●														
19.5	TLZ1950	●														
19.6	TLZ1960	●	14.6	6.5	19.5	20.5	TLZD2000-M10	●	38.5	19	M10	9	14	TSW-2567H	A-08	MSN-M10-＊＊-S20C
19.7	TLZ1970	●														
19.8	TLZ1980	●														
19.9	TLZ1990	●														
20	TLZ2000	●														
20.5	TLZ2050	●														
21	TLZ2100	●	15.2	6.7	20.5	21.5	TLZD2100-M10	●	38.5	20	M10	9	14	TSW-2567H	A-08	MSN-M10-＊＊S-S20C
21.5	TLZ2150	●														
22	TLZ2200	●	15.9	7.5	21.5	22.5	TLZD2200-M10	●	38.5	21	M10	9	14	DSW-307H	A-10	MSN-M10-＊＊S-S20C
22.5	TLZ2250	●														
23	TLZ2300	●	16.7	7.5	22.5	23.5	TLZD2300-M10	●	38.5	22	M10	9	14	DSW-307H	A-10	MSN-M10-＊＊S-S20C
23.5	TLZ2350	●														
24	TLZ2400	●	17.4	8.0	23.5	24.5	TLZD2400-M12	●	43	23	M12	11	19	DSW-307H	A-10	MSN-M12-＊＊S-S23C
24.5	TLZ2450	●														
25	TLZ2500	●	18.3	8.0	24.5	25.5	TLZD2500-M12	●	43	24	M12	11	19	DSW-309H	A-10	MSN-M12-＊＊-S25C
25.5	TLZ2550	●														
26	TLZ2600	●	18.8	8.5	25.5	26.5	TLZD2600-M12	●	43	25	M12	11	19	DSW-309H	A-10	MSN-M12-＊＊S-S25C
26.5	TLZ2650	●														
27	TLZ2700	●	19.5	8.5	26.5	27.5	TLZD2700-M12	●	43	26	M12	11	19	DSW-309H	A-10	MSN-M12-＊＊S-S25C
27.5	TLZ2750	●														
28	TLZ2800	●	20.3	9.0	27.5	28.5	TLZD2800-M12	●	43	27	M12	11	19	TSW-3510H	A-15	MSN-M12-＊＊S-S25C
28.5	TLZ2850	●														
29	TLZ2900	●	21.1	9.0	28.5	29.5	TLZD2900-M16	●	51	28	M16	12	22	TSW-3510H	A-15	MSN-M16-＊＊S-S28C
29.5	TLZ2950	●														
30	TLZ3000	●	21.5	9.5	29.5	30.5	TLZD3000-M16	●	51	29	M16	12	22	TSW-3510H	A-15	MSN-M16-＊＊-S32C
30.5	TLZ3050	●														
31	TLZ3100	●	22.3	10.0	30.5	31.5	TLZD3100-M16	●	51	30	M16	12	22	TSW-3512H	A-15	MSN-M16-＊＊-S32C
31.5	TLZ3150	●														
32	TLZ3200	●	23.1	10.0	31.5	32.5	TLZD3200-M16	●	51	31	M16	14	26	TSW-3512H	A-15	MSN-M16-＊＊-S32C

1 insert per case

Clamp screw	Recommended Torque (N·m)
DSW-2045H	0.9
TSW-2556H	1.2
TSW-2567H	1.2
DSW-307H	2.1
DSW-309H	2.1
TSW-3510H	3.0
TSW-3512H	3.0

Note)
1. Refer to pages F68 - F75 for recommended cutting conditions.
2. The insert is not installed in the holder.
3. Refer to page D16 for the recommended tightening torque for the modular head.
4. Refer to page F63 for the insert replacement procedure.
5. From February 2019 production, the wrench and clamp screw seizure preventive agent (MOLY) will not be attached to the main body (sold separately). Please purchase separately.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Mild steel (SS400) Hardness 180HB or less				Carbon steel (S50C) Hardness 280HB or less				Tool steel (SKD61, SKD11) Hardness 255HB or less		Alloy steel (SCM440) Hardness 280-350HB	
Vc (m/min)	70 (φ14～φ32)				70 (φ14～φ32)				70 (φ14～φ32)			
f (mm/rev)	0.04～0.06 (φ14) 0.04～0.08 (φ15～φ18) 0.04～0.09 (φ19～φ23) 0.06～0.12 (φ24～φ28) 0.06～0.14 (φ29～φ32)				0.04～0.06 (φ14) 0.04～0.08 (φ15～φ18) 0.04～0.09 (φ19～φ23) 0.06～0.12 (φ24～φ28) 0.06～0.14 (φ29～φ32)				0.03～0.05 (φ14) 0.03～0.06 (φ15～φ18) 0.04～0.07 (φ19～φ23) 0.05～0.09 (φ24～φ28) 0.06～0.11 (φ29～φ32)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)
14	40	10	1,590	100	40	10	1,590	100	40	10	1,590	80
	60	10	1,590	60	60	10	1,590	60	60	10	1,590	50
	80	10	1,590	60	80	10	1,590	60	80	10	1,590	50
	–	–	–	–	–	–	–	–	–	–	–	–
15	50	11	1,490	110	50	11	1,490	110	50	11	1,490	90
	70	11	1,490	90	70	11	1,490	90	70	11	1,490	70
	110	11	1,490	60	110	11	1,490	60	110	11	1,490	45
16	50	11	1,390	105	50	11	1,390	105	50	11	1,390	85
	70	11	1,390	85	70	11	1,390	85	70	11	1,390	65
	110	11	1,390	55	110	11	1,390	55	110	11	1,390	40
17	50	12	1,310	100	50	12	1,310	100	50	12	1,310	80
	70	12	1,310	80	70	12	1,310	80	70	12	1,310	60
	110	12	1,310	50	110	12	1,310	50	110	12	1,310	40
18	50	13	1,240	100	50	13	1,240	100	50	13	1,240	75
	70	13	1,240	75	70	13	1,240	75	70	13	1,240	55
	110	13	1,240	50	110	13	1,240	50	110	13	1,240	35
19	60	19	1,170	105	60	19	1,170	105	60	19	1,170	85
	80	19	1,170	95	80	19	1,170	95	80	19	1,170	75
	110	19	1,170	70	110	19	1,170	70	110	19	1,170	65
	130	19	1,170	50	130	19	1,170	50	130	19	1,170	45
	–	–	–	–	–	–	–	–	–	–	–	–
20	60	20	1,110	100	60	20	1,110	100	60	20	1,110	80
	80	20	1,110	90	80	20	1,110	90	80	20	1,110	70
	110	20	1,110	70	110	20	1,110	70	110	20	1,110	60
	130	20	1,110	50	130	20	1,110	50	130	20	1,110	40
	–	–	–	–	–	–	–	–	–	–	–	–
21	60	21	1,060	95	60	21	1,060	95	60	21	1,060	75
	80	21	1,060	85	80	21	1,060	85	80	21	1,060	65
	110	21	1,060	65	110	21	1,060	65	110	21	1,060	55
	130	21	1,060	45	130	21	1,060	45	130	21	1,060	35
	–	–	–	–	–	–	–	–	–	–	–	–

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Mild steel (SS400) Hardness 180HB or less				Carbon steel (S50C) Hardness 280HB or less				Tool steel (SKD61, SKD11) Hardness 255HB or less		Alloy steel (SCM440) Hardness 280-350HB	
Vc (m/min)	70 (φ14～φ32)				70 (φ14～φ32)				70 (φ14～φ32)			
f (mm/rev)	0.04～0.06 (φ14) 0.04～0.08 (φ15～φ18) 0.04～0.09 (φ19～φ23) 0.06～0.12 (φ24～φ28) 0.06～0.14 (φ29～φ32)				0.04～0.06 (φ14) 0.04～0.08 (φ15～φ18) 0.04～0.09 (φ19～φ23) 0.06～0.12 (φ24～φ28) 0.06～0.14 (φ29～φ32)				0.03～0.05 (φ14) 0.03～0.06 (φ15～φ18) 0.04～0.07 (φ19～φ23) 0.05～0.09 (φ24～φ28) 0.06～0.11 (φ29～φ32)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)
22	60	22	1,010	90	60	22	1,010	90	60	22	1,010	70
	80	22	1,010	80	80	22	1,010	80	80	22	1,010	60
	110	22	1,010	60	110	22	1,010	60	110	22	1,010	55
	130	22	1,010	40	130	22	1,010	40	130	22	1,010	35
	–	–	–	–	–	–	–	–	–	–	–	–
23	60	23	970	85	60	23	970	85	60	23	970	70
	80	23	970	75	80	23	970	75	80	23	970	60
	110	23	970	55	110	23	970	55	110	23	970	50
	130	23	970	35	130	23	970	35	130	23	970	35
	–	–	–	–	–	–	–	–	–	–	–	–
24	70	24	930	110	70	24	930	110	70	24	930	85
	100	24	930	85	100	24	930	85	100	24	930	75
	150	24	930	65	150	24	930	65	150	24	930	55
	180	24	930	55	180	24	930	55	180	24	930	45
	–	–	–	–	–	–	–	–	–	–	–	–
25	70	25	890	100	70	25	890	100	70	25	890	80
	100	25	890	80	100	25	890	80	100	25	890	70
	150	25	890	60	150	25	890	60	150	25	890	50
	180	25	890	50	180	25	890	50	180	25	890	40
	–	–	–	–	–	–	–	–	–	–	–	–
26	70	26	890	100	70	26	890	100	70	26	860	80
	100	26	890	80	100	26	890	80	100	26	860	70
	150	26	890	60	150	26	890	60	150	26	860	50
	180	26	890	50	180	26	890	50	180	26	860	40
	–	–	–	–	–	–	–	–	–	–	–	–
27	70	27	830	95	70	27	830	95	70	27	830	75
	100	27	830	75	100	27	830	75	100	27	830	65
	150	27	830	55	150	27	830	55	150	27	830	45
	180	27	830	45	180	27	830	45	180	27	830	35
	–	–	–	–	–	–	–	–	–	–	–	–

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Mild steel (SS400) Hardness 180HB or less				Carbon steel (S50C) Hardness 280HB or less				Tool steel (SKD61, SKD11) Hardness 255HB or less		Alloy steel (SCM440) Hardness 280-350HB	
Vc (m/min)	70 (φ14～φ32)				70 (φ14～φ32)				70 (φ14～φ32)			
f (mm/rev)	0.04～0.06 (φ14) 0.04～0.08 (φ15～φ18) 0.04～0.09 (φ19～φ23) 0.06～0.12 (φ24～φ28) 0.06～0.14 (φ29～φ32)				0.04～0.06 (φ14) 0.04～0.08 (φ15～φ18) 0.04～0.09 (φ19～φ23) 0.06～0.12 (φ24～φ28) 0.06～0.14 (φ29～φ32)				0.03～0.05 (φ14) 0.03～0.06 (φ15～φ18) 0.04～0.07 (φ19～φ23) 0.05～0.09 (φ24～φ28) 0.06～0.11 (φ29～φ32)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)
28	70	28	800	95	70	28	800	95	70	28	800	75
	100	28	800	75	100	28	800	75	100	28	800	65
	150	28	800	55	150	28	800	55	150	28	800	45
	180	28	800	45	180	28	800	45	180	28	800	35
	–	–	–	–	–	–	–	–	–	–	–	–
29	80	29	770	105	80	29	770	105	80	29	770	85
	110	29	770	85	110	29	770	85	110	29	770	75
	130	29	770	75	130	29	770	75	130	29	770	65
	150	29	770	70	150	29	770	70	150	29	770	55
	180	29	770	45	180	29	770	45	180	29	770	45
	–	–	–	–	–	–	–	–	–	–	–	–
30	80	30	740	105	80	30	740	105	80	30	740	85
	110	30	740	85	110	30	740	85	110	30	740	75
	130	30	740	75	130	30	740	75	130	30	740	60
	150	30	740	70	150	30	740	70	150	30	740	50
	180	30	740	45	180	30	740	45	180	30	740	40
	–	–	–	–	–	–	–	–	–	–	–	–
31	80	31	720	100	80	31	720	100	80	31	720	80
	110	31	720	80	110	31	720	80	110	31	720	70
	130	31	720	70	130	31	720	70	130	31	720	60
	150	31	720	65	150	31	720	65	150	31	720	50
	180	31	720	40	180	31	720	40	180	31	720	40
	–	–	–	–	–	–	–	–	–	–	–	–
32	80	32	700	100	80	32	700	100	80	32	700	80
	110	32	700	80	110	32	700	80	110	32	700	70
	130	32	700	70	130	32	700	70	130	32	700	60
	150	32	700	60	150	32	700	60	150	32	700	50
	180	32	700	40	180	32	700	40	180	32	700	40
	–	–	–	–	–	–	–	–	–	–	–	–

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Pre-hardened steel (NAK80) Hardness about 40HRC				Cast iron (FC / FCD)				Stainless steel (SUS304)			
Vc (m/min)	40 (φ14～φ32)				100 (φ14～φ32)				100 (φ14～φ32)			
f (mm/rev)	0.02～0.06 (φ14) 0.03～0.07 (φ15～φ18) 0.03～0.08 (φ19～φ23) 0.04～0.10 (φ24～φ28) 0.05～0.13 (φ29～φ32)				0.02～0.07 (φ14) 0.04～0.09 (φ15～φ18) 0.02～0.10 (φ19～φ23) 0.02～0.12 (φ24～φ28) 0.02～0.13 (φ29～φ32)				0.02～0.04 (φ14～φ23) 0.03～0.04 (φ24～φ23)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	H (mm)	n (min⁻¹)	Vf (mm/min)	ℓ (mm)	H (mm)	n (min⁻¹)	Vf (mm/min)
14	40	10	910	50	40	10	2,270	160	40	10	2,270	80
	60	10	910	20	60	10	2,270	100	60	10	2,270	50
	80	10	910	20	80	10	2,270	100	80	10	2,270	50
	–	–	–	–	110	10	2,270	50	–	–	–	–
15	50	11	850	55	50	11	2,120	180	50	11	2,120	80
	70	11	850	45	70	11	2,120	150	70	11	2,120	65
	110	11	850	25	110	11	2,120	90	110	11	2,120	45
16	50	11	800	50	50	11	1,990	170	50	11	1,990	70
	70	11	800	40	70	11	1,990	140	70	11	1,990	60
	110	11	800	20	110	11	1,990	85	110	11	1,990	40
17	50	12	750	50	50	12	1,870	160	50	12	1,870	70
	70	12	750	40	70	12	1,870	130	70	12	1,870	60
	110	12	750	20	110	12	1,870	80	110	12	1,870	40
18	50	13	710	45	50	13	1,770	150	50	13	1,770	65
	70	13	710	35	70	13	1,770	120	70	13	1,770	55
	110	13	710	20	110	13	1,770	75	110	13	1,770	35
19	60	19	670	50	60	19	1,670	155	60	19	1,670	60
	80	19	670	40	80	19	1,670	135	80	19	1,670	50
	110	19	670	30	110	19	1,670	105	110	19	1,670	40
	130	19	670	20	130	19	1,670	75	130	19	1,670	30
	–	–	–	–	180	19	1,670	30	–	–	–	–
20	60	20	640	50	60	20	1,590	150	60	20	1,590	60
	80	20	640	40	80	20	1,590	130	80	20	1,590	50
	110	20	640	30	110	20	1,590	100	110	20	1,590	40
	130	20	640	20	130	20	1,590	70	130	20	1,590	30
	–	–	–	–	180	20	1,590	30	–	–	–	–
21	60	21	610	50	60	21	1,510	140	60	21	1,510	55
	80	21	610	40	80	21	1,510	120	80	21	1,510	45
	110	21	610	30	110	21	1,510	95	110	21	1,510	35
	130	21	610	20	130	21	1,510	65	130	21	1,510	25
	–	–	–	–	180	21	1,510	25	–	–	–	–

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Pre-hardened steel (NAK80) Hardness about 40HRC				Cast iron (FC / FCD)				Stainless steel (SUS304)			
Vc (m/min)	40 (φ14～φ32)				100 (φ14～φ32)				100 (φ14～φ32)			
f (mm/rev)	0.02～0.06 (φ14) 0.03～0.07 (φ15～φ18) 0.03～0.08 (φ19～φ23) 0.04～0.10 (φ24～φ28) 0.05～0.13 (φ29～φ32)				0.02～0.07 (φ14) 0.04～0.09 (φ15～φ18) 0.02～0.10 (φ19～φ23) 0.02～0.12 (φ24～φ28) 0.02～0.13 (φ29～φ32)				0.02～0.04 (φ14～φ23) 0.03～0.04 (φ24～φ23)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)
22	60	22	580	45	60	22	1,450	135	60	22	1,450	55
	80	22	580	35	80	22	1,450	115	80	22	1,450	45
	110	22	580	25	110	22	1,450	90	110	22	1,450	35
	130	22	580	15	130	22	1,450	65	130	22	1,450	25
	–	–	–	–	180	22	1,450	25	–	–	–	–
23	60	23	550	45	60	23	1,380	130	60	23	1,380	50
	80	23	550	35	80	23	1,380	110	80	23	1,380	40
	110	23	550	25	110	23	1,380	85	110	23	1,380	35
	130	23	550	15	130	23	1,380	60	130	23	1,380	25
	–	–	–	–	180	23	1,380	25	–	–	–	–
24	70	24	530	55	70	24	1,330	150	70	24	1,330	55
	100	24	530	45	100	24	1,330	120	100	24	1,330	45
	150	24	530	30	150	24	1,330	85	150	24	1,330	35
	180	24	530	20	180	24	1,330	75	180	24	1,330	35
	–	–	–	–	200	24	1,330	35	–	–	–	–
25	70	25	510	50	70	25	1,270	145	70	25	1,270	50
	100	25	510	40	100	25	1,270	115	100	25	1,270	40
	150	25	510	30	150	25	1,270	80	150	25	1,270	30
	180	25	510	20	180	25	1,270	70	180	25	1,270	30
	–	–	-	-	200	25	1,270	30	–	–	–	–
26	70	26	490	50	70	26	1,220	140	70	26	1,220	50
	100	26	490	40	100	26	1,220	110	100	26	1,220	40
	150	26	490	30	150	26	1,220	80	150	26	1,220	30
	180	26	490	20	180	26	1,220	70	180	26	1,220	30
	–	–	–	–	200	26	1,220	30	–	–	–	–
27	70	27	470	50	70	27	1,180	135	70	27	1,180	50
	100	27	470	40	100	27	1,180	105	100	27	1,180	40
	150	27	470	30	150	27	1,180	75	150	27	1,180	30
	180	27	470	20	180	27	1,180	65	180	27	1,180	30
	–	–	–	–	200	27	1,180	30	–	–	–	–

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Pre-hardened steel (NAK80) Hardness about 40HRC				Cast iron (FC / FCD)				Stainless steel (SUS304)			
Vc (m/min)	40 (φ14～φ32)				100 (φ14～φ32)				100 (φ14～φ32)			
f (mm/rev)	0.02～0.06 (φ14) 0.03～0.07 (φ15～φ18) 0.03～0.08 (φ19～φ23) 0.04～0.10 (φ24～φ28) 0.05～0.13 (φ29～φ32)				0.02～0.07 (φ14) 0.04～0.09 (φ15～φ18) 0.02～0.10 (φ19～φ23) 0.02～0.12 (φ24～φ28) 0.02～0.13 (φ29～φ32)				0.02～0.04 (φ14～φ23) 0.03～0.04 (φ24～φ23)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)
28	70	28	450	45	70	28	1,140	130	70	28	1,140	45
	100	28	450	35	100	28	1,140	100	100	28	1,140	35
	150	28	450	30	150	28	1,140	75	150	28	1,140	25
	180	28	450	20	180	28	1,140	65	180	28	1,140	25
	–	–	–	–	200	28	1,140	30	–	–	–	–
29	80	29	440	55	80	29	1,100	140	80	29	1,100	45
	110	29	440	45	110	29	1,100	110	110	29	1,100	45
	130	29	440	40	130	29	1,100	100	130	29	1,100	40
	150	29	440	30	150	29	1,100	90	150	29	1,100	30
	180	29	440	20	180	29	1,100	55	180	29	1,100	30
	–	–	–	–	210	29	1,100	20	–	–	–	–
30	80	30	420	50	80	30	1,060	135	80	30	1,060	40
	110	30	420	40	110	30	1,060	105	110	30	1,060	40
	130	30	420	35	130	30	1,060	95	130	30	1,060	35
	150	30	420	30	150	30	1,060	85	150	30	1,060	30
	180	30	420	20	180	30	1,060	50	180	30	1,060	30
	–	–	–	–	210	30	1,060	20	–	–	–	–
31	80	31	410	50	80	31	1,030	130	80	31	1,030	40
	110	31	410	40	110	31	1,030	100	110	31	1,030	40
	130	31	410	35	130	31	1,030	90	130	31	1,030	35
	150	31	410	30	150	31	1,030	80	150	31	1,030	30
	180	31	410	20	180	31	1,030	50	180	31	1,030	30
	–	–	–	–	210	31	1,030	20	–	–	–	–
32	80	32	400	50	80	32	1,000	130	80	32	1,000	40
	110	32	400	40	110	32	1,000	100	110	32	1,000	40
	130	32	400	35	130	32	1,000	90	130	32	1,000	35
	150	32	400	30	150	32	1,000	80	150	32	1,000	30
	180	32	400	20	180	32	1,000	50	180	32	1,000	30
	–	–	–	–	210	32	1,000	20	–	–	–	–

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Aluminum alloy (AC / ADC)			
Vc (m/min)	100 (φ14～φ32)			
f (mm/rev)	0.02～0.07 (φ14) 0.04～0.09 (φ15～φ18) 0.02～0.10 (φ19～φ23) 0.02～0.12 (φ24～φ28) 0.02～0.13 (φ29～φ32)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min⁻¹)	Vf (mm/min)
14	40	10	2,270	160
	60	10	2,270	100
	80	10	2,270	100
	110	10	2,270	50
15	50	11	2,120	180
	70	11	2,120	150
	110	11	2,120	90
16	50	11	1,990	170
	70	11	1,990	140
	110	11	1,990	85
17	50	12	1,870	160
	70	12	1,870	130
	110	12	1,870	80
18	50	13	1,770	150
	70	13	1,770	120
	110	13	1,770	75
19	60	19	1,670	155
	80	19	1,670	135
	110	19	1,670	105
	130	19	1,670	75
	180	19	1,670	30
20	60	20	1,590	150
	80	20	1,590	130
	110	20	1,590	100
	130	20	1,590	70
	180	20	1,590	30
21	60	21	1,510	140
	80	21	1,510	120
	110	21	1,510	95
	130	21	1,510	65
	180	21	1,510	25

Work Materials	Aluminum alloy (AC / ADC)			
Vc (m/min)	100 (φ14～φ32)			
f (mm/rev)	0.02～0.07 (φ14) 0.04～0.09 (φ15～φ18) 0.02～0.10 (φ19～φ23) 0.02～0.12 (φ24～φ28) 0.02～0.13 (φ29～φ32)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min⁻¹)	Vf (mm/min)
22	60	22	1,450	135
	80	22	1,450	115
	110	22	1,450	90
	130	22	1,450	65
	180	22	1,450	25
23	60	23	1,380	130
	80	23	1,380	110
	110	23	1,380	85
	130	23	1,380	60
	180	23	1,380	25
24	70	24	1,330	150
	100	24	1,330	120
	150	24	1,330	85
	180	24	1,330	75
	200	24	1,330	35
25	70	25	1,270	145
	100	25	1,270	115
	150	25	1,270	80
	180	25	1,270	70
	200	25	1,270	30
26	70	26	1,220	140
	100	26	1,220	110
	150	26	1,220	80
	180	26	1,220	70
	200	26	1,220	30
27	70	27	1,180	135
	100	27	1,180	105
	150	27	1,180	75
	180	27	1,180	65
	200	27	1,180	30

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth n: Tool rotation speed
Vf: Feed speed f: Feed amount

NOTE

Please refer to page F75

For drilling

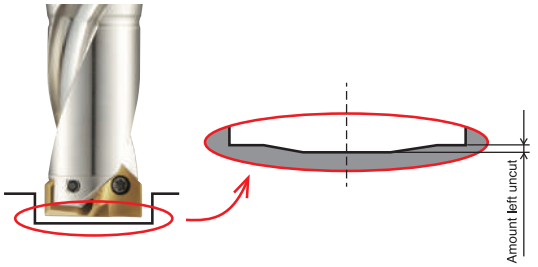
Spot Facing Drill Modular Head TLZD TYPE

RECOMMENDED CUTTING CONDITIONS

Work Materials	Aluminum alloy (AC / ADC)			
Vc (m/min)	100 (ϕ14～ϕ32)			
f (mm/rev)	0.02～0.07 (ϕ14) 0.04～0.09 (ϕ15～ϕ18) 0.02～0.10 (ϕ19～ϕ23) 0.02～0.12 (ϕ24～ϕ28) 0.02～0.13 (ϕ29～ϕ32)			
Drill diameter (mm)	ℓ (mm)	H (mm)	n (min^{-1})	Vf (mm/min)
28	70	28	1,140	130
	100	28	1,140	100
	150	28	1,140	75
	180	28	1,140	65
	200	28	1,140	30
29	80	29	1,100	140
	110	29	1,100	110
	130	29	1,100	100
	150	29	1,100	90
	180	29	1,100	55
	210	29	1,100	20
30	80	30	1,060	135
	110	30	1,060	105
	130	30	1,060	95
	150	30	1,060	85
	180	30	1,060	50
	210	30	1,060	20
31	80	31	1,030	130
	110	31	1,030	100
	130	31	1,030	90
	150	31	1,030	80
	180	31	1,030	50
	210	31	1,030	20
32	80	32	1,000	130
	110	32	1,000	100
	130	32	1,000	90
	150	32	1,000	80
	180	32	1,000	50
	210	32	1,000	20

Vc: Cutting speed ℓ: Overhang length H: Maximum hole depth
n: Tool rotation speed Vf: Feed speed f: Feed amount

Uncut shape



Tool diameter (mm)	Amount left uncut (mm)
ϕ14～ϕ20.5	0.04～0.06
ϕ21～ϕ26.5	0.05～0.07
ϕ27～ϕ32.0	0.06～0.08

NOTE

1) The above recommended cutting conditions indicate the conditions for flat surface machining. For tilted surface machining, reduce the feed rate to 40-80% if the tilt angle is less than 30 °. Also, if the tilt angle is 30 ° or more, reduce the feed rate to 20 to 50%.
2) The above recommended cutting conditions are the conditions when a water-soluble cutting fluid is used. If it is a dry type, use air blow to remove chips.
3) If the hole depth is deeper than the above H value, be careful not to cause chip clogging by pilot hole drilling or step machining.
4) Horizontal feed is not possible.
5) Chips may grow long depending on the nature of the work material and the shape of the work. Since there is a possibility of "increasing the hole diameter", "scratching the wall surface", and "tool damage due to chip clogging", perform "feed up", "step machining", etc. to divide the chips. However, in the case of stainless steel machining, it is not suitable to increase the feed and divide the chips, so increase the cutting speed and decrease the feed to generate connected chips.
6) Uncut parts will occur during machining. See above for details.

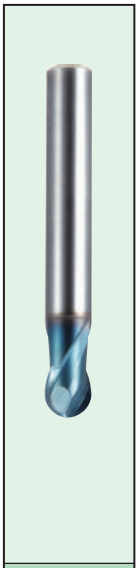
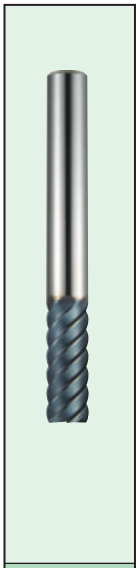
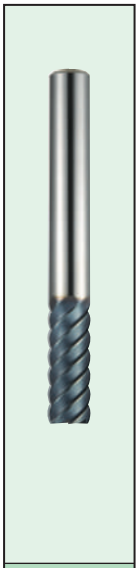
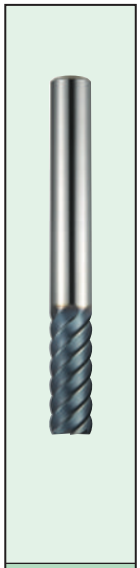
2022-23

DIJET®

Products Guide Vol.4

Solid end mill

List of square end mills

Application	For high hardness materials						
							
Page	G06	G11	G12	G13	G14	G14	G20
Cat. No.	SFSB	SEHS SEHH	SEHH-R02	SEHH-R	SEHM	SEHL	DH-OCHB
No. of flutes	2 flutes	4-6 flutes	4-6 flutes	4-6 flutes	6 flutes	6 flutes	4 flutes
Helix angle	30°	50°	50°	50°	50°	50°	45°
Flute length	Short	Short / Regular	Regular	Regular	Medium	Long	Regular
Dia.	φ1～φ12	φ1～φ20	φ3～φ20	φ3～φ20	φ6～φ20	φ6～φ20	φ3～φ12
Coated	DH coat	DH coat	DH coat	DH coat	DH coat	DH coat	DH coat
Carbon steel Alloy steel	◎						◎
Hardened steel ~45HRC	◎	◎	◎	◎	◎	◎	◎
Hardened steel ~50HRC	◎	◎	◎	◎	◎	◎	◎
Hardened steel ~65HRC	◎ (～70HRC)	◎ (～70HRC)	◎ (～70HRC)	◎ (～70HRC)	◎ (～70HRC)	◎ (～70HRC)	◎ (～70HRC)
Stainless steel							
Cast iron	◎	◎	◎	◎	◎	◎	
Aluminium alloy							
Copper alloy							
Graphite							
Heat resistant alloy Titanium alloy							
Plastic							

◎ : First choice, Good condition　○ : Moderate condition

For heat resistant alloys	General purpose	Aluminum high efficiency For helical processing
		Coolant Hole
G23	**G25**	**G33**
DV-SCMS	**DV-SOCS3**	**AL-OCHE**
6-8 flutes	3 flutes	2 flutes
45°	45°	30°
Regular	Regular	Regular
ϕ6～ϕ16	ϕ3～ϕ20	ϕ4～ϕ16
Value coat	Value coat	DLC coat
○	◎	
○	◎	
	◎	
◎	◎	
	◎	◎
◎	○	

◎ : First choice, Good condition　○ : Moderate condition

For Ball End mill

Hard 1 Ball Hard 1 series SFSB TYPE

1 Ball hard

Features 1

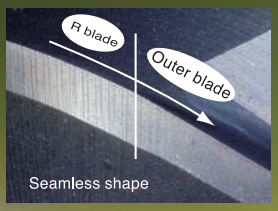
Supports a wide range from roughing to finishing,
Highly efficient machining is possible with a super short type with a blade length of 1D.

Features 2

The R accuracy of the ball cutting edge is ± 0.005 mm, The ball R cutting edge and the outer peripheral cutting edge adopt a seamless shape, Good finished surface and during machining suppresses chipping.

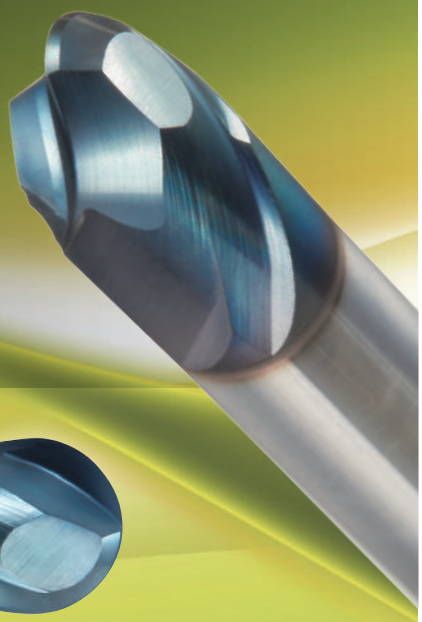
Features 3

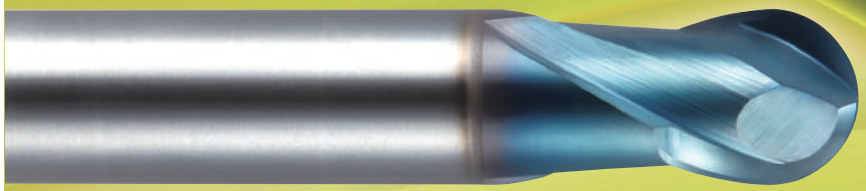
Has rigidity and accuracy at high speed rotation For shrink-fitting holders and hydro grip has adaptive shank accuracy (h5).



Features 4

Achieves long-term, high-precision machining by cutting high-hardness materials. Uses PVD coating grade "DH110".
Ultra-fine grain cemented carbide with excellent cutting edge and With the new coating film "DH1" composed of nano-multilayer film Achieved a long life for machining high hardness materials.





New PVD coating <DH1 coat>

Because it has higher hardness and higher oxidation start temperature than the conventional coating film, Demonstrates stable cutting performance in high-speed dry machining of high-hardness materials.

Characteristics of each PVD coating film

	DH1 coat (hard coat)	DV coat (value coat)	DZ coat (TiAlN)
Vickers hardness (Hv)	3,500～3,700	3,300～3,500	2,800～2,900
Oxidation start temperature (° C)	1,100～1,200	1,000～1,100	700～800
Coefficient of friction	0.5	0.65	0.6

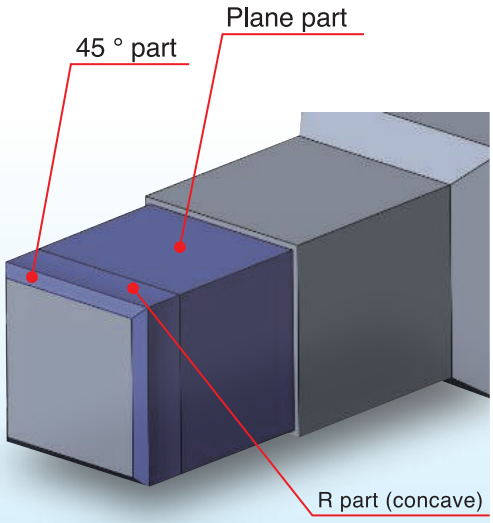
For Ball End mill

Hard 1 Ball Hard 1 series SFSB TYPE

CUTTING PERFORMANCE

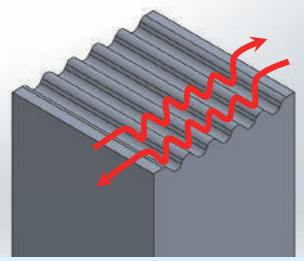
1. Surface accuracy (high speed hardness steel <61-65HRC>)

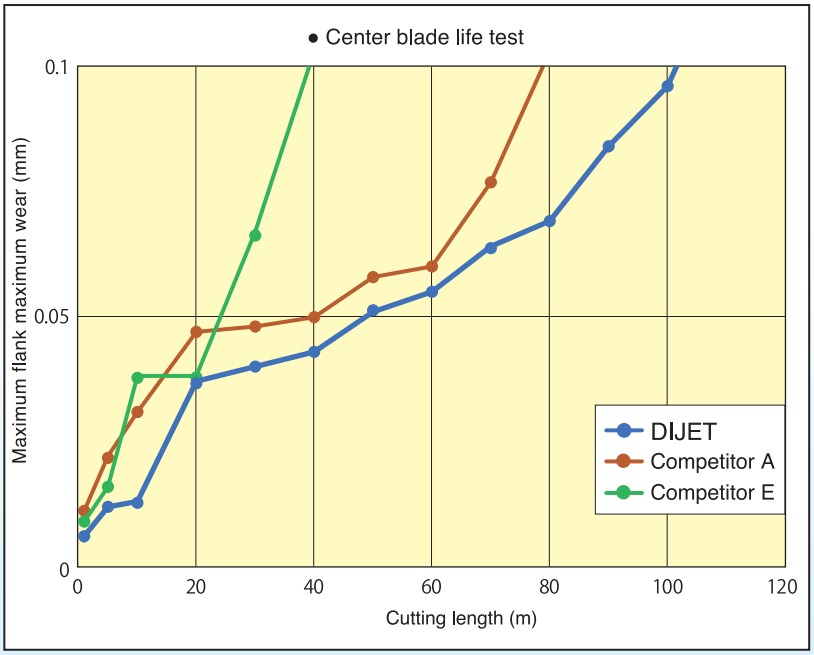
Work material	name	Earring punch	
	Hardness	SKH51 (61-65HRC)	
Tool	Tool diameter ϕ3	Competitor's product	Hard 1 ball
		Solid ball End mill	SFSB2030-S6
Cutting conditions	Rotation speed: n (min-1)	16,500	
	Cutting speed: Vc (m / min)	155	
	Number of blades: z (sheets)	2	
	Feed rate: Vf (mm / min)	1,000	
	Feed amount: f (mm / rev)	0.06	
	Axial depth of cut: ap (mm)	0.05	
	Radial depth of cut: ae (mm)	0.05	
Result	Plane surface roughness Ra average (μm)	0.438	0.252
	R part surface roughness Ra average (μm)	0.266	0.152
	In terms of surface roughness Ra average, hard 1 ball is significantly compared to other competitor's products. Improved surface accuracy. Good evaluation within the product standard upper limit RaMAX 0.3.		



2. Life comparison (SKD11 <60HRC>)

Work material	SKD11
Hardness	60HRC
Work tools	ϕ3
Cutting conditions	Vc = 170m / min n = 18,000min-1 Vf = 1,500mm / min f = 0.083mm / rev ap = 0.15mm ae = 0.3mm Air blow Burn-in holder: HSK-A63 type used





Result

Hard 1 ball has a long life of about 1.4 times that of competitor A and about 2.8 times that of competitor E.

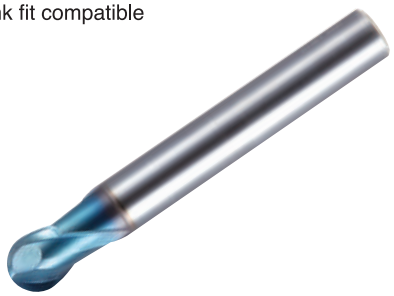
For Ball End mill

Hard 1 Ball

Hard 1 series

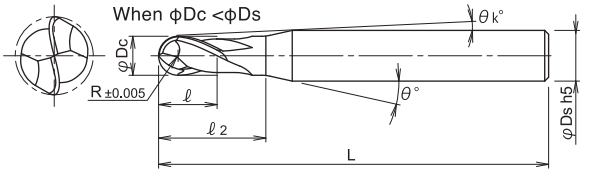
SFSB TYPE

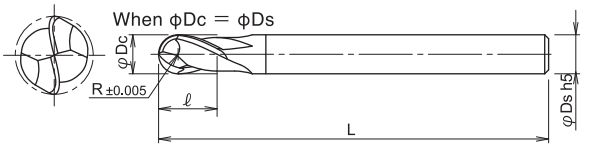
- For machining high hardness materials (70HRC compatible)
- 2-flute, helix angle 30 °
- Shrink fit compatible



DH Hard coated

Copy Milling | Pocket Milling | Slotting





■ **Ball radius tolerance (mm)**

Ball radius	R tolerance
R0.5～R6	±0.005

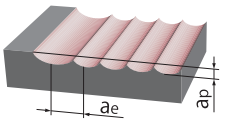
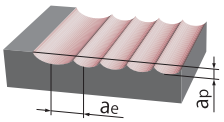
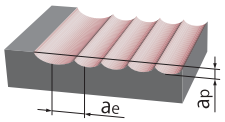
Cat. No.	Stock	Grade	Dimensions (mm)								Fig.
			R	φDc	ℓ	ℓ 2	L	φDs	θ	θk	
SFSB2010	●	DH110	0.5	1	1	1.5	40	4	12°	10.49°	1
SFSB2010-S6	●		0.5	1	1	1.5	40	6	12°	11.04°	1
SFSB2020	●		1	2	2	2.5	40	4	10°	7.86°	1
SFSB2020-S6	●		1	2	2	2.5	40	6	10°	8.8°	1
SFSB2030	●		1.5	3	3	4	40	4	10°	5.29°	1
SFSB2030-S6	●		1.5	3	3	4	40	6	10°	7.69°	1
SFSB2040	●		2	4	4	—	40	4	—	—	2
SFSB2040-S6	●		2	4	4	5	40	6	8°	5.59°	1
SFSB2050	●		2.5	5	5	6	50	6	5°	2.79°	1
SFSB2060	●		3	6	6	—	50	6	—	—	2
SFSB2080	●		4	8	8	—	60	8	—	—	2
SFSB2100	●		5	10	10	—	60	10	—	—	2
SFSB2120	●		6	12	12	—	60	12	—	—	2

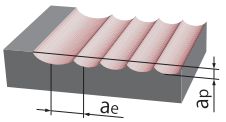
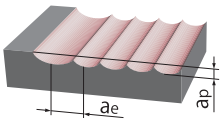
Note) Refer to pages G07 - G08 for recommended cutting conditions.

For Ball End mill

Hard 1 Ball Hard 1 series SFSB TYPE

Recommended cutting conditions (rough / intermediate finishing)

Work Material	Carbon steel (S50C, S55C) Hardness ~ 250HB		Alloy steel, tool steel, pre-hardened steel (SKD, SKH, NAK) Hardness ~ 45HRC		Hardened steel (SKD61, DAC, DHA) Hardness 42-52HRC	
Machining shape	 ap≦0.1Dc ae≦0.3Dc		 ap≦0.1Dc ae≦0.3Dc		 ap≦0.1Dc (MAX 0.5mm) ae≦0.3Dc	
Tool diameter R (mm)	Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
0.5	1	31,800	1,590	31,800	1,590	30,200	1,210
1	2	23,900	1,910	23,900	1,910	22,300	1,560
1.5	3	19,100	2,480	19,100	2,290	18,000	1,800
2	4	14,300	2,290	14,300	2,150	13,500	1,620
2.5	5	11,500	2,190	11,500	2,070	10,800	1,620
3	6	9,500	2,090	9,500	1,900	9,000	1,620
4	8	7,200	1,940	7,200	1,800	6,800	1,500
5	10	5,700	1,820	5,700	1,710	5,400	1,460
6	12	4,800	1,540	4,800	1,440	4,500	1,220

Work material	Hardened steel (SKD11, SKH51, SLD) Hardness 55-62HRC		Hardened steel (SKH, HAP) Hardness 63-70HRC	
Machining shape	 ap≦0.05Dc (MAX 0.3mm) ae≦0.15Dc		 ap≦0.05Dc (MAX 0.3mm) ae≦0.15Dc	
Tool diameter R (mm)	Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
0.5	1	28,600	1,140	27,100	810
1	2	19,100	1,150	17,500	700
1.5	3	17,000	1,360	14,900	890
2	4	12,700	1,270	11,100	890
2.5	5	10,200	1,220	8,900	890
3	6	8,500	1,280	7,400	890
4	8	6,400	1,280	5,600	840
5	10	5,100	1,280	4,500	900
6	12	4,200	1,050	3,700	740

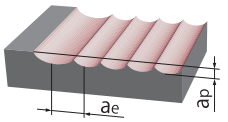
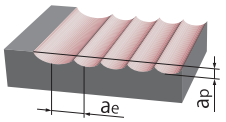
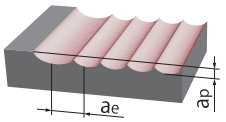
NOTE

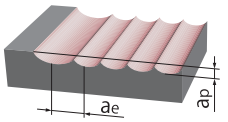
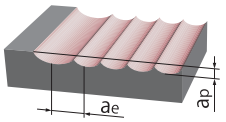
1) The recommended cutting conditions in the above table show general guideline conditions. If the tilt angle is 15 ° or more, reduce 70% from the above condition table. Please use it as a guide.
2) Vibration and abnormal noise may occur if the mounting rigidity of the machine or workpiece is not sufficient, or if the protrusion length is long. In that case, adjust the conditions such as lowering the rotation speed and feed speed.
3) If the rotation speed of the machine is insufficient, reduce the rotation speed and feed rate by the same ratio.

For Ball End mill

Hard 1 Ball Hard 1 series SFSB TYPE

SFSB type standard cutting conditions (finishing)

Work Material	Carbon steel (S50C, S55C) Hardness ~ 250HB		Alloy steel, tool steel, pre-hardened steel (SKD, SKH, NAK) Hardness ~ 45HRC		Hardened steel (SKD61, DAC, DHA) Hardness 42-52HRC	
Machining shape	 ap≦0.05Dc ae≦0.02Dc		 ap≦0.05Dc ae≦0.02Dc		 ap≦0.05Dc ae≦0.02Dc	
Tool diameter R (mm)	Tool diameter ϕDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
0.5	1	38,200	3,440	38,200	3,440	35,000	2,450
1	2	27,100	3,250	27,100	3,250	25,500	2,550
1.5	3	21,200	3,390	21,200	3,180	20,200	2,630
2	4	15,900	3,340	15,900	3,180	15,100	2,270
2.5	5	12,700	2,670	12,700	2,540	12,100	2,420
3	6	10,600	2,860	10,600	2,650	10,100	2,530
4	8	8,000	2,560	8,000	2,400	7,600	2,280
5	10	6,400	2,370	6,400	2,240	6,000	1,920
6	12	5,300	1,960	5,300	1,860	5,000	1,600

Work Material	Hardened steel (SKD11, SKH51, SLD) Hardness 55-62HRC		Hardened steel (SKH, HAP) Hardness 63-70HRC	
Machining shape	 ap≦0.05Dc ae≦0.02Dc		 ap≦0.03Dc ae≦0.02Dc	
Tool diameter R (mm)	Tool diameter ϕDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
0.5	1	31,800	1,590	30,200	1,210
1	2	22,300	2,010	19,100	1,530
1.5	3	19,100	2,290	15,900	1,910
2	4	14,300	2,150	11,900	1,790
2.5	5	11,500	2,070	9,500	1,710
3	6	9,500	1,900	8,000	1,600
4	8	7,200	1,800	6,000	1,200
5	10	5,700	1,710	4,800	1,200
6	12	4,800	1,440	4,000	1,000

NOTE

1) The recommended cutting conditions in the above table show general guideline conditions. If the tilt angle is 15 ° or more, reduce 70% from the above condition table. Please use it as a guide.
2) Vibration and abnormal noise may occur if the mounting rigidity of the machine or workpiece is not sufficient, or if the protrusion length is long. In that case, adjust the conditions such as lowering the rotation speed and feed speed.
3) If the rotation speed of the machine is insufficient, reduce the rotation speed and feed rate by the same ratio.

Square End mill

One-Cut 70 (DH coat) SEHS / SEHH TYPE

One-Cut 70
70HRC compatible

Features 1

The body design with thick core rigidity minimizes tool edge chipping & minimizes vibration on the tool. Achieves high-speed, high-efficiency machining of high-hardness materials.

Features 2

By adopting a unique cutting edge shape, cutting resistance is reduced and High-precision machining from mid-finishing to finishing is possible.

Features 3

Cutting of high hardness material for a long time PVD coating grade that realizes high-precision machining "DH102" is adopted. The new coating film "DH1" Consists of nano-multilayer film, high temperature oxidation resistance, impact resistance, Excellent film toughness and adhesion.
Double the machining life with high hardness material machining (Compared to other competitor's products) can be obtained.

New PVD coating <DH1 (Dijet Hard) coat>

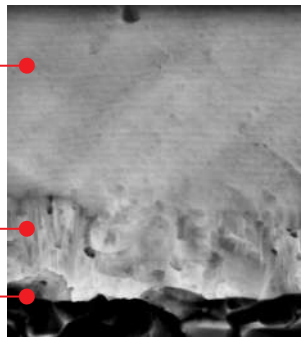
Because it has higher hardness and higher oxidation temperature than the conventional coating layer, demonstrates stable cutting performance in high-speed dry machining of high-hardness materials.

Characteristics of each PVD coating film

	DH1 coat (hard coat)	DV coat (value coat)	DZ coat (TiAlN)
Vickers hardness (Hv)	3,500～3,700	3,300～3,500	2,800～2,900
Oxidation start temperature (° C)	1,100～1,200	1,000～1,100	700～800
Coefficient of friction	0.5	0.65	0.6

Features of DH1 coat

- AlCr-based with significantly improved hardness and oxidation resistance Hard coating.
- The super-multilayered coating avoids formation of cracks.
- Ideal for mid-finishing to finishing of high hardness materials.



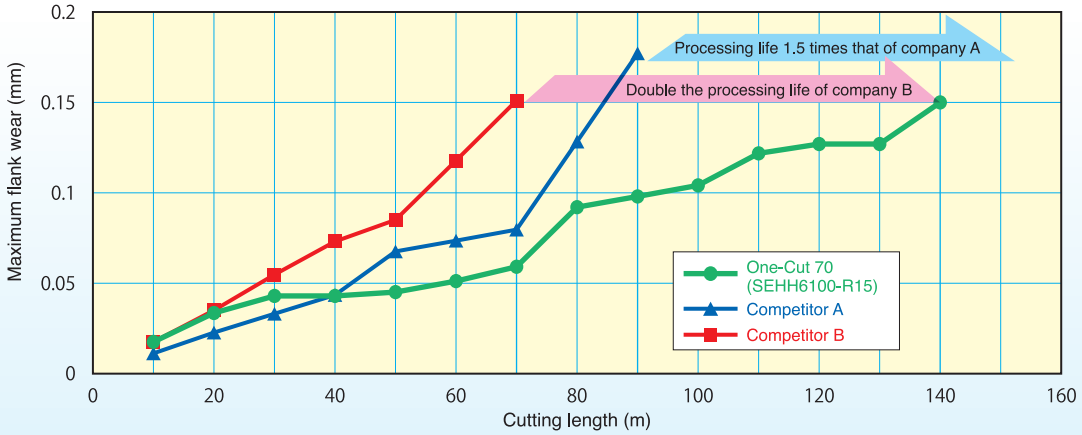
Square End mill

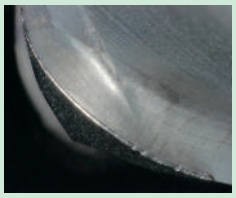
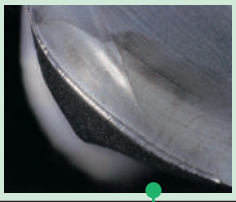
One-Cut 70 (DH coat) SEHS / SEHH TYPE

Cutting performance

Life comparison

- Work material: SKD11 (60HRC)
- Model number: SEHH6100-R15 (ϕ10)
- Cutting conditions: Vc = 150m / min, f = 0.6mm / rev, ap = 3mm, ae = 0.3mm
  Down cut, air blow

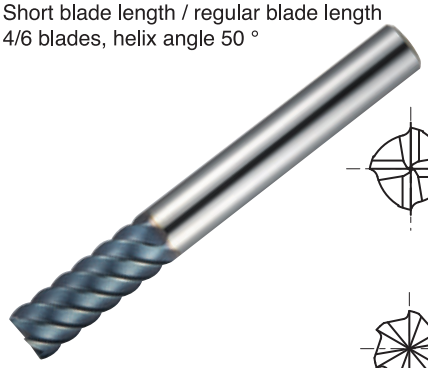


	70m	90m	140m
One-Cut 70 SEHH6100-R15			
Competitor B		Corner R and outer blade Damage from the joint	No damage

Square End mill

One-Cut 70 (DH coat) SEHS / SEHH TYPE

- For machining high hardness materials (70HRC compatible)
- Short blade length / regular blade length
- 4/6 blades, helix angle 50 °



DH Hard coated | Sharp Corner | Shoulder milling

Fig.1 When φDc <3

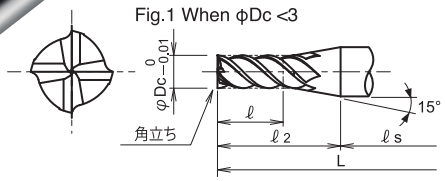


Fig.2 When φDc ≧ 3

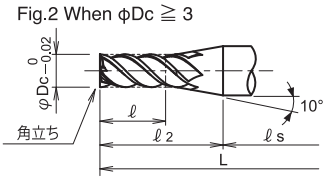
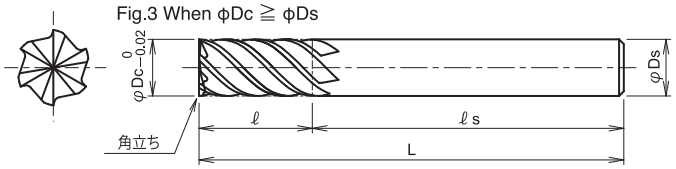


Fig.3 When φDc ≧ φDs



	Cat. No.	Stock	Grade	No. of blades	Dimensions (mm) φDc	ℓ	ℓ2	ℓs	L	φDs	Fig.
Short	SEHS4010	●	DH102	4	1	2	12	48	60	6	1
	SEHS4020	●		4	2	4	12	48	60	6	1
	SEHS4030	●		4	3	7	17	43	60	6	2
	SEHS4040	●		4	4	9	16	44	60	6	2
	SEHS4050	●		4	5	12	16	44	60	6	2
	SEHS6060	●		6	6	13	–	47	60	6	3
Regular	SEHH4010	●	DH102	4	1	3.5	13	47	60	6	1
	SEHH4015	●		4	1.5	5	14	46	60	6	1
	SEHH4020	●		4	2	7	15	45	60	6	1
	SEHH4025	●		4	2.5	8	15	45	60	6	1
	SEHH4030	●		4	3	10	20	40	60	6	2
	SEHH4035	●		4	3.5	12	20	40	60	6	2
	SEHH4040	●		4	4	12	19	41	60	6	2
	SEHH4045	●		4	4.5	15	20	40	60	6	2
	SEHH4050	●		4	5	15	19	41	60	6	2
	SEHH4055	●		4	5.5	15	18	42	60	6	2
	SEHH6060	●		6	6	15	–	45	60	6	3
	SEHH6065	●		6	6.5	20	25	50	75	8	2
	SEHH6070	●		6	7	20	24	51	75	8	2
	SEHH6075	●		6	7.5	20	22	53	75	8	2
	SEHH6080	●		6	8	20	–	55	75	8	3
	SEHH6085	●		6	8.5	25	30	50	80	10	2
	SEHH6090	●		6	9	25	29	51	80	10	2
	SEHH6095	●		6	9.5	25	27	53	80	10	2
	SEHH6100	●		6	10	25	–	55	80	10	3
	SEHH6105	●		6	10.5	30	35	65	100	12	2
	SEHH6110	●		6	11	30	34	66	100	12	2
	SEHH6120	●		6	12	30	–	70	100	12	3
	SEHH6130	●		6	13	35	45	60	105	16	2
	SEHH6140	●		6	14	35	42	63	105	16	2
	SEHH6150	●		6	15	40	44	66	110	16	2
	SEHH6160	●		6	16	40	–	70	110	16	3
	SEHH6180	●		6	18	40	47	73	120	20	2
	SEHH6200	●		6	20	45	–	80	125	20	3

Note) Refer to pages G16 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Square End mill

One-Cut 70 (DH coat) SEHH-R02 TYPE

A minute R is attached to the corner of the cutting edge tip, and the corner Resolve chipping

- For machining high hardness materials (70HRC compatible)
- 4/6 blades, helix angle 50 °
- With corner R0.2

Fig.1 When φDc <φDs

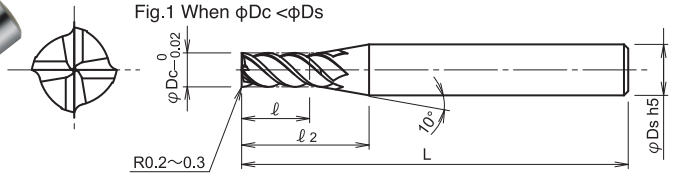
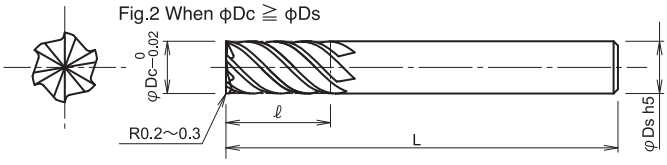


Fig.2 When φDc ≧ φDs



Cat. No.	Stock	Grade	No. of blades	Dimensions (mm)					Fig.
				φDc	ℓ	ℓ2	L	φDs	
SEHH4030-R02	●	DH102	4	3	10	20	60	6	1
SEHH4040-R02	●		4	4	12	19	60	6	1
SEHH4050-R02	●		4	5	15	19	60	6	1
SEHH6060-R02	●		6	6	15	–	60	6	2
SEHH6070-R02	●		6	7	20	24	75	8	1
SEHH6080-R02	●		6	8	20	–	75	8	2
SEHH6090-R02	●		6	9	25	29	80	10	1
SEHH6100-R02	●		6	10	25	–	80	10	2
SEHH6120-R02	●		6	12	30	–	100	12	2
SEHH6160-R02	●		6	16	40	–	110	16	2
SEHH6200-R02	●		6	20	45	–	125	20	2

Note) Refer to pages G16 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Square End mill

One-Cut 70 (DH coat) SEHH-R TYPE

- For machining high hardness materials (70HRC compatible)
- Regular length end mill
- 4/6 blades, helix angle 50 °

Fig.1 When φDc <φDs

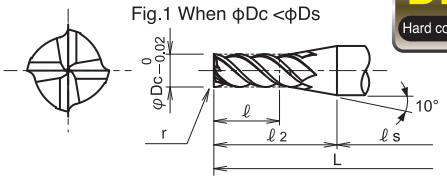
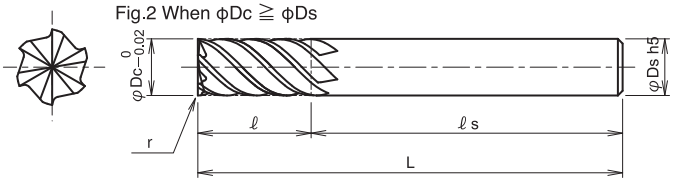


Fig.2 When φDc ≧ φDs



Cat. No.	Stock	Grade	No. of blades	Dimensions (mm) φDc	r	ℓ	ℓ 2	ℓ s	L	φDs	Fig.
SEHH4030-R03	●	DH102	4	3	0.3	10	20	40	60	6	1
SEHH4030-R05	●		4	3	0.5	10	20	40	60	6	1
SEHH4040-R03	●		4	4	0.3	12	19	41	60	6	1
SEHH4040-R05	●		4	4	0.5	12	19	41	60	6	1
SEHH4050-R03	●		4	5	0.3	15	19	41	60	6	1
SEHH4050-R05	●		4	5	0.5	15	19	41	60	6	1
SEHH6060-R03	●		6	6	0.3	15	–	45	60	6	2
SEHH6060-R05	●		6	6	0.5	15	–	45	60	6	2
SEHH6060-R10	●		6	6	1	15	–	45	60	6	2
SEHH6080-R03	●		6	8	0.3	20	–	55	75	8	2
SEHH6080-R05	●		6	8	0.5	20	–	55	75	8	2
SEHH6080-R10	●		6	8	1	20	–	55	75	8	2
SEHH6100-R03	●		6	10	0.3	25	–	55	80	10	2
SEHH6100-R05	●		6	10	0.5	25	–	55	80	10	2
SEHH6100-R10	●		6	10	1	25	–	55	80	10	2
SEHH6100-R15	●		6	10	1.5	25	–	55	80	10	2
SEHH6120-R03	●		6	12	0.3	30	–	70	100	12	2
SEHH6120-R05	●		6	12	0.5	30	–	70	100	12	2
SEHH6120-R10	●		6	12	1	30	–	70	100	12	2
SEHH6120-R15	●		6	12	1.5	30	–	70	100	12	2
SEHH6160-R03	●		6	16	0.3	40	–	70	110	16	2
SEHH6160-R05	●		6	16	0.5	40	–	70	110	16	2
SEHH6160-R10	●		6	16	1	40	–	70	110	16	2
SEHH6160-R15	●		6	16	1.5	40	–	70	110	16	2
SEHH6200-R03	●		6	20	0.3	45	–	80	125	20	2
SEHH6200-R05	●		6	20	0.5	45	–	80	125	20	2
SEHH6200-R10	●		6	20	1	45	–	80	125	20	2
SEHH6200-R15	●		6	20	1.5	45	–	80	125	20	2

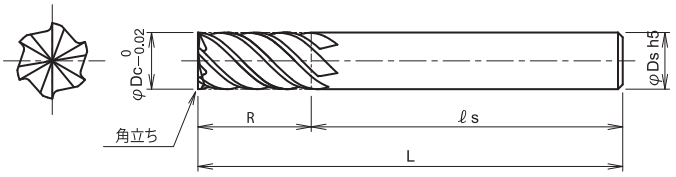
Note) Refer to pages G16 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Square End mill

One-Cut 70 (DH coat) SEHM / SEHL TYPE

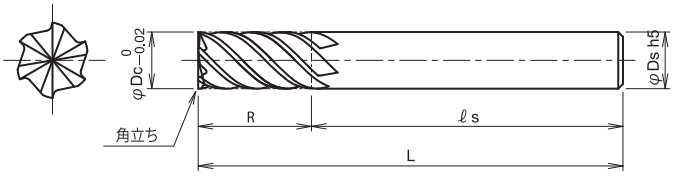
- For machining high hardness materials (70HRC compatible) - SEHM type
- Middle length end mill
- 6 blades, helix angle 50 °



Cat. No.	Stock	Grade	No. of blades	Dimensions (mm)				
				φDc	ℓ	ℓ2	L	φDs
SEHM6060	●	DH102	6	6	20	45	65	6
SEHM6080	●		6	8	28	52	80	8
SEHM6100	●		6	10	35	55	90	10
SEHM6120	●		6	12	45	65	110	12
SEHM6160	●		6	16	55	65	120	16
SEHM6200	●		6	20	60	80	140	20

Note) Refer to pages G16 for recommended cutting conditions.

- For machining high hardness materials (70HRC compatible) - SEHL type
- Long length end mill
- 6 blades, helix angle 50 °



Cat. No.	Stock	Grade	No. of blades	Dimensions (mm)				
				φDc	ℓ	ℓ2	L	φDs
SEHL6060	●	DH102	6	6	26	44	70	6
SEHL6080	●		6	8	36	54	90	8
SEHL6100	●		6	10	46	54	100	10
SEHL6120	●		6	12	56	64	120	12
SEHL6160	●		6	16	66	69	135	16
SEHL6200	●		6	20	76	79	155	20

Note) Refer to pages G17 for recommended cutting conditions.

●: Standard stock items □: Stock in Japan ◎: Soon to be stocked ○: Soon to be deleted ※: Production after order received

Square End mill

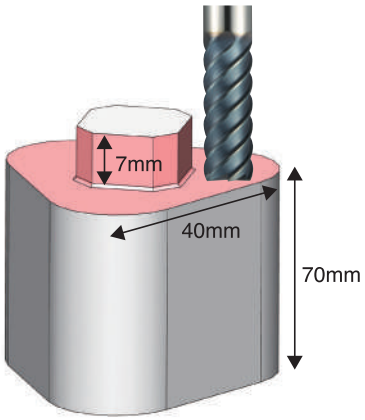
One-Cut 70 (DH coat)

CASE STUDIES

1. Machining example of high hardness material

Carved out

Chip MMR: Q = 0.138cm³ / min



Work	Part name		Mold parts
	Material		SKD11
	Hardness		59-61HRC
Tool	Tool No.		SEHH6080-R10
	Grade		DH102
Cutting conditions	Rotational speed Cutting speed	n	2,189 (min-1)
		Vc	54 (m / min)
	Feed rate	Vf	658 (mm / min)
		f	0.3 (mm / rev)
	ap(mm)		0.1 (mm)
	ae(mm)		2.1 (mm)
	Coolant		Air blow
	Machine		Gate MC

Result

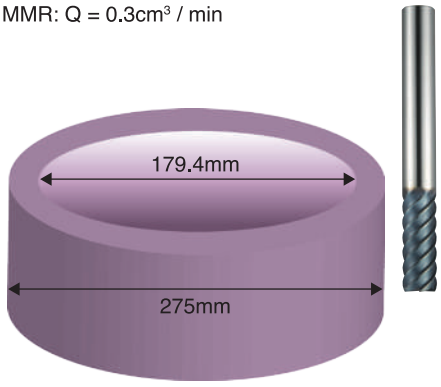
Uses rough to medium finish. The SEHH type can be used continuously with 6 workpieces. Less wear than current other competitor's products. Good machining surface and longevity.

2. Machining example of high hardness material

Overhung length: 55 mm

Outer diameter / inner diameter finish

Chip MMR: Q = 0.3cm³ / min



Work	Part name		Machine parts
	Material		SKD11
	Hardness		50HRC (with heat treatment)
Tool	Tool No.		SEHH6080
	Grade		DH102
Cutting conditions	Rotational speed Cutting speed	n	3,800 (min-1)
		Vc	95.5 (m / min)
	Feed rate	Vf	380 (mm / min)
		f	0.1 (mm / rev)
	ap(mm)		4 (mm)
	ae(mm)		0.2 (mm)
	Coolant		Wet (water-soluble cutting oil)
	Machine		Vertical MC (BT30)

Result

60 workpieces are processed to deal with the lack of current products SEHH type has machined without chipping (Can be used continuously).

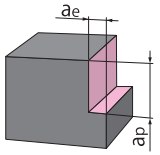
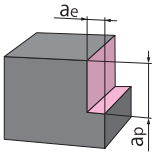
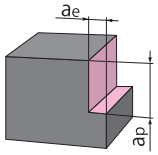
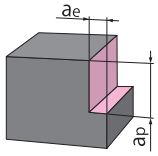
● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

Square End mill

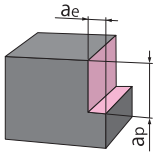
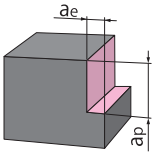
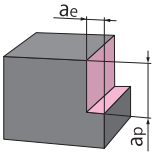
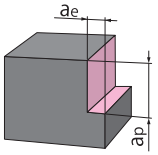
One-Cut 70 (DH coat) SEHS / SEHH / SEHM SEHH-R02 / SEHH-R TYPE

■ RECOMMENDED CUTTING CONDITIONS FOR SEHS / SEHH / SEHH-R02 / SEHH-R TYPE

Side cutting

Work Material	Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC		Hardened steel (SKD61, DAC, DHA) Hardness 42-52 HRC		Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC		High speed tool steel (SKH, HAP) Hardness 63-70HRC	
Machining shape	 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 diameter ϕDc (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate 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

■ RECOMMENDED CUTTING CONDITIONS FOR SEHM TYPE

Work Material	Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC		Hardened steel (SKD61, DAC, DHA) Hardness 42-52 HRC		Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC		High speed tool steel (SKH, HAP) Hardness 63-70HRC	
Machining shape	 ap≦2.25Dc ae≦0.03Dc		 ap≦2.25Dc ae≦0.025Dc		 ap≦2.25Dc ae≦0.025Dc		 ap≦2.25Dc ae≦0.01Dc	
Tool diameter ϕDc (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)
6	10,600	1,900	6,400	1,200	5,300	1,000	2,700	320
8	8,000	1,900	4,800	1,200	4,000	1,000	2,000	360
10	6,400	1,900	3,800	1,200	3,200	1,000	1,600	380
12	5,300	1,600	3,200	1,000	2,700	800	1,300	240
16	4,000	1,200	2,400	700	2,000	600	1,000	180
20	3,200	1,000	1,900	600	1,600	500	800	140

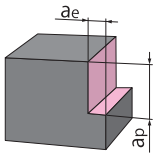
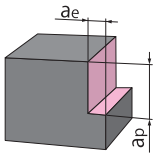
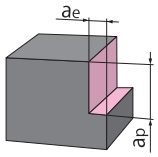
■ NOTE

1) The recommended cutting conditions in the above table show general guideline conditions.
2) If there is no mounting rigidity for the machine or workpiece, or adjust the conditions according to the machining shape, purpose, etc.
3) Downcut, air blow, and mist cutting are recommended.

Square End mill

One-Cut 70 (DH coat) SEHL TYPE

RECOMMENDED CUTTING CONDITIONS

Work Material	Pre-hardened steel (NAK80, HPM1, P21) Hardness 38-43HRC		Hardened steel (SKD61, DAC, DHA) Hardness 42-52 HRC		Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC	
Machining shape	 ap≦3Dc ae≦0.01Dc		 ap≦3Dc ae≦0.01Dc		 ap≦3Dc ae≦0.01Dc	
Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
6	3,180	760	2,650	480	2,100	380
8	2,390	720	1,990	480	1,590	380
10	1,910	690	1,590	480	1,270	380
12	1,590	670	1,330	480	1,060	380
16	1,190	570	1,000	420	800	340
20	950	510	800	380	640	310

NOTE

1) The recommended cutting conditions in the above table show general guideline conditions.
2) If there is no mounting rigidity for the machine or workpiece, or adjust the conditions according to the machining shape, purpose, etc.
3) Downcut, air blow, and mist cutting are recommended.

Ball End Mill

One-Cut Ball 70 End Mill DH-OCHB TYPE

One-Cut 70

70HRC compatible

One piece can be used for rough finishing of high hardness materials.
4-flute solid ball end mill capable of 70HRC machining

Features of DH-OCHB type

High machining efficiency is possible with 4 blades

High tool rigidity and unequal division reduce chatter

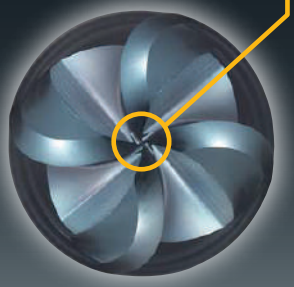
Achieves cutting performance with low resistance and good helix angle of 45 °

High hardness material, for high-speed machining, new PVD coating "new DH coat" (Dijet Hardcourt)

A new grade "DH102" made by combining a new PVD coating "New DH (Dijet Hard) Coat" for high-hardness materials and high-speed machining and ultrafine cemented carbide for high-hardness materials has been adopted to achieve a long life.

Unique blade shape

By adopting a unique blade shape at the center of the cutting edge, good chip evacuation is achieved even when machining the tip of the tool, enabling stable machining.



New PVD coating <New DH (Dijet Hard) coat>

Since it has higher hardness and higher oxidation start temperature than the conventional coating layer, it gives stable cutting performance in high-speed dry machining of high-hardness materials.

- Characteristics of each PVD coating film

	DH1 coat (hard coat)	DV coat (value coat)	DZ coat (TiAlN)	DX coat (TiCN)	JC coat (TiN)
Vickers hardness (Hv)	3,500~3,700	3,300~3,500	2,800~2,900	2,500~2,600	2,100~2,200
Oxidation start 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

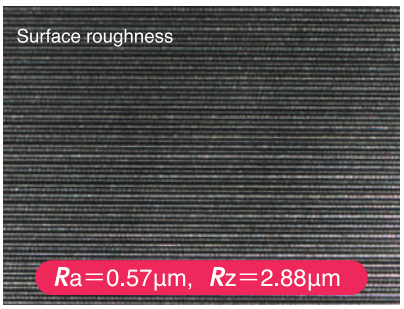
Ball End Mill

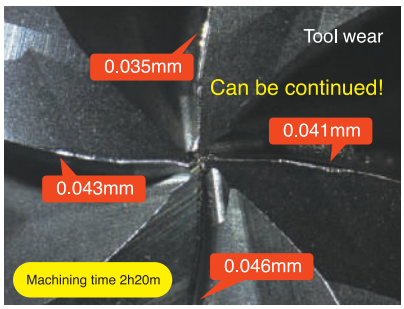
One-Cut Ball 70 End Mill DH-OCHB TYPE

■ Cutting performance

1. Life test in flat surface machining (70HRC)

Work	HAP72
Hardness	70HRC
Work tools	Model number : DH-OCHB4100(R5)
Cutting Conditions	Rotation speed: n = 3,800min^{-1} Cutting speed: Vc = 120m / min Feed rate: Vf = 1,050mm / min Feed amount: fz = 0.07mm / t Notch: ap = 0.2mm Pick feed: ae = 0.3mm Coolant: Dry type Machine used: Vertical MC



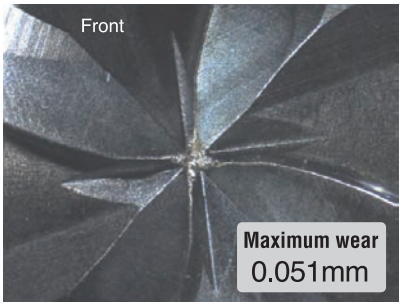


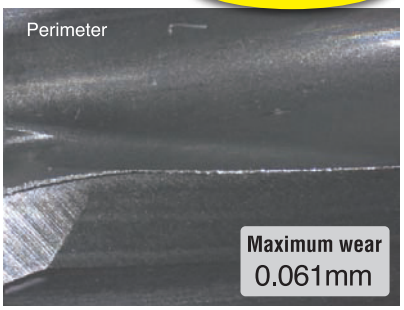
2. Drilling of high hardness material by high efficiency helical machining

Work	SKD11
Hardness	60HRC
Work tools	Model number : DH-OCHB4100(R5)
Cutting Conditions	Rotation speed: n = 3,800min^{-1} Cutting speed: Vc = 120m / min Feed rate: Vf = 1,834mm / min Feed amount: f = 0.48mm / rev Helical pitch: 0.3mm Machined hole diameter: ϕ12.6mm Drilling depth: 6mm (penetration) Coolant: External air blow Overhung length: 50mm Machine used: Vertical MC

After machining 180 holes (machining length 1.08m)

Can be continued!





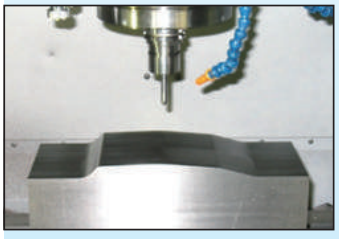
Compared to conventional tools for machining high-hardness materials

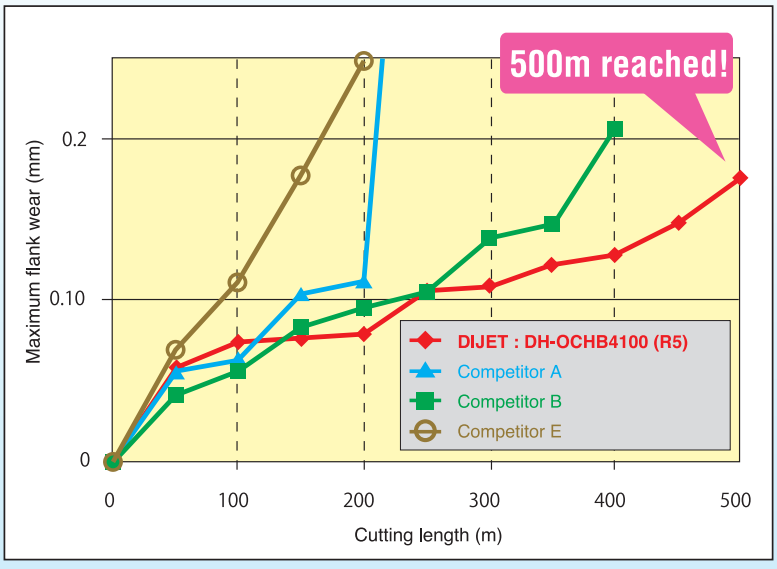
- High efficiency (machining time reduced from 60 seconds / hole to 15 seconds / hole)
- Wet → dry machining
- Tool consolidation is possible (hole diameter can be adjusted and various hole drilling is possible with one
- Long life (several tens of holes 180 holes or more)
- There is no edge chipping and the hole accuracy is good.

■ Cutting performance

3. Life comparison in high hardness material machining (60HRC)

Work	SKD11
Hardness	60HRC
Work tools	Model number : DH-OCHB4100(R5)
Cutting Conditions	Rotation speed: n = 5,100min^{-1} Cutting speed: Vc = 160m / min Feed rate: Vf = 2,040mm / min Feed amount: f = 0.4mm / rev Notch: ap = 0.2mm Pick feed: ae = 0.3mm Overhung length: 50mm Coolant: External air blow Machine used: Vertical MC





Ball End Mill

One-Cut Ball 70 End Mill DH-OCHB TYPE

- For machining high hardness materials (70HRC compatible)
- 4-flute, helix angle 45 °
- Shrink compatible

DH Hard coated | Copy Milling | Pocket Milling | Slotting

Fig.1 When ϕDc <ϕDs

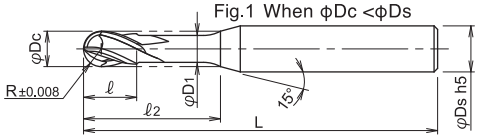
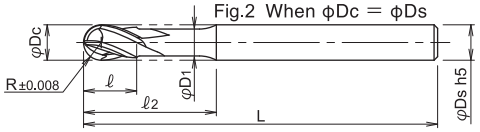


Fig.2 When ϕDc = ϕDs



■ **Outer diameter dimensional tolerance (mm)**

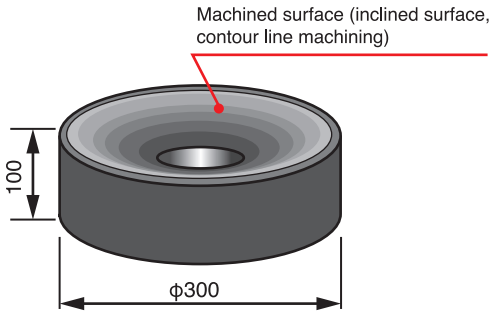
Cutting edge R	R tolerance	ϕDc tolerance
R1.5～R2	±0.008	0 −0.01
R2.5～R6	±0.008	0 −0.015

Cat. No.	Stock	Dimensions (mm)							Fig.
		R	φDc	ℓ	ℓ2	L	φD1	φDs	
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

Note) Refer to page G21 for recommended cutting conditions.

■ Case Study

Overhung length: 45mm



Result

Compared to the current 2-flute solid balls made by other competitors, the machining efficiency is 1.2 times, 4 hours → 9 hours can be machined, the life is more than doubled, and continuous use is possible.

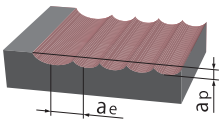
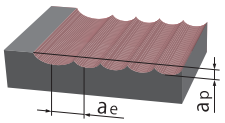
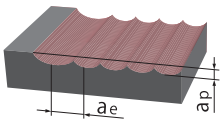
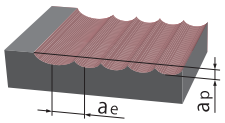
Work	Part name	Dice
	Material	SKD11 (heat treatment)
	Hardness	60HRC
Tool	Tool No.	DH-OCHB4080
	Grade	DH coat
Cutting conditions	Cutting speed	n=7,000 (min^{-1}), Vc=175 (m/min)
	Feed rate	Vf=5,000 (mm/min)
	ap(mm)	0.1 (mm)
	ae(mm)	0.3 (mm)
	Coolant	Wet
	Machine	Vertical MC

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

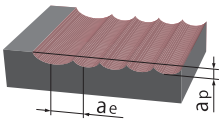
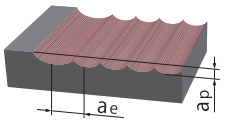
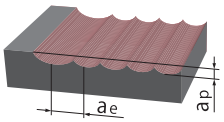
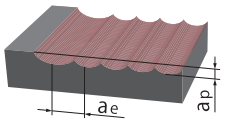
Ball End Mill

One-Cut Ball 70 End Mill DH-OCHB TYPE

RECOMMENDED CUTTING CONDITIONS (FINISHING)

Work Material	Alloy steel / tool steel / pre-hardened steel (SKD, SKH, NAK) Hardness ~ 45HRC		Hardened steel (SKD61, DAC, DHA) Hardness 42-52HRC		Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC		High-speed tool steel (SKH, HAP) Hardness 63~70HRC	
Machining shape	 ap≦0.03Dc ae≦0.03Dc		 ap≦0.03Dc ae≦0.03Dc		 ap≦0.03Dc ae≦0.03Dc		 ap≦0.03Dc ae≦0.03Dc	
Tool diameter R (mm)	Tool diameter ϕDc (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)
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

RECOMMENDED CUTTING CONDITIONS (ROUGH / INTERMEDIATE FINISHING)

Work Material	Alloy steel / tool steel / pre-hardened steel (SKD, SKH, NAK) Hardness ~ 45HRC			Hardened steel (SKD61, DAC, DHA) Hardness 42-52HRC			Hardened steel (SKD11, SLD, DC11) Hardness 55-62HRC			High-speed tool steel (SKH, HAP) Hardness 63~70HRC		
Machining shape	 ap≦1.2Dc ae≦0.2Dc ◆ Example: When the tool diameter is ϕ3 ap = 2.2, ae = 0.1, (ap x ae ≤ 0.22)			 ap≦1.2Dc ae≦0.2Dc ◆ Example: When the tool diameter is ϕ3 ap = 2.2, ae = 0.1, (ap x ae ≤ 0.22)			 ap≦1.2Dc ae≦0.2Dc ◆ Example: When the tool diameter is ϕ3 ap = 1.8, ae = 0.1, (ap x ae ≤ 0.18)			 ap≦1.0Dc ae≦0.1Dc ◆ Example: When the tool diameter is ϕ3 ap = 1, ae = 0.05, (ap x ae ≤ 0.05)		
Tool diameter R (mm)	Tool diameter ϕDc (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	ap×ae	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	ap×ae	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	ap×ae	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	ap×ae
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

● Precautions for helical processing

1. The recommended tilt angle is 1 ° or less (maximum 3 ° or less).
2. If the inclination angle is 1 ° or less, apply the above "rough finishing recommended conditions" as it is. However, if the tilt angle exceeds 1 °, reduce the feed rate according to the machining conditions.

NOTE

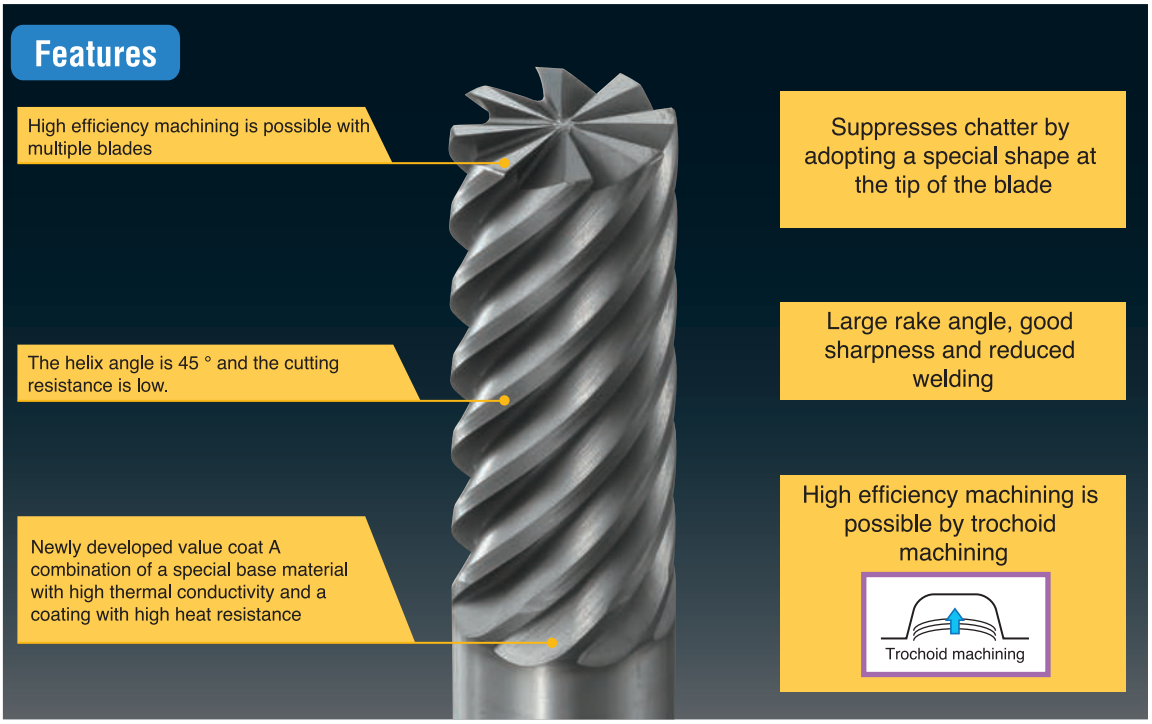
1) The recommended cutting conditions in the above table show general guideline conditions.
2) Vibration and abnormal noise may occur if the mounting rigidity of the machine or workpiece is not sufficient, or if the protrusion length is long. In that case, adjust the conditions such as lowering the rotation speed and feed speed.

Square End Mill

S cut Mill Square DV-SCMS TYPE

Solid end mill for high-speed, high-efficiency machining of micro-cutting of heat-resistant alloys

Features



■ Cutting performance

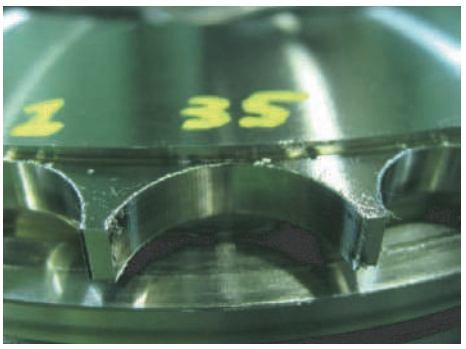
Cutting performance (life evaluation)

Work material	Part name	Test piece
	Material	Inco718 aging process
	Hardness	42HRC
Tool	Tool No.	DV-SCMS8120
	Species	Value coat
Cutting conditions	Cutting speed	100 (m/min)
	Feed amount	0.48 (mm/rev), 0.06 (mm/t)
	ap	5 (mm)
	ae	0.8 (mm)
	Coolant	Neat cutting oil
	Machine	Vertical MC

Result

The DV-SCMS type has less wear and no chipping, and the result is good.

● 7.4m Work condition after machining



● 7.4m Wear condition after machining

Flank / flank wear amount 0.09mm

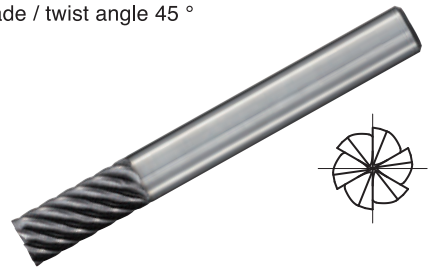
Smooth surface

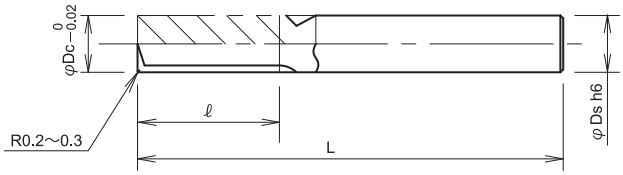
Square End Mill

S cut Mill Square DV-SCMS TYPE

- For heat-resistant alloys
  A minute R is attached to the corner of the cutting edge to solve the chipping of the corner.

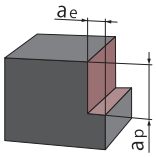
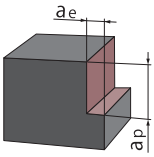
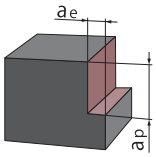
- 6/8 blade / twist angle 45 °





Cat. No.	Stock	No. of blades	Dimensions (mm)			
			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

■ DV-SCMS TYPE RECOMMENDED CUTTING CONDITIONS

Work Material	Stainless steel (SUS304)		Titanium alloy (Ti-6Al-4V)		Heat resistant alloy (INCO718)	
Machining shape	 ap≦1.5Dc ae≦0.1Dc		 ap≦1.5Dc ae≦0.1Dc		 ap≦1.5Dc ae≦0.05Dc	
Tool dia. φDc (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)	Rotational speed n (min⁻¹)	Feed rate 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	800	260

■ NOTE

1) The recommended cutting conditions in the above table show general guideline conditions.
2) If there is no mounting rigidity for the machine or workpiece, or adjust the conditions according to the machining shape, purpose, etc.
3) Downcut is recommended.
4) Wet processing is recommended. It is effective to use oil-based cutting oil for heat-resistant alloys.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

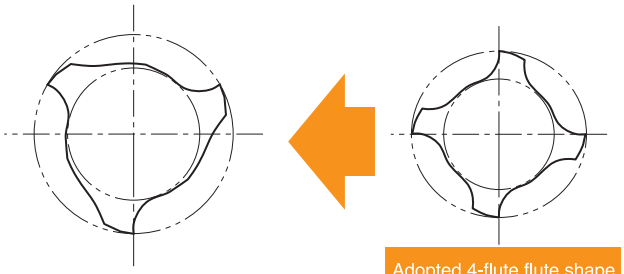
Square End Mill

3-Flute Super One-Cut End Mill DV-SOCS3 TYPE

Features

A new lineup of 3-flute type for the multifunctional solid end mill "Super One Cut End Mill"

- It is possible to plunge & machine a slot / groove with 1D cut.
- The combination of a newly developed center cutting edge that can be plunged, an original groove shape, and a strong twist of 45 ° demonstrates outstanding chip evacuation not only in shoulder cutting and grooving but also in plunging.
- Improved wear resistance by adopting PVD coating grade "Value Coat"

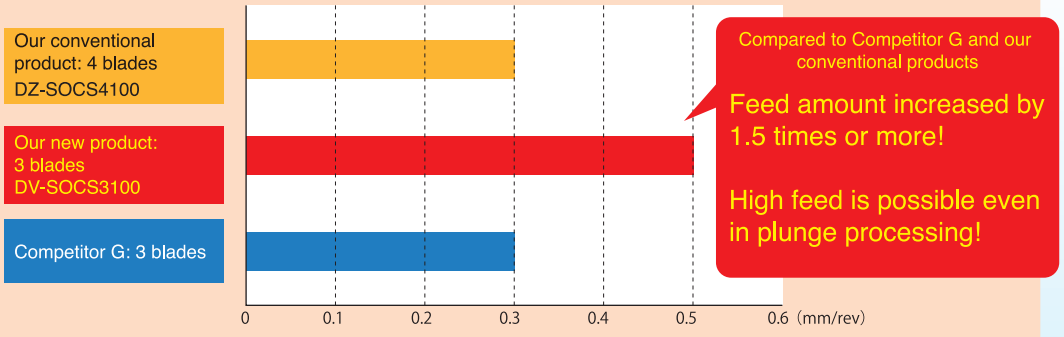


Adopted 4-flute flute shape for 3-flute

1 pass for plunge processing
ap = Dc (carbon steel, cast iron, alloy steel, pre-hardened steel)
ap = 0.2Dc (hardened steel)
ap = 0.5Dc (stainless steel) is possible!!!

■ Cutting feed limit value during plunge machining

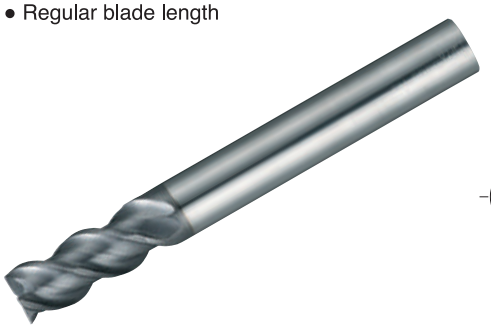
Tool diameter: Φ10, Work material: SKD11 (40HRC), Vc = 37.7m / min, n = 1,200min^{-1}, 10mm blind hole, external refueling, increase feed by 0.05mm / rev for every 10 holes

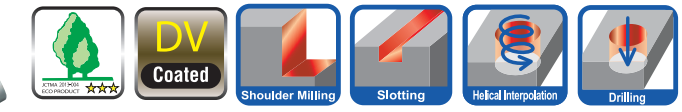


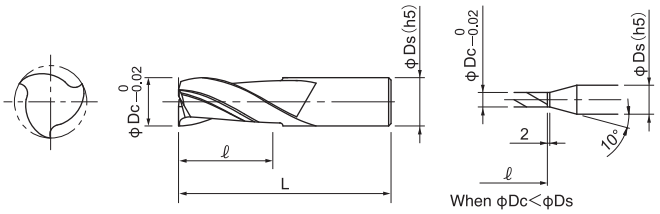
Square End Mill

3-Flute Super One-Cut End Mill DV-SOCS3 TYPE

- 3-flute, helix angle 45 °
- Regular blade length







Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
DV-SOCS3030	●	3	8	60	6
DV-SOCS3040	●	4	11	60	6
DV-SOCS3050	●	5	13	60	6
DV-SOCS3060	●	6	13	60	6
DV-SOCS3080	●	8	19	75	8
DV-SOCS3100	●	10	22	80	10
DV-SOCS3120	●	12	26	100	12
DV-SOCS3160	●	16	32	110	16
DV-SOCS3200	●	20	38	125	20

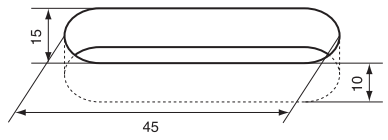
Note) Refer to pages G27 - G28 for recommended cutting conditions.

● : Standard stock items □ : Stock in Japan ◎ : Soon to be stocked ○ : Soon to be deleted ※ : Production after order received

Square End Mill

3-Flute Super One-Cut End Mill DV-SOCS3 TYPE

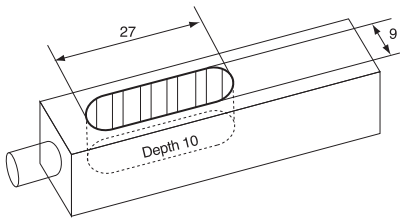
CASE STUDIES



{Notch 5 mm + Side processing 45 mm x 15 mm} x 2 times = Depth 10 mm x Length 45 mm x Width 15 mm Keyway machining

Result: There is no chatter and the machined surface is also good. The machining sound is smaller than that of other competitor's products

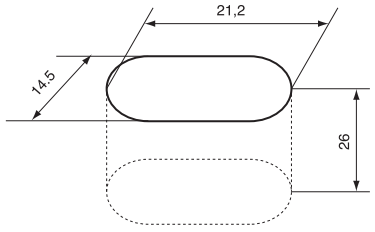
Work	Part name	Mold parts	
	Material	F C D600	
	Hardness	—	
Tool	Tool No.	DV-SOCS3100	
	Grade	Value coat	
Cutting conditions	Rotation speed / cutting speed	2500 (min^{-1}) 78.5 (m/min)	
	Feed rate	Drilling	Groove machining
		400 (mm/min)	1000 (mm/min)
		0.16 (mm/rev)	0.4 (mm/rev)
	ap(mm)	5(mm) (× 2 times = 10 mm)	
	ae(mm)	10 (mm)	
	Coolant	Air	
	Machine	Vertical machining center	



3.5mm plunge, helical machining twice, 3mm plunge, helical machining

Result: There is no chatter and the machined surface is also good. The surface roughness was improved.

Work	Part name	Machine parts	
	Material	SUS304	
	Hardness	—	
Tool	Tool No.	DV-SOCS3080	
	Grade	Value coat	
Cutting conditions	Rotation speed / cutting speed	1800 (min^{-1}) 45.2 (m/min)	
	Feed rate	Drilling	Groove machining
		72 (mm/min)	180 (mm/min)
		0.04 (mm/rev)	0.1 (mm/rev)
	ap(mm)	3.5 (mm) ×2times + 3 (mm) ×1times	
	ae(mm)	8 (mm)	
	Coolant	Water soluble	
	Machine	Vertical machining center	



{13mm plunge, helical machining} x 2 times

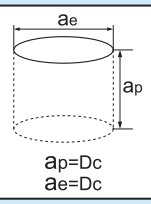
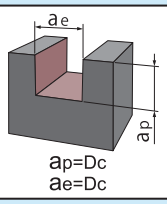
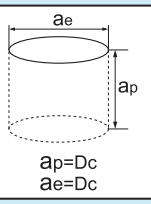
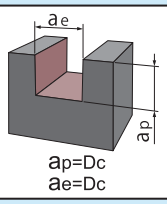
Result: There is no chatter and the machined surface is also good. The life is 1.5 times longer than the current tool.

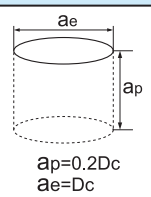
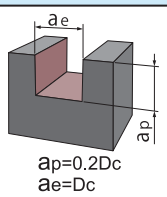
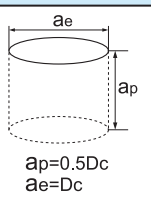
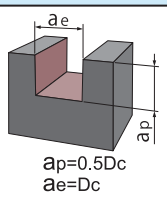
Work	Part name	Parts	
	Material	SCM440H	
	Hardness	28~34HRC	
Tool	Tool No.	DV-SOCS3120	
	Grade	Value coat	
Cutting conditions	Rotation speed / cutting speed	2142 (min^{-1}) 80.75 (m/min)	
	Feed rate	Drilling	Groove machining
		130 (mm/min)	380 (mm/min)
		0.06 (mm/rev)	0.178 (mm/rev)
	ap(mm)	13 (mm) (× 2times = 26mm)	
	ae(mm)	12 (mm)	
	Coolant	Water soluble	
	Machine	Vertical machining center	

Square End Mill

3-Flute Super One-Cut End Mill DV-SOCS3 TYPE

Recommended cutting conditions for continuous groove cutting from plunge cutting

Work Material	Structural / Carbon Steel / Gray Cast Iron (SS400, S50C, FC250)			Alloy Steel / Pre-Hardened Steel Alloy Steel / Pre-Hardened Steel		
Machining shape		 ap=Dc ae=Dc	 ap=Dc ae=Dc		 ap=Dc ae=Dc	 ap=Dc ae=Dc
Tool diameter ϕDc (mm)	Rotational speed n (min⁻¹)	Plunge machining	Groove machining	Rotational speed n (min⁻¹)	Plunge machining	Groove machining
		Feed rate (mm/min)			Feed rate (mm/min)	
3	10,600	330	480	6,400	160	290
4	8,000	370	490	4,800	190	300
5	6,300	370	490	3,800	210	300
6	5,300	350	490	3,200	230	300
8	4,000	350	490	2,400	240	300
10	3,200	350	490	1,900	240	300
12	2,700	350	490	1,600	220	300
16	2,000	320	460	1,200	220	290
20	1,600	300	440	950	190	280

Work Material	Hardened steel (SKD11, SKD61) Hardness 40-50HRC			Stainless steel (SUS304)		
Machining shape		 ap=0.2Dc ae=Dc	 ap=0.2Dc ae=Dc		 ap=0.5Dc ae=Dc	 ap=0.5Dc ae=Dc
Tool diameter ϕDc (mm)	Rotational speed n (min⁻¹)	Plunge machining	Groove machining	Rotational speed n (min⁻¹)	Plunge machining	Groove machining
		Feed rate (mm/min)			Feed rate (mm/min)	
3	3,200	80	90	6,400	100	190
4	2,400	95	120	4,800	120	240
5	1,900	100	120	3,800	130	260
6	1,600	110	120	3,200	150	250
8	1,200	110	120	2,400	140	240
10	950	110	110	1,900	130	220
12	800	100	110	1,600	130	220
16	600	100	100	1,200	120	200
20	480	95	90	950	110	180

NOTE

1) Wet machining is required when performing plunge machining.
2) Adjust the above cutting conditions according to the machine rigidity and workpiece rigidity.
3) If chips grow during plunge processing, perform step machining.

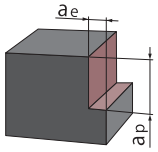
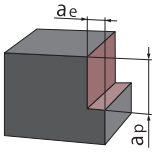
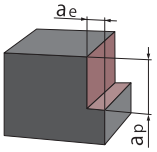
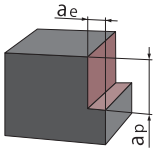
Square End Mill

3-Flute Super One-Cut End Mill DV-SOCS3 TYPE

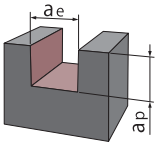
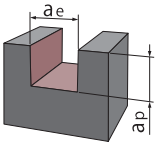
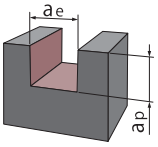
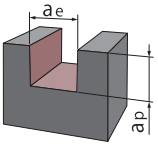
■ Recommended cutting conditions when using only for side machining or groove machining

(* Refer to the conditions on page G27 when performing groove machining from plunge machining.)

(1) Side machining

Work Material	Structural steel, carbon steel, gray cast iron (SS400, S50C, FC250)		Alloy steel / pre-hardened steel (SKD, SKT) Hardness ~ 40HRC		Hardened steel (SKD11, SKD61) Hardness 40-50HRC		Stainless steel (SUS304)	
Machining shape	 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.2Dc		 ap=1.5Dc ae=0.1Dc		 ap=1.5Dc ae=0.1Dc	
Tool diameter ϕDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
3	12,700	770	7,400	450	3,800	200	7,400	300
4	9,600	900	5,500	550	2,850	210	5,500	440
5	7,500	900	4,500	640	2,200	210	4,500	540
6	6,300	1,100	3,700	650	1,900	280	3,700	520
8	4,800	1,200	2,800	700	1,400	280	2,800	510
10	3,800	1,200	2,200	700	1,100	240	2,200	500
12	3,200	1,100	1,850	620	950	240	1,850	480
16	2,400	850	1,400	500	700	200	1,400	420
20	1,900	700	1,100	400	560	180	1,100	360

(2) Groove machining

Work Material	Structural steel, carbon steel, gray cast iron (SS400, S50C, FC250)		Alloy steel / pre-hardened steel (SKD, SKT) Hardness ~ 40HRC		Hardened steel (SKD11, SKD61) Hardness 40-50HRC		Stainless steel (SUS304)	
Machining shape	 ap=Dc ae=Dc		 ap=Dc ae=Dc		 ap=0.2Dc ae=Dc		 ap=0.5Dc ae=Dc	
Tool diameter ϕDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
3	10,600	480	6,400	290	3,200	90	6,400	190
4	8,000	490	4,800	300	2,400	120	4,800	240
5	6,300	490	3,800	300	1,900	120	3,800	260
6	5,300	490	3,200	300	1,600	120	3,200	250
8	4,000	490	2,400	300	1,200	120	2,400	240
10	3,200	490	1,900	300	950	110	1,900	220
12	2,700	490	1,600	300	800	110	1,600	220
16	2,000	460	1,200	290	600	100	1,200	200
20	1,600	440	950	280	480	90	950	180

■ NOTE

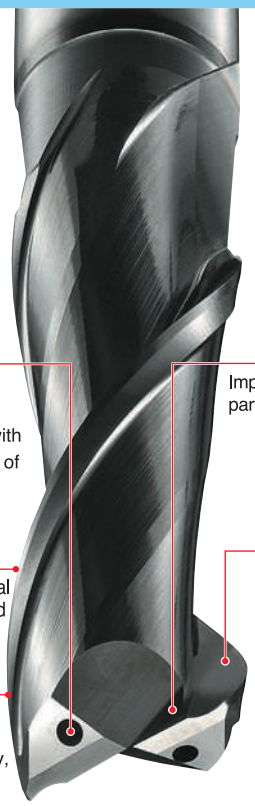
1) Remove chips by air blow.
2) Please use stainless steel wet.
3) Adjust the above cutting conditions according to the machine rigidity and workpiece rigidity.

Square End Mill

One-Cut Helical AL-OCHE TYPE

Features

Supports a wide variety of highly efficient drilling with one



DLC

For Aluminum Machining

1 Helical oil hole

- High feed helical machining is possible by internal refueling from the helical oil hole along the flute.
- Holes and bores of various diameters can be drilled with a single tool, resulting in high efficiency and reduction of tool costs.

2 Thinning shape

Improved the chip evacuation in the central part, which was difficult in helical machining.

3 Flute shape

By adopting a helix angle of 30 °, a wide cross-sectional shape, and a new lubricating film, high-speed high-feed helical machining is possible.

4 Cutting edge shape

The large rake angle ensures smooth machining.

6 Grade

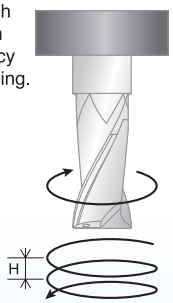
JC20015, which uses a fine particle cemented carbide base material with high toughness and a newly developed coating with excellent hardness and lubricity, provides high reliability and long life.

5 End mill machining

Of course, conventional end mill machining such as shoulder cutting and grooving is also possible.

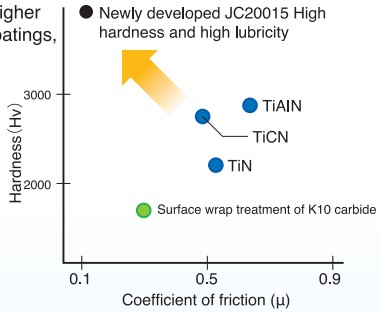
Features of the new machining method using one-cut helical

It can be machined with a much larger axial depth of cut H than before, achieving high-efficiency hole drilling comparable to drilling.



Newly developed coating JC20015

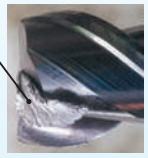
It has higher hardness and higher lubricity than conventional coatings, and achieves excellent chip evacuation and long life in high-feed helical machining of aluminum materials.



Chip evacuation

Comparison of chip emission status during high feed helical machining

Conventional general-purpose end mill

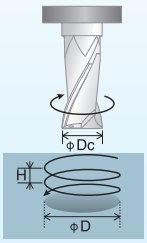


Chip welding and chip clogging can be seen in the 3-hole machining.

One-cut helical

No chip welding or chip clogging is observed even after 20m machining, and chip evacuation is good.

■ One-cut helical machining status diagram



■ Cutting Conditions

Work Material : AC4B
Tool diameter Dc : φ8
Machined hole diameter D : φ10
Machining depth : 30mm
Cutting speed Vc : 200m/min
Feed amount f : 0.25mm/rev
Axial direction per revolution
Cut amount H : 4.65mm
Uses internal water-soluble coolant

Square End Mill

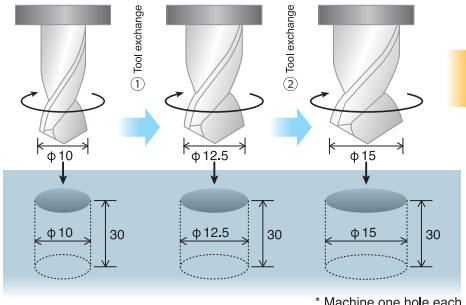
One-Cut Helical AL-OCHE TYPE

Improvement of machining method

Example of machining time comparison between conventional drilling and high-efficiency helical machining

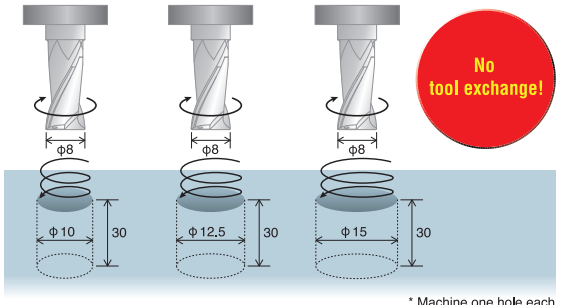
Conventional: Machining with 3 carbide drills

- Because it uses a wide variety of products in small quantities, the reduction of cutting tools is a bottleneck.
- It takes time to change tools to make a wide variety of holes.



Improvement: High-efficiency helical machining with one-cut helical

- By using a highly efficient helical drilling method that was originally developed, a wide variety of highly efficient drilling can be performed with a single tool!



Machining conditions for conventional drills

Tool diameter : φ10, φ 12.5, Use 3 of φ15
Cutting speed : 120m/min
Feed amount : 0.2mm/rev
(Machined under the same conditions for each diameter)

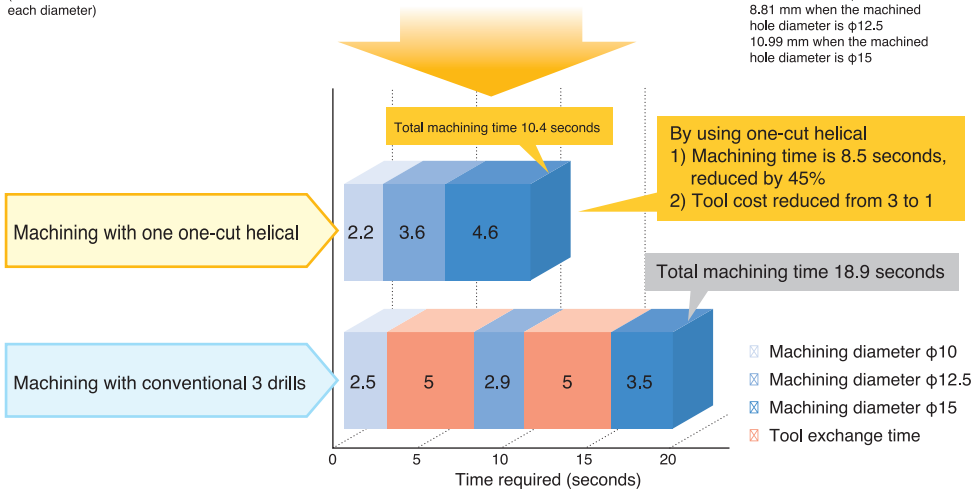
Work material : AC4B
Machining depth : 30mm
Uses internal coolant

One-cut helical cutting conditions

Tool diameter : φ8 AL-OCHES2080
Cutting speed : 200m/min
Feed amount : 0.25mm/rev

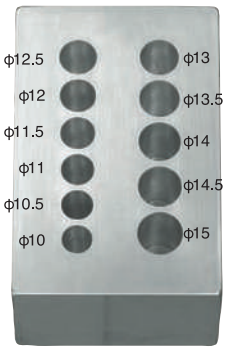
Axial depth of cut per revolution H:
4.65 mm when the machined hole diameter is φ10
8.81 mm when the machined hole diameter is φ12.5
10.99 mm when the machined hole diameter is φ15

Work material : AC4B
Machining depth : 30mm
Uses internal coolant

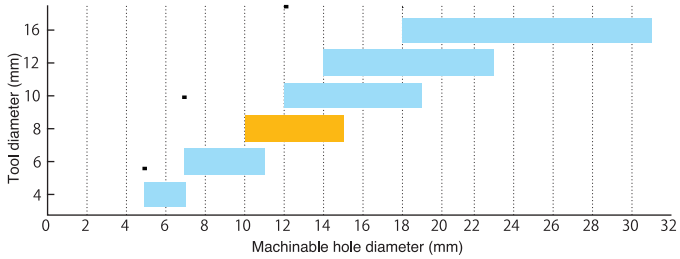


One-cut helical machined hole diameter

■ With one tool diameter φ8
Hole diameter φ10 - φ15
Machining depth 30 mm
The hole was machined.



■ Machinable hole diameter area for each tool diameter



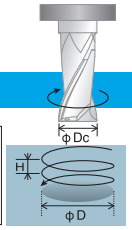
A variety of holes can be machined with a single tool!

Square End Mill

One-Cut Helical AL-OCHE TYPE

Cutting performance

Machining example ① High-efficiency helical machining

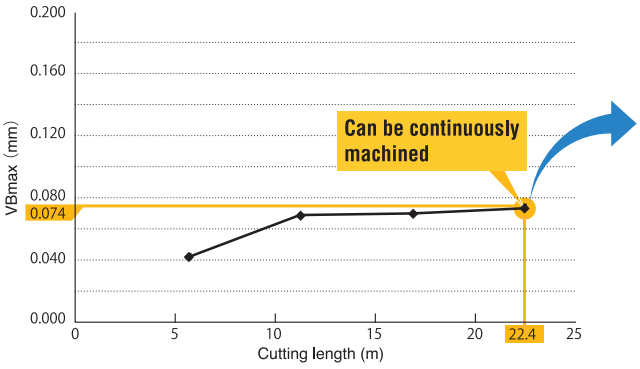


Cutting conditions

Work material	:AC4B	Cutting speed	:201m/min	Axial depth of cut per revolution H	:4.65mm
Tool dia.	:8mm	Rotational speed	:8,000min^{-1}		
Machined hole dia.	:10mm	Feed amount	:0.25mm/rev	1 hole machining time	:2.2 Sec
Machining depth	:30mm	Feed rate	:2,000mm/min	Uses internal water-soluble coolant	

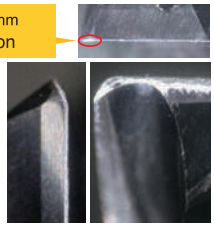
With high efficiency helical machining Machining time per hole is with a carbide drill. Achieves 2.2 seconds less than the same level!

Relationship between machining length and maximum tool friction



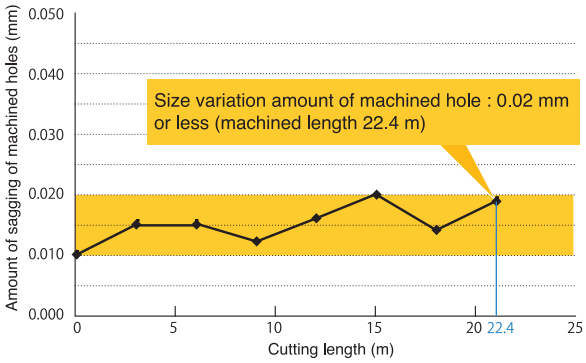
■ Friction photo after 22.4m processing

VBmax: 0.074mm
normal friction

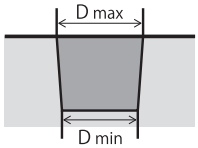


More than 10 times that of conventional general-purpose end mills,
High feed of axial depth of cut H = 4.65 mm per revolution. But no chip welding and chip clogging!

Relationship between machined length and amount of variation of machined holes

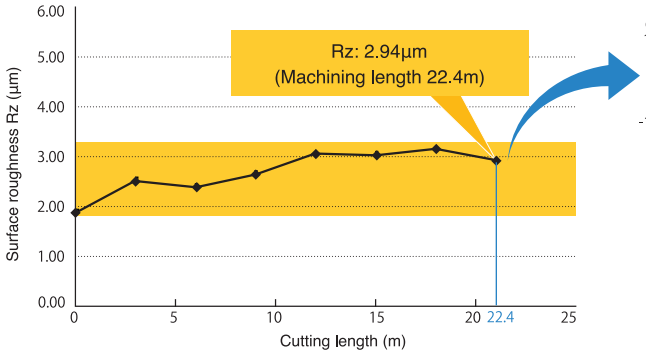


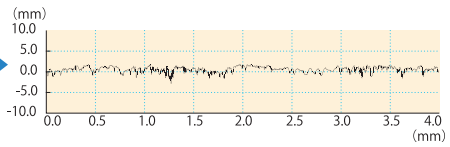
■ Machined hole tilt amount = (Dmax Dmin)



With a machining length of 22.4 m, the amount of variation of the machined hole is 0.02 mm or less, which is stable with little variation. Achieves high-precision hole drilling equal to or less than the finishing drill!

Relationship between machined length and surface roughness Rz of machined hole





Finished surface roughness of the machined hole at a machined length of 22.4 m Rz = 2.94 µm. Achieves better hole drilling than the finished surface roughness Rz = 6.3 µm of general cutting finish machining!

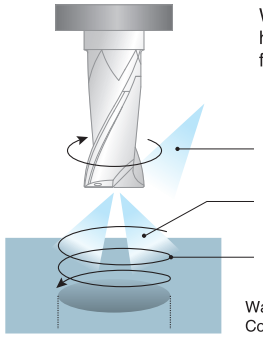
Square End Mill

One-Cut Helical AL-OCHE TYPE

Cutting performance

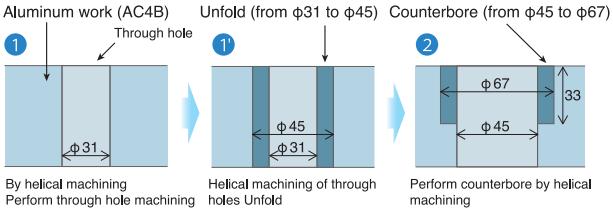
Machining example ② Stepped-hole machining

Machining procedure



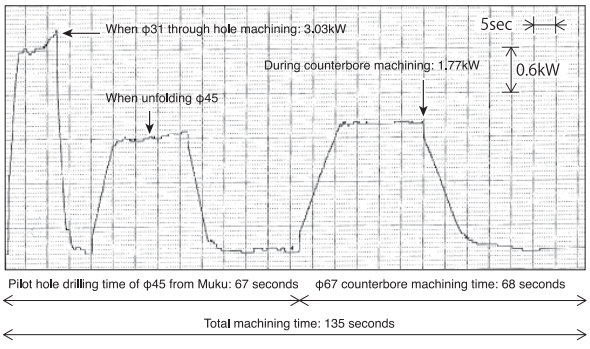
With one tool diameter of ϕ16, drilling holes of ϕ45 and counterbore of ϕ67 from Muku.

Water-soluble cutting fluid: 2-3% diluted
Coolant pressure: 1.5MPa



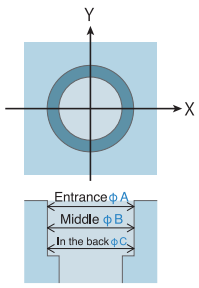
Tool diameter (mm)	16
Cutting speed (m / min)	200
Rotation speed (min)$^{-1}$	4,000
Feed rate (mm / rev)	0.25
Feed rate per revolution (mm / min)	1,000
Maximum axial Depth H (mm)	13 (During counterbore machining 10mm)

Transition of power value and machining time in each process



1) A wide variety of holes can be drilled with a single tool diameter of ϕ16. Moreover, the total machining time was 135 seconds, which was a short time.
2) Since it is about 3.03kW even for ϕ31 through hole machining, which requires the most power, it can be sufficiently machined even with a general small machining center.
3) No special tools are required for through-hole machining, unfolding, and large-diameter counterbore machining performed this time. Significant tool cost reduction and lead time for manufacturing special tools can be shortened.

Machined hole diameter measurement result



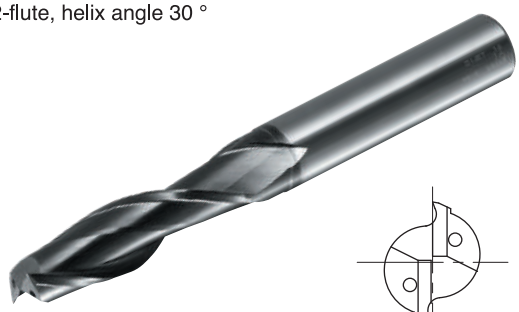
Tool diameter: 16 mm (unit: mm)

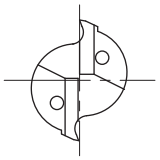
Counterbore input diameter	67 (X)	67 (Y)
Measured diameter (entrance)	66.990	66.974
Measured diameter (middle)	66.993	66.982
Measured diameter (back)	66.992	66.986
Maximum difference in hole diameter at entrance, middle and back	0.019 (from maximum 66.993-minimum 66.974 = 0.019)	

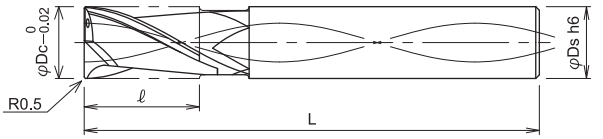
Square End Mill

One-Cut Helical AL-OCHE TYPE

● 2-flute, helix angle 30 °





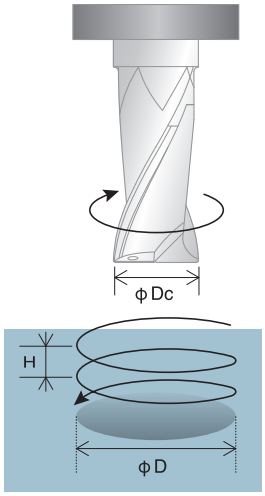


Cat. No.	Stock	Dimensions (mm)			
		φDc	ℓ	L	φDs
AL-OCHES2040	●	4	16	60	4
AL-OCHES2060	●	6	22	74	6
AL-OCHES2080	●	8	31	90	8
AL-OCHES2100	●	10	37	105	10
AL-OCHES2120	●	12	43	113	12
AL-OCHES2160	●	16	55	130	16

Note) Refer to pages G33 - G35 for recommended cutting conditions.

■ AL-OCHE type recommended cutting conditions

Helical machining



Work Material	Aluminum alloy (A5052, A7075)			
Tool diameter φDc (mm)	Machined hole dia. D (mm)	Machining depth T (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)
4	5～7	max15	16,000	960
6	7～11	max21	10,600	1,060
8	10～15	max30	8,000	2,000
10	12～19	max36	6,400	1,600
12	14～23	max42	5,300	1,300
16	18～31	max54	4,000	1,000

Work Material	Aluminum alloy casting (Si less than 13%)			
Tool diameter φDc (mm)	Machined hole dia. D (mm)	Machining depth T (mm)	Rotational speed n (min⁻¹)	Feed rate Vf (mm / min)
4	5～7	max15	14,400	860
6	7～11	max21	9,500	950
8	10～15	max30	7,200	1,800
10	12～19	max36	5,700	1,400
12	14～23	max42	4,800	1,200
16	18～31	max54	3,600	900

公転径 Dk(mm) (加工穴径D－工具径Dc)	1公転当りの軸方向切込み量 H(mm)
1	2.6
2	5
3	6.4
4	7.4
5	8.2
6	8.8
7	9.4
8	9.8
9	10.2
10	10.6
11	11
12	11.3
13	11.5
14	11.8
15 that's all	12

■ NOTE

1) Revolution diameter Dk = machined hole diameter D-tool diameter Dc
2) When drilling blind holes, set the final axial depth of cut per revolution to 0.8 to 2.0 mm.
3) When drilling through holes, since corner R0.5 is added to the tool, set it so that the tip of the tool comes out by 1 mm or more.
4) If accuracy of the drilled hole is required, leave a radial margin (at the radius) of about 0.03 mm, and after drilling, set the axial notch to 0 and set the rotation speed and feed rate to 20%. Please lower it to a certain extent and make one revolution.
5) Please use for internal refueling.
6) The above shows the conditions for drilling holes from Muku. Unfolding when there is a pilot hole can also be machined under the above conditions. In that case, it is recommended to machine the radial notch with 75% or less of the outer diameter of the tool. Also, when machining with pilot holes and cast holes, use external lubrication together.
7) If the mounting rigidity of the machine or workpiece is not rigid or chattering occurs, reduce the rotation speed and feed rate by the same ratio from the above table conditions, or reduce the axial depth of cut H per revolution.

● : Standard stock items　□ : Stock in Japan　◎ : Soon to be stocked　○ : Soon to be deleted　※ : Production after order received

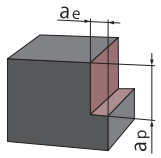
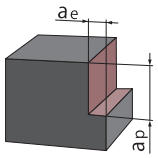
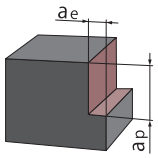
Square End Mill

One-Cut Helical AL-OCHE TYPE

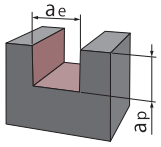
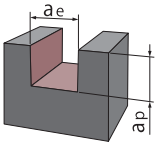
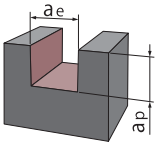
AL-OCHE type recommended cutting conditions

End mill machining

(1) Side cutting

Work Material	Aluminum alloy (A5052)		Aluminum alloy (A7075)		Aluminum alloy casting (Si less than 13%)	
Machining shape	 ap=1.5Dc ae=0.4Dc		 ap=1.5Dc ae=0.4Dc		 ap=1.5Dc ae=0.4Dc	
Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
4	16,000	1,800	16,000	1,800	14,000	1,700
6	10,000	1,800	10,000	1,800	9,500	1,700
8	8,000	1,600	8,000	1,600	7,000	1,500
10	6,000	1,300	6,000	1,300	5,700	1,200
12	5,000	1,300	5,000	1,300	4,700	1,200
16	4,000	1,200	4,000	1,200	3,500	1,100

(2) Groove cutting

Work Material	Aluminum alloy (A5052)		Aluminum alloy (A7075)		Aluminum alloy casting (Si less than 13%)	
Machining shape	 ap=Dc ae=Dc		 ap=Dc ae=Dc		 ap=Dc ae=Dc	
Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
4	14,000	1,000	14,000	1,000	12,000	850
6	9,500	1,000	9,500	1,000	8,500	850
8	7,000	1,000	7,000	1,000	6,400	850
10	5,700	1,000	5,700	1,000	5,000	850
12	4,700	1,000	4,700	1,000	4,200	850
16	3,500	1,000	3,500	1,000	3,200	850

NOTE

1) We recommend using water-soluble cutting oil.
2) Please keep the proper gripping length when using the shank gripping allowance.
3) Please use in an environment where machine accuracy, rigidity, touring accuracy, work setting accuracy and rigidity are sufficient.
4) If the maximum rotation speed of the machine is lower than the recommended condition, reduce the feed according to the rate of decreasing the rotation speed.

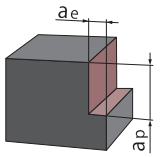
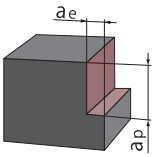
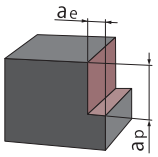
Square End Mill

One-Cut Helical AL-OCHE TYPE

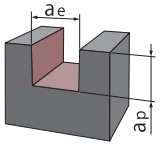
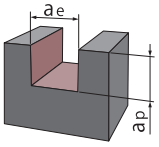
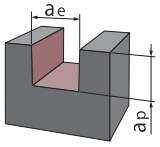
■ AL-OCHE type High-speed cutting conditions

End mill machining

(1) Side cutting

Work Material	Aluminum alloy (A5052)		Aluminum alloy (A7075)		Aluminum alloy casting (Si less than 13%)	
Machining shape	 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc		 ap=1.5Dc ae=0.3Dc	
Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
4	32,000	3,800	32,000	3,800	28,000	3,300
6	21,000	3,800	21,000	3,800	18,000	3,300
8	16,000	3,200	16,000	3,200	14,000	3,300
10	12,000	3,200	12,000	3,200	11,000	3,000
12	10,000	3,200	10,000	3,200	9,000	2,700
16	8,000	2,800	8,000	2,800	7,000	2,450

(2) Groove cutting

Work Material	Aluminum alloy (A5052)		Aluminum alloy (A7075)		Aluminum alloy casting (Si less than 13%)	
Machining shape	 ap=0.5Dc ae=Dc		 ap=0.5Dc ae=Dc		 ap=0.5Dc ae=Dc	
Tool diameter φDc (mm)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)	Rotational speed n (min-1)	Feed rate Vf (mm / min)
4	28,000	1,900	28,000	1,900	24,000	1,600
6	19,000	1,900	19,000	1,900	16,000	1,600
8	14,000	1,900	14,000	1,900	12,000	1,600
10	11,000	1,900	11,000	1,900	9,500	1,600
12	9,500	1,900	9,500	1,900	8,000	1,600
16	7,000	1,800	7,000	1,800	6,000	1,600

■ NOTE

1) We recommend using water-soluble cutting oil.
2) Please keep the proper gripping length when using the shank gripping allowance.
3) Please use in an environment where machine accuracy, rigidity, touring accuracy, work setting accuracy and rigidity are sufficient.
4) If the maximum rotation speed of the machine is lower than the recommended condition, reduce the feed according to the rate of decreasing the rotation speed.

2022-23

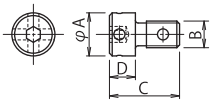
DIJET®

Products Guide Vol.4

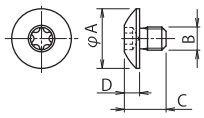
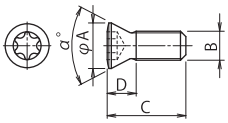
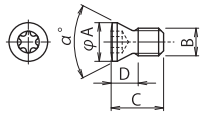
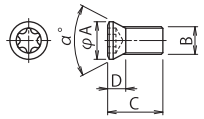
H
01

Parts

Adjustable screw

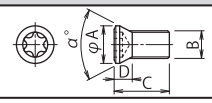
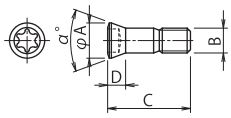
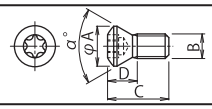
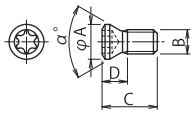
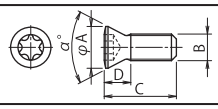
Drawings	Cat. No.	Dimensions (mm)						Wrench
		A	B	C	D	E	α°	
	**ADS-513**	7.8	M5×0.5	13.0	5.0	—	—	AD-2080
	ADS-514	5.6	M5×0.5	14.5	6.5	—	—	AD-2080

Clamp screw

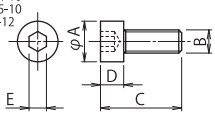
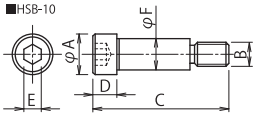
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	α°		
	**CB3540**	9.0	M3.5×0.6	6.3	2.3	—	—	T-15	2.1
	**CSW-1838**	2.7	M1.8×0.35	3.7	1.8	—	55	T-6	0.25
	CSW-206	3.5	M2.5×0.45	5.0	2.4	—	55	T-8	0.9
	CSW-2542	3.0	M2.5×0.45	4.2	2.5	—	43	T-7	0.9
	CSW-2547	3.4	M2.5×0.45	4.7	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-513H	7.0	M5×0.8	13.0	4.4	—	63	T-20	5.5
	CSW-510	6.4	M5×0.8	11.0	4.5	—	43	T-20	5.5
	CSW-515	7.0	M5×0.8	15.0	5.0	—	63	T-20	5.5
	**DSW-1840H**	2.5	M1.8×0.35	4.0	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	1.1
	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	2.1
	DSW-309H	4.3	M3×0.5	9.0	3.2	—	55	T-10	2.1
	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-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
	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

Parts

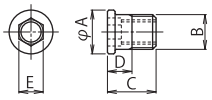
Clamp screw

Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N·m)
		A	B	C	D	E	α°		
	**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	1.1
	TSW-2567H	3.6	M2.5×0.45	6.7	2.7	—	60	T-8	1.1
	TSW-3509H	5.3	M3.5×0.6	9.0	4.5	—	60	T-15	3.0
	TSW-3510H	5.3	M3.5×0.6	10.0	4.5	—	60	T-15	3.0
	TSW-3512H	5.3	M3.5×0.6	11.5	4.5	—	60	T-15	3.0
	TSW-408	5.5	M4×0.7	8.0	3.3	—	60	T-15	3.1
	TSW-410H	5.3	M4×0.7	10.0	3.6	—	60	T-15	3.5
	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

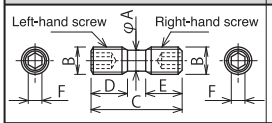
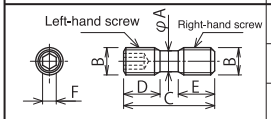
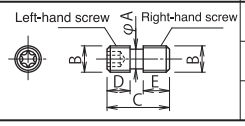
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N·m)
		A	B	C	D	E	F		
■HCS4-10 HCS5-10 HSB-12 	**HCS4-10**	7.0	M4×0.7	14.0	4.0	3.0	—	—	—
	HCS5-10	8.5	M5×0.8	15.0	5.0	4.0	—	—	—
■HSB-10 	**HSB-10**	17.0	M10×1.5	56.0	10.0	8.0	13	—	—
	HSB-12	18.0	M12×1.75	62.0	12.0	10.0	—	—	—

Shim screw

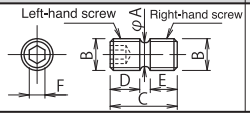
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N·m)
		A	B	C	D	E	F		
	**SSW-535**	6.3	M5×0.5	7.0	3.1	3.5	—	—	6.5
	SSW-745	8.4	M7×0.5	8.0	2.9	4.5	—	—	8.0

Parts

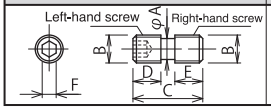
Wedge screw

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

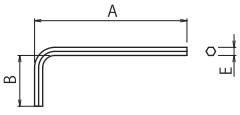
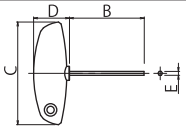
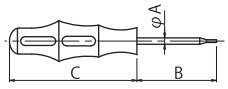
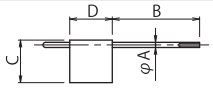
Rest button screw

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

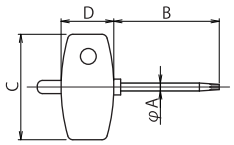
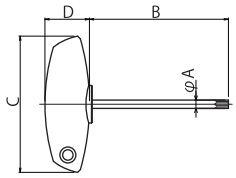
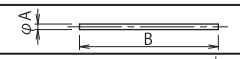
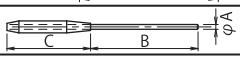
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N·m)
		A	B	C	D	E	F		
	**SLS-3**	6.0	M8×1.0	20.0	8.0	8.0	4.0	—	8.0

Wrench screw

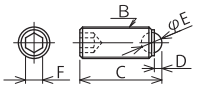
Drawings	Cat. No.	Dimensions (mm)					Wrench
		A	B	C	D	E	
	**LW-015**	46.5	14.0	—	—	1.5	—
	LW-020	52.0	15.0	—	—	2.0	—
	LW-025	59.5	18.0	—	—	2.5	—
	LW-030	67.0	20.0	—	—	3.0	—
	LW-035	71.5	22.5	—	—	3.5	—
	LW-040	75.0	25.0	—	—	4.0	—
	LW-045	80.5	27.0	—	—	4.5	—
	LW-050	80.0	28.0	—	—	5.0	—
	LW-120	137.0	45.0	—	—	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

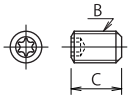
Wrench

Drawings	Cat. No.	Dimensions (mm)					Wrench
		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	—	—	—

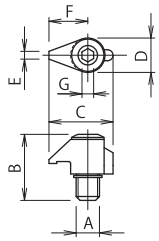
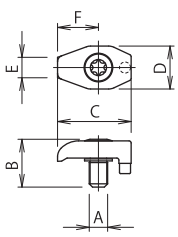
Wedge screw

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

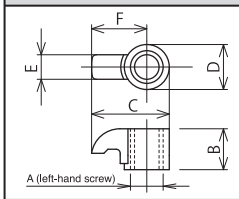
Drawings	Cat. No.	Dimensions (mm)						Wrench	Recommended torque (N•m)
		A	B	C	D	E	F		
	**RSW-05008**	—	M5×0.8	8.0	—	—	—	T-10	—

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 screw seizure eliminator

Drawings	Cat. No.
	MOLY

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	DIN
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	X100CrMoV5 1
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

SI Unit Conversion Table

■ Conversion rate table to major SI units (Excerpt from JIS Steel Handbook)

The box is the unit by SI

Power

N	kgf	dyn
1	$1.019\,72\times10^{-1}$	1×10^{5}
9.806 65	1	$9.806\,65\times10^{5}$
1×10^{-5}	$1.019\,72\times10^{-6}$	1

Stress

1Pa=1N/m², 1MPa=1N/mm²

Pa or N / m2	MPa or N / mm2	kgf/mm²	kgf/cm²	kgf/m²
1	1×10^{-6}	$1.019\,72\times10^{-7}$	$1.019\,72\times10^{-5}$	$1.019\,72\times10^{-1}$
1×10^{6}	1	$1.019\,72\times10^{-1}$	$1.019\,72\times10$	$1.019\,72\times10^{5}$
$9.806\,65\times10^{6}$	9.806 65	1	1×10^{2}	1×10^{6}
$9.806\,65\times10^{4}$	$9.806\,65\times10^{-2}$	1×10^{-2}	1	1×10^{4}
9.806 65	$9.806\,65\times10^{-6}$	1×10^{-6}	1×10^{-4}	1

Pressure

1Pa=1N/m²

Pa	kPa	Mpa	bar	kgf/cm²
1	1×10^{-3}	1×10^{-6}	1×10^{-5}	$1.019\,72\times10^{-5}$
1×10^{3}	1	1×10^{-3}	1×10^{-2}	$1.019\,72\times10^{-2}$
1×10^{6}	1×10^{3}	1	1×10	$1.019\,72\times10$
1×10^{5}	1×10^{2}	1×10^{-1}	1	1.019 72
$9.806\,65\times10^{4}$	$9.806\,65\times10$	$9.806\,65\times10^{-2}$	$9.806\,65\times10^{-1}$	1

Work / energy / heat

1J=1W・s, 1J=1N・m

J	kW・h	kgf・m	kcal
1	$2.777\,78\times10^{-7}$	$1.019\,72\times10^{-1}$	$2.388\,89\times10^{-4}$
$3.600\,00\times10^{6}$	1	$3.670\,98\times10^{5}$	$8.600\,00\times10^{2}$
9.806 65	$2.724\,07\times10^{-6}$	1	$2.342\,70\times10^{-3}$
$4.186\,05\times10^{3}$	$1.162\,79\times10^{-3}$	$4.268\,58\times10^{2}$	1

Power (work rate / power) / heat flow

1W = 1J / s, PS: Horsepower

W	kW	kgf・m/s	PS	kcal/h
1	1×10^{-3}	$1.019\,72\times10^{-1}$	$1.359\,62\times10^{-3}$	$8.600\,00\times10^{-1}$
1×10^{3}	1	$1.019\,72\times10^{2}$	1.359 62	$8.600\,00\times10^{2}$
9.806 65	$9.806\,65\times10^{-3}$	1	$1.333\,33\times10^{-2}$	8.433 71
7.355×10^{2}	7.355×10^{-1}	7.5×10	1	$6.325\,29\times10^{2}$
1.162 79	$1.162\,79\times10^{-3}$	$1.185\,72\times10^{-1}$	$1.580\,95\times10^{-3}$	1

Specific Heat

J/(kg・K)	kcal/(kg・℃), cal/(g・℃)
1	$2.388\,89\times10^{-4}$
$4.186\,05\times10^{3}$	1

Thermal Conductivity

W/(m・K)	kcal/(h・m・℃)
1	$8.600\,00\times10^{-1}$
1.162 79	1

Rotational Speed

min⁻¹	s⁻¹	r.p.m.
1	0.0167	1
60	1	60

Hardness comparison table

Approximate conversion value for vickers hardness of steel

Vickers	Brinell 10mm ball Load 3,000 kgf		Rockwell			Shore	Tensile strength
	Standard ball	Tungsten carbide ball	A scale Load 60 kgf 120° diamond cone	B scale Load 100 kgf 1/16 inch steel ball	C scale Load 150 kgf 120° diamond cone		MPa (kgf/²)
HV		HB	HRA	HRB	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)

Vickers	Brinell 10mm ball Load 3,000 kgf		Rockwell			Shore	Tensile strength
	Standard ball	Tungsten carbide ball	A scale Load 60 kgf 120° diamond cone	B scale Load 100 kgf 1/16 inch steel ball	C scale Load 150 kgf 120° diamond cone		MPa (kgf/²)
HV		HB	HRA	HRB	HRC	HS	
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			

Note 1. This table is an excerpt from the JIS Steel Handbook.
Note 2. 1MPa = 1N / mm
Note 3. The values in parentheses in the table are in the range that is not often used. It is shown as a reference.

2022-23

DIJET®

Products Guide Vol.4

Product model number index

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The □ part contains the alphabet.

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BNM-○○○	Insert for mirror ball BNM type / MBX type	E384
BNM-○○○○○○T-S○○LS	Mirror ball, steel shank, taper neck, long shank	E374,E375
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	Ultra precision grade	
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There are numbers in the ○ part,
The □ part contains the alphabet.

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BNM-○○○-SS	Insert for mirror ball BNM type / MBX type	E386
	Mirror SS insert / twisted blade type	
BNM-○○○-SSR	Insert for mirror ball BNM type / MBX type	E387
	•Mirror SSR insert•Twisted blade type•All R types	
BNM-○○○-TG	Mirror ball BNM type / MBX type insert, twisted blade type,	E391
	Reinforced cutting edge type	
BNM-○○○-TS	Mirror ball BNM type / MBX type insert / strong twist blade	E389
BNMU-○○○○○○-S○○C	Mirror ball, carbide shank, under shank	E378
C		
CSW-408H	Clamp screw	E266, E267
CSW-410H	Clamp screw	E266, E267
CSW-510	Clamp screw	E338, E339
CSW-513H	Clamp screw	E018, E033, E034, E229
CX75	Cermet grade	E088, E353, E355, E365
CX90	Cermet grade	E355
D		
DBD170408	Backdraft DBD type / MDB type /	E355
	Insert for finish jet mill FJM-BD type	
	For bottom finishing	
DBD170408-30	Backdraft DBD type / MDB type /	E355
	Insert for finish jet mill FJM-BD type	
	For bottom finishing and surface roughness improvement	
DBD170408-F	Backdraft DBD type / MDB type /	E355
	Insert for finish jet mill FJM-BD type	
	For simultaneous wall bottom finishing	
DCM-17	Clamp set	E242, E265, E266, E267
DCM-18	Clamp set	E265, E266, E267
DH102	Milling coating grade	E065, E088, E152, E365, E370, E391, E392,
		E418, G11, G12, G13, G14
DH103	Milling coating grade	E258, E268, E317, E353, E355, E384, E415,
		E416
DH108	Milling coating grade	E386, E387
DH110	Milling coating grade	G06
DH111	Milling coating grade	E258, E384, E385
DH115	Milling coating grade	E372, E438
DH202	Milling coating grade	E389
DH-OCHB4○○○-○○	One-cut ball 70 end mill, high hardness material (70HRC)	G20
	compatible	
DS-○○	Modular head spanner	E369, E370, E372, E379, E414, E438, E442,
		E447
DSW-1840H	Clamp screw	E063, E064
DSW-2045H	Clamp screw	F33, F38, F58, F59, F66
DSW-2563H	Clamp screw	E085, E086, E325, E326
DSW-306H	Clamp screw	E004
DSW-307	Clamp screw	E300
DSW-307H	Clamp screw	E003, E004, E325, E326, F35, F39, F58,
		F59, F67
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DSW-4075	Clamp screw	E305, E306

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DSW-4085	Clamp screw	E300, E304, E305, E306
DSW-410H	Clamp screw	E265, E266, E267
DSW-4510H	Clamp screw	E353, E355
DSW-4512H	Clamp screw	E242, E265, E266, E267
DSW-511H	Clamp screw	E325, E326
DUM○○○○○S○○-6R	Undercutter	E299
DUM-○○○○○S○○-W○R	Undercutter, straight shank, with both R	E299
DUM○○○○○T-MT5	Undercutter / MT shank	E299
DV-SCMS○○○○	Scut Mill Square, 6 8 blades, for heat resistant alloys,	G23
	with corner R0	
DV-SOCS3○○○	3-Flute Super One-Cut End Mill / Regular Blade Length	G25

E

ENMQ100312ZER	Insert for Max Master GMX / MXG	E149～E152
	Non-breaker for processing high hardness materials	
ENMU100312ZER-HL	Insert for Max Master GMX / MXG	E149～E152
	Flat breaker for processing high hardness materials	
ENMU100412ZER-PH	Insert for Max Master GMX / MXG	E149～E152
ENMU100412ZER-SL	For Max Master GMX / MXG Inserts / Titanium Processing	E149～E152
EOHW0602○○ZTR	Insert for QM mill PME type / PME-LS type / MPM type	E065
	Hard insert for high hardness materials	
EOMT0602○○ZER	For QM mill PME type / PME-LS type / MPM type insert /	E063, E064, E065
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EOMW060210ZER	Insert for QM mill PME type / PME-LS type / MPM type	E065
	Reinforced cutting edge type for high feed	
EPHW100316ZTR	Insert for QM Max QXP type / MQX type	E085, E086, E087, E088
	Hard insert for high hardness materials	
EPMT1003○○ZER	For QM Max QXP type / MQX type insert / high feed	E087, E088
EPMW100312Z□R	Insert for QM Max QXP type / MQX type	E087, E088
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ESW-206	Clamp screw	E338, E339
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	Hole diameter mm size	
EXM-○○○○R-SM-○○	Multi-extreme, SM type for shoulder milling	E043
	Hole diameter mm size	
EXSAP-○○○○R-○○	Shoulder extreme, Face mill type, hole diameter mm size	E194
EXSAP-○○○○R-○○-○○	Shoulder extreme, Face mill type, hole diameter mm size	E190
EXSAP-○○○○-○○○-S○○	Shoulder extreme, End mill type, hole diameter mm size	E195
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EZN2D○○○○S○○	For strike drill 2D	F06, F07
EZN3DCH○○○○S○○	For strike drill 3D	F10, F11
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F		
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FJM-○○○○R-○○-BD	Finish jet mill, hole diameter mm size, corner cutting specifications	E354
FJM-○○○○R-○○-F4	Finish jet mill, hole diameter mm size	E352
FSW-2005H	Clamp screw for mirror ball / mirror radius	E374, E376, E411
FSW-2506H	Clamp screw for mirror ball / mirror radius	E374, E376, E410, E411, E413
FSW-3007H	Clamp screw for mirror ball / mirror radius	E374, E376, E379, E410, E411, E413, E414
FSW-3509	Clamp screw for mirror ball / mirror radius	E411, E413
FSW-3509H	Clamp screw for mirror ball / mirror radius	E374, E376, E379, E410, E411, E413, E414
FSW-4013	Clamp screw for mirror ball / mirror radius	E412, E413
FSW-4013H	Clamp screw for mirror ball / mirror radius	E370, E374. E376, E378, E379, E410, E411, E413, E414
FSW-5016	Clamp screw for mirror ball / mirror radius	E412, E413
FSW-5016H	Clamp screw for mirror ball / mirror radius	E370, E374, E377, E378, E379, E410, E414
FSW-6020	Clamp screw for mirror ball / mirror radius	E374, E377, E379, E410, E412, E414
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G		
GMX-○○○○-○○-S○○	Maxmaster shank type	E150
GMX-○○○○R-○○	Max master, bore type, hole diameter mm size	E149
GRM-○○○-R○○	Giant Radius Insert for Mirror Ball BNM / MBX	E392
H		
HDM-○○○○-○○R-○○	Super die mate, bore type, hole diameter mm size	E264
HEP-○○○○-○○○-S42	Heptamill straight shank type	E242
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I		
IM-SP43GS	Peripheral blade	E338, E339
J		
JBN245	CBN sintered body	E384, E392
JBN500	CBN sintered body	E355
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JC10000	Diamond coating grade	E384, E415, E416,
JC20003	DLC coating grade	E391
JC5015	Coating grade for milling and turning	E300, E345
JC5040	Milling coating grade	E243, E268, E300, E317, E321, E345
JC5118	Coating grade for milling and turning	E258, E307, E345
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JC7560	Milling coating grade	E034, E065, E088, E152, E243
JC8003	PVD Coated grade NHP type	E258
JC8015	Coating grade for milling and turning	E065, E088, E243, E268, E317, E321,
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JC8050	Milling coating grade	E017, E018, E034, E045, E065, E088,
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		E268, E293, E317, E321, E345, E365,
		F32, F34, F36, F38, F39
JC8118	Milling coating grade	E017, E018, E034, E045, E065, E088,
		E152, E168, E193, E229, E243, E268,
		E293, E327, E365

K

KRM-○○○-R○○-BR○○	Mirror ball modular head KRM / MRX type	E370
KT9	Non-coated grade	E384, E415, E416

L

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M

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M10	Screw	E016, E018, E042, E043, E229, E241,
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M10×1.5×25	Set bolt (Head screw Slim Standard)	E229, E241
M10×1.5×35	SKS-GII•SKG type / HEP-FM type dedicated arbor bolt	E016, E018
M12	Set bolt (Head screw Slim Standard)	E264, E265, E447
M12×1.75×30	Set bolt (Head screw JIS Standard)	E016, E018, E229, E241
M12×1.75×35	Multi Extreme EX M type / Shoulder 6 EXSIX type	E042
M12×1.75×40	Set bolt (Head screw JIS Standard)	E241
	Wild Radius WDR Type Dedicated Arbor Bolt	
M16	screw	E448
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M20×2.5×40	Set bolt (Head screw JIS Standard)	E229
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M12	Set bolt (Head screw JIS Standard)	E370
M12X1.75X30	Set bolt (Head screw JIS Standard)	E003, E166, E190, E194
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M16X2X25	Set bolt (Head screw JIS Standard)	E194
M16X2X30	Set bolt (Head screw JIS Standard)	E166

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MEX-○○○○-HF-M16	Multi-extreme modular head type / HF type	E044
MEX-○○○○-SM-M16	Multi-extreme modular head type / SM type	E045
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MQT-○○○○A○○-M○○	High precision version QM Max Modular Head	E364
MQX-○○○○-M○○	QM Max Modular Head	E085
MRX-○○○-M○○	Mirror Radius Modular Head (with Coolant Hole)	E370
MSG-○○○○-09-M○○	SKS-GII 09 type Modular head type	E004
MSG-○○○○-10-M○○	SKS-GII, bore type, hole diameter inch size	E017
MSG-○○○○-10	SKS-GII, 10 & 14 Type	E021
SKG-○○○○-10	SKS-GII, 10 & 14 Type	E021
SKG-○○○○-14	SKS-GII, 10 & 14 Type	E021
MSN-M○○-○○○-S○○C	All Carbide Shank Arbor for Stubborn Ittetsu /	E432, E433
	Modular Head	
	(End mill shank type)	
MSN-M○○-○○○S-S○○C	All Carbide Shank Arbor for Stubborn Ittetsu /	E434
	Modular Head	
	(Straight arbor type)	
MSN-M○○-○○○T-S○○C	All Carbide Shank Arbor for Stubborn Ittetsu /	E432, E433
	Modular Head	
	(Taper neck end mill shank type)	
MSW-3225-M16	Swing ball modular head	E343
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MSX-○○○○-M○○	Shoulder Extreme Modular Head	E196
MSX-○○○○-○○-M○○	Shoulder Extreme Modular Head	E192
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N

NHP-○○○○○R-○○-○○	Negative hepta, hole diameter mm size	E256, E257

P

PME○○○○S○○	QM Mill Shank Type Regular	E064
PME○○○○S○○-LS	QM mill shank type long shank	E064

Q

QXP-○○○○R-○○	QM max, bore type, hole diameter mm size	E086

R

RD○○07T2MO...	Insert for Super Diemaster SDH type	E266, E267
RD○○1004MO...	Insert for Super Diemaster SDH type	E266, E267
RD○○1204MO○	Insert for Super Diemaster SDH type	E264, E265, E266, E267
RD○○1606MO○	Insert for Super Diemaster SDH type	E264, E265
	With round positive insert breaker	
RD□T○○○○M□□	Insert for Super Dymate HDM / SDH type	E268
	Round positive insert with breaker for aluminum	
RDGT○○□○MOF-AL	Insert for Super Diemaster SDH type	E269

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RDMT○○○○MOE-ML	Insert for Super Diemate HDM / SDH type	E268
	With round positive insert breaker	
RDMW○○□○M□□	Insert for Super Diemaster SDH type	E268
	No round positive insert breaker	
RNM□-○○○○○○S-S○○	Mirror radius end mill, steel shank, straight neck	E410
RNM□-○○○○○○S-S○○C	Mirror Radius End Mill / Carbide Shank / Straight Neck	E411, E412
RNM□-○○○○○○T-S○○	Mirror Radius End Mill / Steel Shank / Tapered Neck	E410
RNM□-○○○○○○T-S○○C	Mirror Radius End Mill / Carbide Shank / Tapered Neck	E411,E412
RNM□-○○○○○○U-S○○C	Mirror radius end mill, carbide shank, stub type	E411
RNM-○○○-R○○	Insert for Mirror Radius RNM type / MRX type	E415, E416
	(Corner R ○. ○)	
RNMU-○○○○○○S-S○○C	Mirror Radius End Mill / Carbide Shank / Under Shank	E413
RNMU1205MOE-MM	Insert for Extreme Diemate EXTDM / MTX	E293
RNMU1205MOE-PM	Insert for Extreme Diemate EXTDM / MTX	E293

S

SBZ-8	Finish Jet Mill FJM / FJM-F4 /	E353, E355
SDET090312ZDER-SM	Insert for SKS-GII 09 09 type	E003, E004
SDEW090312ZER	Insert for SKS-GII 09 09 type	E003, E004
SDH-○○○○-R○○-M○○	Super Diemaster Modular Head	E266, E267
SDHW1504AD□N-W○	Insert for finish jet mill FJM / FJM-F4 type	E353
SDHW1504ADEN-F1	Insert for finish jet mill FJM / FJM-F4 type	E353
SDMT1204****	With insert breaker for DIJET MILL 90 / SSD90 type	E321
SEGT13T3AGFN-AL	Dijet mill 45 / SSE45 type insert / aluminum	E317
SEHH○○○○	One-cut 70 (DH coat), regular blade length	G11
SEHH○○○○-R○○	One-cut 70 (DH coat) with corner R	G13
SEHH○○○○-R02	One-cut 70 (DH coat) with corner R0.2	G12
SEHL6○○○	One-cut 70 (DH coat), long blade length	G14
SEHM6○○○	One-cut 70 (DH coat), middle blade length	G14
SEHS○○○○	One-cut 70 (DH coat), short blade length	G11
SEMT13T3AGSN-○○	Insert for DIJET MILL 45 / SSE45 type	E317
SFSB○○○○	Compatible with hard 1-ball and high-hardness material	G06
	processing	
SFSB○○○○-S○	Compatible with hard 1-ball and high-hardness material	G06
	processing	
SKG-○○○○-○○○-09-S○○	SKS-GII 09 type shank type milling cutter	E006
SKG-○○○○R-09-○○	SKS-GII 09 type, bore type, hole diameter mm size,	E006
	inscribed circle 9 m	
SKG-○○○○R-10-○○	SKS-GII•Bore type•Hole diameter mm size•Inscribed circle	E016, E021, E022
	10 mm	
SKG-○○○○R-14-○○	SKS-GII•Bore type•Hole diameter mm size•Inscribed circle	E018, E021, E022
	14 mm	
SMAL-○○○○-M○○	S head for aluminum (solid modular head)	E447
SMHB-○○○○-M○○	Mirror ball SMHB type	E372
SMSA-○○○○R○○-M○○	S head (solid modular head)	E442
SM-SD12	Sim for DIJET MILL 90 / SSD90 type	E321
SM-SE13	Sim for DIJET MILL 45 / SSE45 type	E317
SMSR-○○○○R○○-M○○	Anti-vibration S head (solid modular head)	E438
SPET100415ZPER-SM	Insert for SKS-GII / SKG / MSG type / Inscribed circle 10 mm	E016, E017
SPGA090304	Peripheral blade	E300, E338, E339
SPHW1203ZPTR	Insert / rough blade for finish jet mill FJM type	E353
SPMA090304	Peripheral blade	E300, E338, E339
SPMT100415ZP□R-PM	Insert for SKS-GII / SKG / MSG type / Inscribed circle 10 mm	E017

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SPMT100415ZP□R-SM	Insert for SKS-GII / SKG / MSG type / Inscribed circle 10 mm	E017
	For titanium processing	
SPMT140520ZP□R-PM	Insert for SKS-GII / SKG / MSG type / Inscribed circle 14 mm	E016, E018
SPMT140520ZP□R-SM	Insert for SKS-GII / SKG / MSG type / Inscribed circle 14 mm	E016, E018
	For titanium processing	
SPNW100415ZTR	Insert for SKS-GII / SKG / MSG type / Inscribed circle 10 mm	E016, E017
SPNW140515ZTR	Insert for SKS-GII / SKG / MSG type / Inscribed circle 14 mm	E018
SSD90-○○○○○R-○○	Dijet mill 90	E320
SSE45-○○○○○R-○○	Dijet mill 45	E316
SSFDR15-15F	Finish jet mill for FJM / FJM-F4 type	E353, E355
	Finishing blade cartridge	
SSFPR15-12R	Finish Jet Mill FJM Type / Rough Blade Cartridge	E353, E355
SSV-○○○○-M○○	Indexable milling cutter SSV type Modular head type	E168
SSV-○○○○R-○○	Indexable milling cutter SSV type Face mill type	E166
SSV-○○○○-○○-○○○+A	Indexable milling cutter SSV type End mill type	E167
SSW-535	Sim screw	E317, E321
ST45○R	Feathermill tough HSG45-5000RS type shim	E023
STLP○○○○○○○R○-M○	Solid Modular Head STLP type	E369
S-TSC4-○○○○S○○	Super T slot cutter (low resistance type)	B429
SWB□3242S○○-G	Swing ball, φ32, with outer peripheral blade, straight shank	E338, E339
SWB□4035S○○	Swing ball, φ40, no outer blade, straight shank	E338, E339
SWB□4050C508	Swing ball, φ40, with outer peripheral blade, combination	E338, E339
	shank	
SWB□4050S○○	Swing ball, φ40, with outer peripheral blade, straight shank	E338, E339
SWB□5060C508	Swing ball, φ50, with outer peripheral blade, combination	E338, E339
	shank	
SWB□5060S42	Swing ball, φ50, with outer peripheral blade, slim shank	E338, E339
SWB□5080C508	Swing ball, φ50, outer peripheral multi-blade, combination	E340
	shank	
SWB2○○MMW	For swing ball φ40 / φ50 main blade insert / overlay	E338, E339
	processing	
SWB2○○MSW	For swing ball φ40 / φ50 secondary blade insert / overlay	E338, E339
	processing	
SWB232HM-G	Main blade insert for swing ball φ32	E338, E339
SWB232HS-G	Secondary blade insert for swing ball φ32	E338, E339
SWB232MMW-G	For swing ball φ32 main blade insert / overlay processing	E338, E339
SWB232MSW-G	For swing ball φ32 secondary blade insert / overlay	E338, E339
	processing	
SWB240HMN	Main blade insert for swing ball φ40	E338, E339
SWB240HSN	Secondary blade insert for swing ball φ40	E338, E339
SWB250HMN-N	Main blade insert for swing ball φ50, low resistance type	E338, E339
SWB250HSN-N	Secondary blade insert for swing ball φ50, low resistance	E338, E339
	type	
SWB-32○○○-MT4-G	Swing ball, φ32, with outer peripheral blade, MT shank	E341
SWB-32○○○-W○○-G	Swing ball, φ32, with outer peripheral blade, Weldon shank	E341
SWB-40○○○-MT○	Swing ball, φ40, with outer peripheral blade, MT shank	E341
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SWB-50○○○-MT5	Swing ball, φ50, with outer peripheral blade, MT shank	E341
SWB-50○○○-W50	Swing ball, φ50, with outer peripheral blade, Weldon shank	E341
SWBX-○○○○○-S○○	Swing ball neo shank type	E324, E325, E326, E327
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SWBX2○○HS	Swing Ball Neo Secondary Blade Insert	E325, E326, E327

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T-15	Wrench	E370
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TLDM○○○-S○	Tyler drill, 2D, counterbore processing, shank φ6 type	F50
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TLZD○○○○-M○○	TA Tyler Drill Modular Head for 0.7D, For Counterbore Machining	F67
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There are numbers in the ○ part,
The □ part contains the alphabet.

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ZNGU1105**ZER-**	EXSAP / MSX type insert	E190, E191, E192, E193,
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Note :

Note :

Note :

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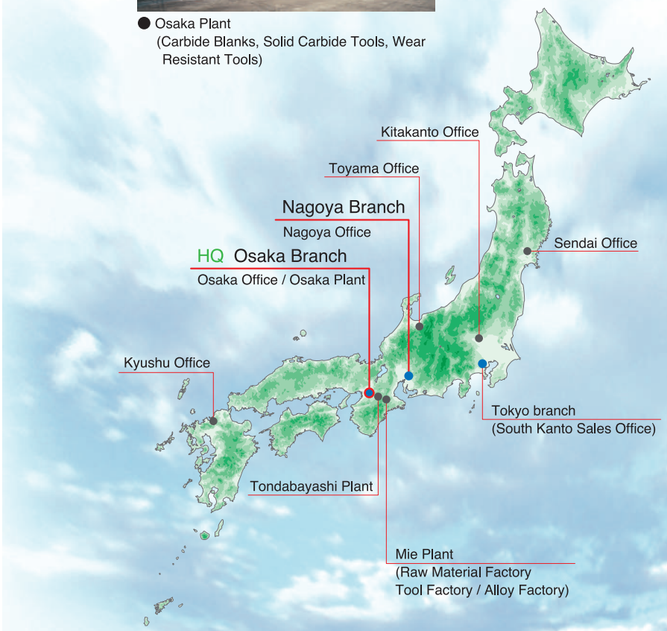

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