THE NEW VALUE FRONTIER

KYOCERA

2013

KYOCERA Cutting Tools

Milling Catalog

SPT SUNCOAST INC. PRECISION TOOLS

ESTABLISHED 1963

ADVANCING PRODUCTIVITY

THE NEW VALUE FRONTIER

KYOCERA

Continuously Create New Value
at the Cutting Edge of Technology

ADVANCING PRODUCTIVITY

Contributing to the betterment of world-wide manufacturing and our customers' productivity by providing efficient cutting tool products and high-precision machining solutions

KYOCERA

2013

Milling Catalog

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Kyocera Cutting Tool Network

KYOCERA Cutting Tools
Global Manufacturing Facilities


Okaya Factory (JAPAN)


Yokaichi Factory (JAPAN)


Sendai Factory (JAPAN)


Silong Factory (CHINA)


Incheon Factory (KOREA)

KYOCERA Cutting Tools
North America Manufacturing Facilities


North Carolina Facility


Washington Facility


Ohio Facility


California Facility

Kyocera Cutting Tool Network

KYOCERA Cutting Tools
Global Technical Centers

North American Technical Center (NC)

- **KYOCERA Industrial Ceramics Corp. (Hendersonville, NC)**
  North American Headquarters and CT Manufacturing Facility
- **KYOCERA Industrial Ceramics Corp. (Vancouver, WA)**
  Advanced Ceramics Components Facility
- **KYOCERA Cutting Tool Division (Wapakoneta, OH)**
  CT Manufacturing Facility


Technical Center (BRAZIL)


Technical Center (JAPAN)


Technical Center (JAPAN)


Technical Center (JAPAN)

Sales Office and Technical Center (GERMANY)


Technical Center (KOREA)


Technical Center (SINGAPORE)


Technical Center (CHINA)

THE NEW VALUE FRONTIER

KYOCERA

Company Profile

Kyocera Industrial Ceramics Corporation (KICC), a core company of the Kyocera Group, is a leading manufacturer and provider of **cutting tool products**, advanced ceramic components, liquid crystal displays, thermal printheads, metallized assemblies and industrial lenses. The Kyocera Group is a diversified network of companies working together to create new value for businesses and consumers. Kyoto, Japan-based Kyocera Corporation (NYSE: KYO), the group's global parent, employs approximately 64,000 people in 25 nations and recorded consolidated net sales of approximately US$13 billion during the year ended March 31, 2010.

KICC North American Headquarters
Hendersonville, NC

KICC, Cutting Tool Division Ohio Production Facility
Wapakoneta, OH

Kyocera's Cutting Tool Division is the market leader in Japan and a leading supplier of high-quality tooling solutions in North America with plants in Ohio, North Carolina, and Washington. Kyocera manufactures a diversified product line of turning, milling, Swiss, and drilling products. Our indexable inserts and steel products are manufactured to the highest quality standards and include coated and uncoated carbide, cermet, ceramic, CBN and PCD.

Kyocera's continuous **investment and focus on R&D** has resulted in market beating products such as our innovative CVD coated CA45-Series for cast iron, CA55-series for steel and CA65-series for stainless steel, our high performance MECH helical endmills, our highly acclaimed MFPN high-efficiency 10-edged face mill, and most recently our new line of MEGACOAT carbide, cermet, CBN and ceramic tools, just to name a few.

The Kyocera Industrial Ceramics Corporate headquarters are located in Mountain Home, NC which also serves as the primary North American cutting tool manufacturing plant and is home to the Cutting Tool Division Customer Service, Marketing, and Technical Center staff.

THE NEW VALUE FRONTIER

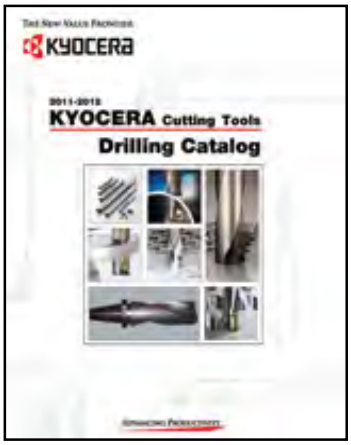
KYOCERA

How to Order
Kyocera Cutting Tool Products

Kyocera Cutting Tool products are sold exclusively through our North American line of authorized distributors. To locate a local Kyocera Cutting Tool Distributor, please contact Kyocera Customer Service at 800-823-7284.

Using the Kyocera Product Catalogs

All standard Kyocera Cutting Tool Products are located in one of these four General Catalogs.



Stock Status Symbols

●: Indicates that an item is **Stock Standard** and available at our North American Headquarters in North Carolina. Stock Standard items will ship the same day if ordered by 4:30pm (EST).

○: Indicates that an item is a **World Express** and available at our Worldwide Headquarters in Japan. Please allow 5-7 business days for World Express items to arrive.

All Stock Standard and World Express items are subject to availability

Kyocera Authorized Distributor Ordering Guide

Order online

To place an order for Kyocera Cutting Tools, please utilize the MyKICC Distributor Website - **http://mykicc.kyocera.com**

In addition to placing orders, the MyKICC distributor website allows you to view real-time product availability, check pricing, view and download product and promotional literature, watch product training videos, and much, much more.

Call us

- Kyocera Cutting Tool Customer Service – (800) 823-7284.
  Representatives are available Monday through Friday from 8:00am to 5:30pm (EST).
- Kyocera Applications Engineers – (800) 823-7284.
  Engineers are available Monday through Friday from 8:00am to 5:00pm (EST).

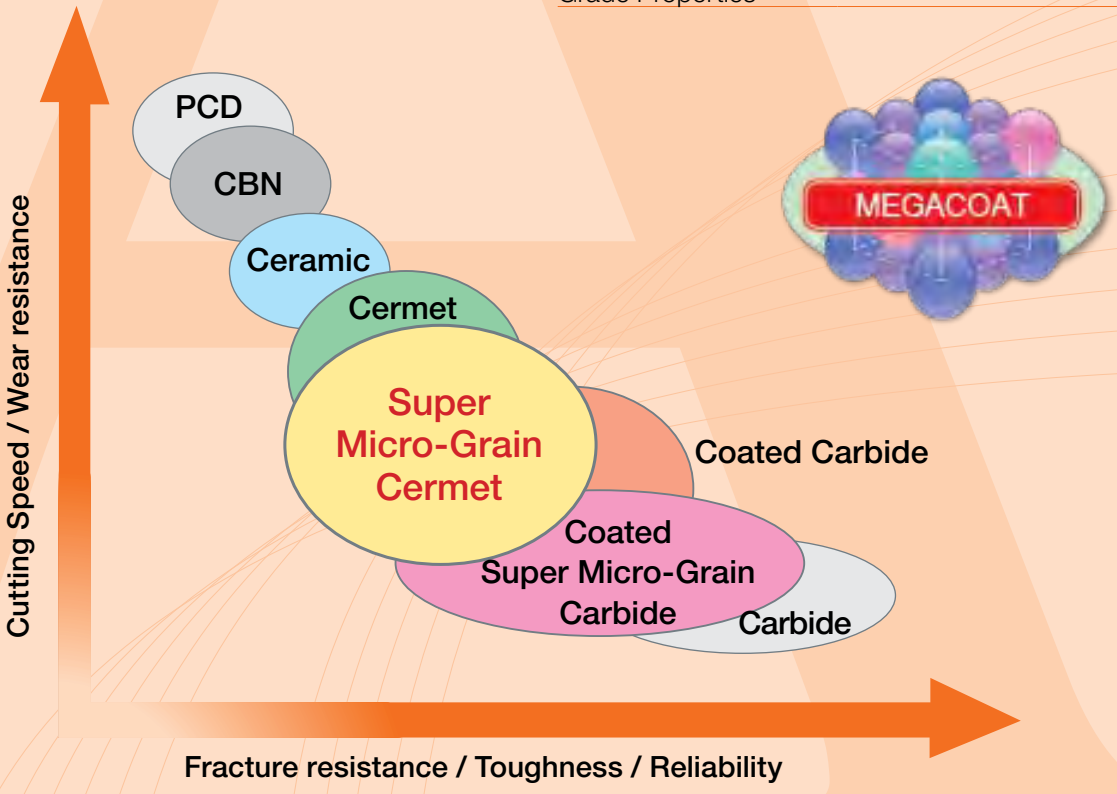
Email us

- General Inquiries – **cuttingtools@kyocera.com**
- Customer Service – **ctsales@kyocera.com**
- Technical Center – **cttechs@kyocera.com**

Insert Grades

A1~A16

A



Summary of Insert Grades

Milling

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN Series	TN60, TN100M					TN60, TN100M								
	TC Series		TC60					TC60							
Coated Carbide	PR Series		PR730, PR830	PR630, PR660				PR730, PR830, PR1025	PR630, PR660			PR905			
	MEGACOAT (PR Series)		PR1225, PR1230					PR1225					PR1210		
	MEGACOAT NANO (PR Series)		PR1525					PR1525					PR1510		
Carbide					PW30								KW10, GW25		

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Titanium / Titanium alloys				Hard Materials (Hardened steel / Chilled cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	PR Series					PR905							
	MEGACOAT (PR Series)						PR1210						
	MEGACOAT NANO (PR Series)						PR1510						
Carbide		KW10, GW25					KW10, GW25						
CBN										KBN525			
PCD		KPD001, KPD010, KPD230				KPD001, KPD010, KPD230							

Drilling

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated Carbide	PR Series		PR730, PR830, PR915, PR930, PR1025	PR660				PR730, PR830, PR915, PR930, PR1025	PR660			PR905			
	MEGACOAT (PR Series)		PR1225, PR1230					PR1225					PR1210		
Carbide													KW10, GW15		

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Titanium / Titanium alloys				Hard Materials (Hardened steel / Chilled cast Iron)			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30
Coated Carbide	MEGACOAT (PR Series)									PR1230			
Carbide			KW10, GW15				KW10, GW15						

Turning

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ←				→ Roughing	Finishing ←				→ Roughing	Finishing ←			→ Roughing
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	TN Series	TN6010, TN6020, TN60, TN90					TN6010, TN6020, TN60, TN90					TN60			
	TC Series	TC40, TC60					TC60					TC40			
	PV Series	PV7020, PV60, PV90					PV7020, PV60, PV90								
	MEGACOAT (PV Series)	PV7010, PV7025					PV7010, PV7025					PV7005			
Coated Carbide	CA Series	CA5505, CA5515, CA5525, CA5535					CA6515, CA6525					CA4010, CA4115, CA4120, CA4505, CA4515			
	PR Series	PR915, PR930, PR1005, PR660, PR1025, PR1115					PR915, PR930, PR660, PR1025, PR1125								
	MEGACOAT (PR Series)	PR1225					PR1225								
	MEGACOAT NANO (PR Series)	PR1425					PR1425								
Ceramic												KA30, KT66, A66N, PT600M, KS6000, KS6050, CS7050			
Carbide												KW10, GW15			
CBN												KBN60M, KBN900			

Summary of Insert Grades

Turning

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Heat-resistant alloys / Inconel				Hard Materials (Hardened steel / Chilled cast Iron)				Sintered Steel			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	CA Series						CA6515	CA6525									
	PR Series							PR1125							PR930		
	MEGACOAT (PR Series)					PR1305	PR1310	PR1325									
Cermet														TN6010	TN60		
Ceramic							CF1			KT66	A66N	PT600M					
CBN										KBN510	KBN525	KBN900					
MEGACOAT										KBN05M	KBN10M	KBN25M	KBN30M KBN35M		KBN65M	KBN70M	

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Titanium / Titanium alloys				Hard Materials (Hardened steel / Chilled cast Iron)				Sintered Steel			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing				Finishing ⟷ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Carbide			KW10 GW15			SW05	SW10	SW25									
PCD		KPD001 KPD010				KPD001 KPD010											

PVD Coated Carbide for Small Tools A10

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ⟷ Roughing					Finishing ⟷ Roughing					Finishing ⟷ Roughing			
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Coated Carbide	PR Series	PR1005	PR930 PR1025 PR1115					PR930	PR1025	PR1125	PR1115				
	MEGACOAT (PR Series)			PR1225					PR1225						
	MEGACOAT NANO (PR Series)			PR1425					PR1425						

Grooving / Cut-Off

Workpiece Material		Steel (Carbon steel / Alloy steel)					Stainless steel / Cast steel					Cast Iron (Gray cast iron / Nodular cast iron)			
Cutting Range		Finishing ←				→ Roughing	Finishing ←				→ Roughing	Finishing ←			→ Roughing
Classification		P01	P10	P20	P30	P40	M01	M10	M20	M30	M40	K01	K10	K20	K30
Cermet	MEGACOAT (PV Series)	PV7040										PV7040			
	TN Series	TN6020, TN60, TN90					TN6020, TN60, TN90					TN60			
	TC Series	TC40, TC60					TC60					TC40			
Coated Carbide	CR Series	CR9025					CR9025								
	PR Series	PR915, PR930, PR1025, PR1115, PR630, PR660					PR915, PR930, PR1025, PR630, PR660					PR905			
	MEGACOAT (PR Series)	PR1215, PR1225					PR1215, PR1225						PR1215		
Ceramic												A65, A66N, PT600M			
Carbide												KW10, GW15			

Workpiece Material		Non-ferrous Metals (Aluminum / Non-ferrous metals / Non-metals)				Titanium / Titanium alloys				Hard Materials (Hardened steel / Chilled cast Iron)				Sintered Steel			
Cutting Range		Finishing ←			→ Roughing	Finishing ←			→ Roughing	Finishing ←			→ Roughing	Finishing ←			→ Roughing
Classification		N01	N10	N20	N30	S01	S10	S20	S30	H01	H10	H20	H30	01	10	20	30
Coated Carbide	PR Series														PR930		
	MEGACOAT (PR Series)														PR1215, PR1225		
Cermet															TN60		
Ceramic										A65, A66N, PT600M							
Carbide			KW10, GW15				KW10, GW15										
CBN										KBN510, KBN525					KBN570		
PCD		KPD001, KPD010				KPD001, KPD010											

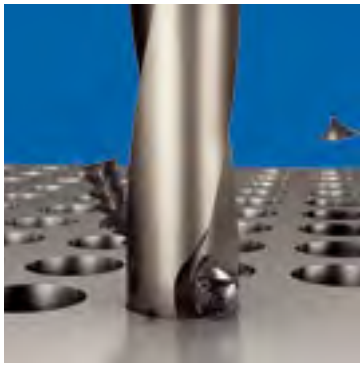
Summary of Insert Grades

Insert Material Selection Table

Applications		Cutting Range	P	M	K		N	S		H	Sintered Steel
			Steel	Stainless Steel	Gray Cast Iron	Nodular Cast Iron	Non-ferrous Metals	Heat-resistant Alloys	Titanium Alloys	Hard Materials	
Milling		Finishing	TN100M								
			PR730	PR730			KPD230		KPD230		
			PR830	PR830	PR905	PR905	KPD001	PR830	KPD001		
			PR660	PR660	PR1210	PR1210	KPD010	PR660	KW10	-	-
			PR1225	PR1225	PR1510	PR1510	KW10	PR1225	PR905		
			PR1230	PR1525	KW10	KW10	GW25	PR1525	PR1210		
		Roughing	PR1525						PR1510		
Turning		Finishing	TN6010							KT66	
			TN60	TN60	KBN60M			CF1		A66N	
			TN6020	PV7025	KA30	TN60		KW10		PT600M	TN6010
			PV7010	CA6515	PV7005	PV7005	KPD001	CA6515	KPD001	KBN05M	TN60
			PV7025	CA5525	CA5505	CA5505	KPD010	CA6525	KPD010	KBN10M	PR930
			CA5505	CA5535	CA4505	CA4505	KW10	PR1305	SW05	KBN25M	KBN65M
			CA5515	CA6525	CA4515	CA4515		PR1310	SW10	KBN30M	KBN70M
			CA5525	PR1125				PR1325	SW25	KBN35M	
		Roughing	CA5535							KBN900	
Small Tools		Finishing	TN6010								
			TN60								
			TN6020								TN6010
			PV7010	PV7025	CA4505	CA4505	KPD001	CA6515	KPD001	KBN05M	TN60
			PV7025	PR930	CA4515	CA4515	KPD010	PR1125	KPD010	KBN10M	PR930
			PR930	PR1025	KW10	KW10	KW10	PR660	KW10	KBN25M	KBN65M
			PR1005	PR1225				PR1225		KBN30M	KBN70M
			PR1025								
			PR1225								
		Roughing	PR1425								
Boring		Large	TN6010								
			TN60	TN60							
			TN6020	PV7025	KBN60M			PR1310		PT600M	TN6010
			PV7010	CA6515	PV7005	PV7005	KPD001	CA6515	KPD001	KBN05M	TN60
			PV7025	CA6525	CA4505	CA4505	KPD010	CA6525	KPD010	KBN10M	PR930
			CA5515	PR1025	CA4515	CA4515	KW10	PR1125	KW10	KBN25M	KBN65M
			CA5525	PR1125	KW10	KW10		PR1225		KBN30M	KBN70M
			CA5535	PR1225							
			PR1025	PR930							
			PR1425								
		Small	PR930								
Cut-off		Large	CR9025	CR9025							
			PR930	PR930							
			PR915	PR915	KW10	KW10	KW10	KW10	KW10	-	-
			PR1215	PR1215	PR1215	PR1215		PR1225			
			PR1225	PR1225				PR660			
		Small	PR660	PR660							
Grooving		Glossy finish	TC40	TC40							
			TN6020	TN6020	PV7040	PV7040					
			TN90	TN90	PR905	PR905	KPD001	PR915	KPD001	KBN510	TC40
			PV7040	PV7040	PR1215	PR1215	KW10	KW10	KW10	KBN525	PR930
			PR930	PR930	KW10	KW10	GW15	PR1215		PT600M	KBN570
			PR1115	PR1115	GW15	GW15		PR1225			
			PR1215	PR1215							
		Stable Cutting	PR1225	PR1225							
Threading		Glossy finish									
			TC60	TC60	KW10	KW10	KW10	KW10	KW10		PR930
			PR930	PR930	GW15	GW15	GW15	GW15	GW15	-	PR1115
			PR1115	PR1115				PR1115			
		Stable Cutting									
Drilling		Wear Resistance	PR930								
			PR830	PR830				PR660			
			PR915	PR915	PR905	PR905	KW10	PR1025	KW10		
			PR1025	PR1025	PR1210	PR1210	GW15	PR1225		-	-
			PR1225	PR1225	KW10	KW10		KW10			
			PR1230	PR660				GW15			
		Toughness	PR660								

· Highlighted materials are recommended 1st choice grades.

PVD Coated Carbide for Milling and Drilling



PVD Coated Carbide (MEGACOAT/MEGACOAT NANO)

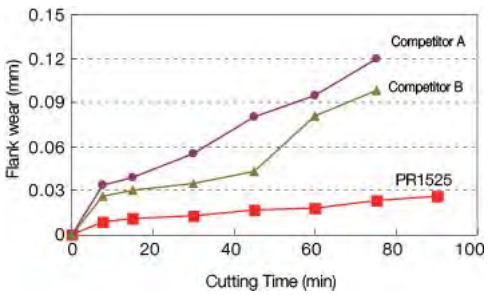
KYOCERA's PVD coated carbide for milling and drilling is coated on a very tough carbide substrate.
The low processing temperature, compared with CVD, leads to improved bending strength, less deterioration of the coating and superior tool life with stable machining.

Features of PVD Coated Carbide for Milling and Drilling

Workpiece Material	Symbol	Color	Main Component (Coated Composition)	Advantages
P Steel	**PR630**	Gold	TiN	· TiN based PVD Coated Carbide · Application: General purpose for milling, grooving and threading of steel
	PR730	Gold	TiAlN+TiN	· Superior oxidation resistance with well balanced wear resistance and toughness · Application: Stable and long tool life at high-speed cutting of steel
	PR830	Gold	TiAlN+TiN	· Improved high temperature stability and wear resistance by TiAlN base PVD coating · Application: Stable and long tool life for milling of steel
	PR1230	Blackish red	MEGACOAT	· Superior wear and oxidation resistant MEGACOAT on a special tough carbide substrate · Application: Stable and high feed rate milling and drilling of steel
	PR1525	Blackish red	MEGACOAT NANO	· New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance. · Application: Stable and long tool life milling of Steel and Stainless Steel
M Stainless Steel	**PR660**	Gold	TiN	· Superior adhesion-resistant TiN base PVD coated carbide on special tough carbide substrate · Application: For steel, stainless steel, cast steel and heat-resistant alloys, low speed cutting
	PR1025	Reddish gray	TiCN	· TiCN base PVD coated on micro-grain carbide · Application: Stable and long tool life milling of stainless steel
	PR1225	Blackish red	MEGACOAT	· Superior wear and oxidation-resistant MEGACOAT on micro-grain carbide substrate · Application: General and high feed drilling of steel and stainless steel
K Cast Iron	**PR905**	Bluish violet	TiAlN	· TiAlN base PVD coated on special tough carbide substrate for cast iron · Application: Highly efficient stable milling and drilling of gray and nodular cast iron
	PR1210	Blackish red	MEGACOAT	· Superior wear and oxidation resistant MEGACOAT on special carbide substrate for cast iron · Application: Highly efficient stable milling and drilling of gray and nodular cast iron
	PR1510	Blackish red	MEGACOAT NANO	· New coating technology [MEGACOAT NANO] is applied. Nano thin multi-layer coating performs superior wear resistance and high oxidation resistance. · Application: For gray and nodular cast iron, stable wear resistance and toughness

Wear resistance (PR1525)

1045 Steel (S45C)



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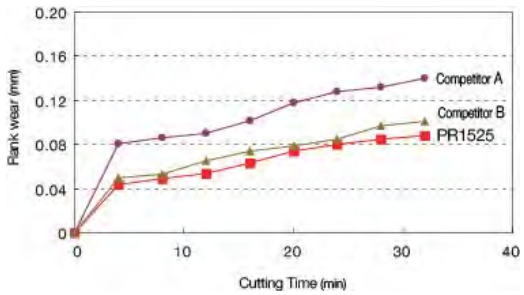
fz=0.005ipt, Dry

D2 Tool Steel (SKD11)



<Cutting Conditions>

D2, Vc=400sfm, ap×ae=0.080x0.394in
fz=0.004ipt, Dry

Cermet

Cermet

KYOCERA is known as the leading manufacturer of cermets.
Cermet is a composite material combining Ceramic and Metal. Typical materials used in cermets are TiC, TiN, TiCN and NbC. Designed to provide long tool life and excellent surface finishes, cermets combine toughness with superior wear resistance.

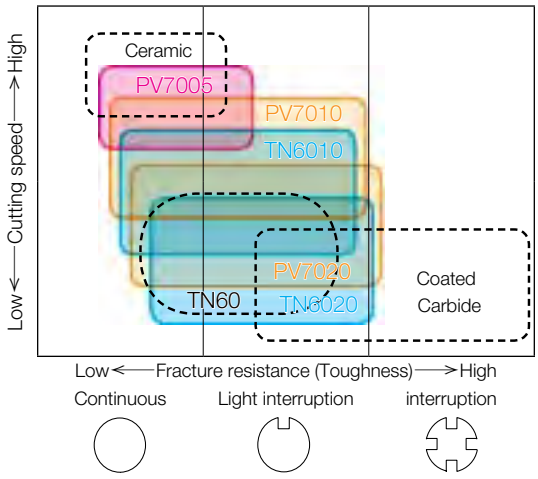
PVD Coated Cermet

PVD Coated Cermet is coated on cermet substrate with a thin layer of high wear resistance and high adhesion resistance by PVD (Physical Vapor Deposition) technology. Generally because of the low processing temperature of PVD compared with CVD, PVD Coated Cermet features less deterioration and more bending strength.

Features of Cermet and PVD Coated Cermet

Workpiece Material		Symbol	Color	Main Component (Coating Composition)	Advantages
P Steel	Cermet	**TN6010** (Super Micro-Grain)	Gray	TiCN	• Improved surface cermet with superior wear resistance and toughness • Application: Economical uncoated cermet for steel
		TN60	Gray	TiCN+NbC	• Typical choice cermet with superior wear resistance and toughness • Application: Cutting of steel and stainless steel
		TN6020 (Super Micro-Grain)	Gray	TiCN	• Super micro-grain cermet with superior wear resistance and toughness • Application: First choice cermet for steel and stainless steel cutting
		TN100M	Gray	TiCN+NbC	• Tough cermet with improved oxidation resistance and thermal shock resistance • Application: Milling of steel at high speed
		TC40	Gray	TiC+TiN	• Good balance of wear resistance and toughness • Application: Grooving and threading of steel
	PVD	**PV7010** (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	• Heat-resistant MEGACOAT on improved surface cermet with excellent wear resistance and toughness • Application: Stable and improved tool life in steel cutting, excellent surface finish
		PV7025 (Super Micro-Grain)	Blackish red	TiCN (MEGACOAT)	• MEGACOAT on the super micro-grain cermet • Application: First choice PVD cermet for general steel cutting. High strength and long life given by MEGACOAT.
		PV7040	Blackish red	TiC+TiN (MEGACOAT)	• MEGACOAT on the super micro-grain cermet • Application: First choice PVD cermet for general steel grooving. High strength and long life given by MEGACOAT.
K Cast Iron		**PV7005**	Blackish red	TiC+TiN (MEGACOAT)	• Heat-resistant MEGACOAT on cermet with excellent wear resistance • Application: High speed finishing of gray and nodular cast iron

Application Map



PV7025,PV7010,PV7005,PV7040,TN6020,TN6010

MEGACOAT Cermet

- Improved tool life and high speed capability due to its superior heat resistance and hardness
- Stability improvement through prevention of crater wear (oxidation, diffusional wear)
- High thermal stability and surface smoothness provide excellent surface finish

PV7025: MEGACOAT for Steel
PV7010: MEGACOAT for Steel
PV7005: MEGACOAT for Cast Iron

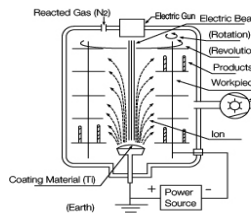
Improved Surface Cermet

- Hard surface and tougher inner phase
- Achieves balance between wear resistance and toughness
- Economical uncoated cermet

TN6020: Uncoated Cermet for Steel
TN6010: Uncoated Cermet for Steel

Features of PVD

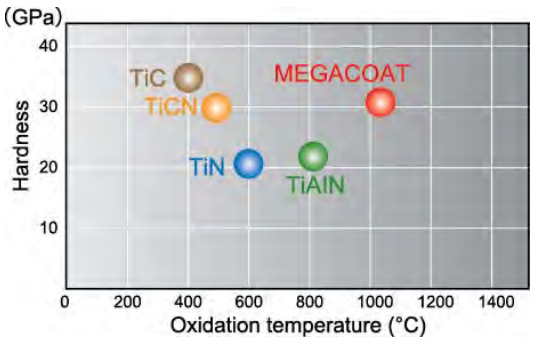
PVD (Physical Vapor Deposition)



• **Features**
①No deterioration
②No loss of Transverse Strength
③Excellent Chipping resistance

Processing temperature: 400~600°C

Properties of PVD Coating



CVD Coated Carbide

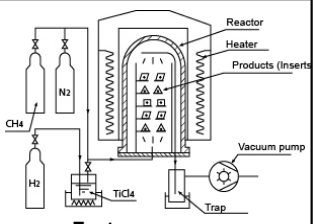
CVD Coated Carbide

KYOCERA's CVD coated carbide grades are based on ceramic thin film technology and provide stable, efficient cutting at high speeds or heavy interrupted applications.

Features

- Applicable from low to high speed cutting and from finishing to roughing
- Stable cutting is achieved due to the superior toughness and crack resistance
- Cutting times are reduced due to good chip control from effective chipbreakers

CVD (Chemical Vapor Deposition)



- **Features**
  ①Equally deposited on face
  ②Easy application for multilayer deposition
  ③Enabling thick coating

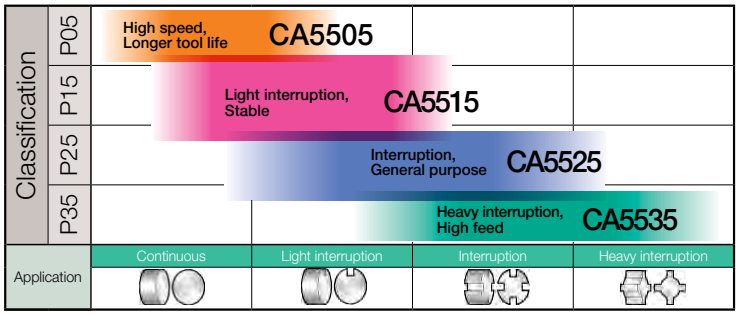
Processing temperature: 900~1100°C

Features of CVD Coated Carbide

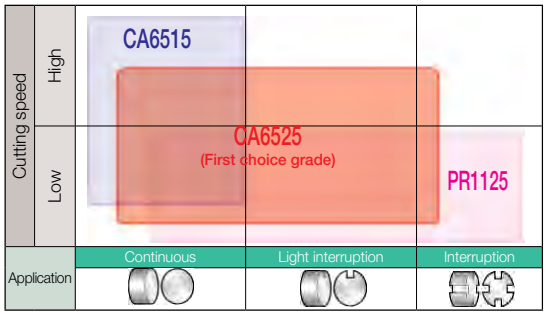
Workpiece Material	Symbol	Color	Coating Composition	Advantages
P Steel	CA5505	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved wear resistance due to hard carbide substrate and micro columnar structure of coated composition • Application: High speed continuous cutting of steel, continuous to light interrupted cutting of cast iron
	CA5515	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved wear resistance and longer tool life due to micro columnar structure of coated composition • Application: High speed cutting of steel, continuous to light interruption
	CA5525	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved toughness and wear resistance due to tougher carbide substrate and micro columnar structure of coated composition • Application: First choice for general cutting of steel, roughing to interruption
	CA5535	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved toughness due to tougher carbide substrate • Application: Roughing to heavy interrupted cutting of steel
	CR9025	Gold	Columnar TiCN+TiN	• Improved toughness and stability due to specialized carbide substrate with plastic deformation resistance • Application: Cut-off, grooving and multi-function cutting of steel
M Stainless Steel	CA6515	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Specialized carbide substrate for stainless steel cutting, excellent wear resistance • Application: Continuous to light interrupted cutting of stainless steel
	CA6525	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Specialized carbide substrate for stainless steel cutting, excellent notching resistance and toughness • Application: First choice for general cutting of stainless steel, from finishing to roughing, continuous to interruption
K Cast Iron	CA4010	Gold	Columnar TiCN+Al_2O_3+TiN	• Excellent high temperature stability due to plastic deformation and oxidation wear resistance • Application: Continuous to light interrupted high speed cutting of cast iron
	CA4115	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved wear resistance due to micro columnar structure of coated composition • Application: Nodular cast iron cutting, continuous to light interruption
	CA4120	Gold	Micro columnar TiCN+Al_2O_3+TiN	• Improved toughness and wear resistance due to tougher carbide substrate and micro columnar structure of coated composition • Application: Roughing to heavy interrupted cutting of nodular cast iron
	CA4505	Blackish gray	Micro columnar TiCN+Al_2O_3	• Stable, long tool life due to improved bounding force of coated layers and special treatment on the surface of top coated layer • Application: For gray cast iron and nodular cast iron at high speed in continuous to light interrupted cutting
	CA4515	Blackish gray	Micro columnar TiCN+Al_2O_3	• Stable, long tool life due to improved bounding force of coated layers and special treatment on the surface of top coated layer • Application: First choice for gray cast iron and nodular cast iron in light to heavy interrupted cutting

Application Map

Steel



Stainless Steel



PVD Coated Carbide (for Turning)

PVD Coated Carbide

KYOCERA's PVD coated carbide grades are based on ceramic thin film coating and precise edging technologies and are good for precision turning, grooving, threading and cut-off. Very tough carbide substrates and innovative coating technology promote excellent wear resistance and strong coating adhesion for long tool life and stable cutting.

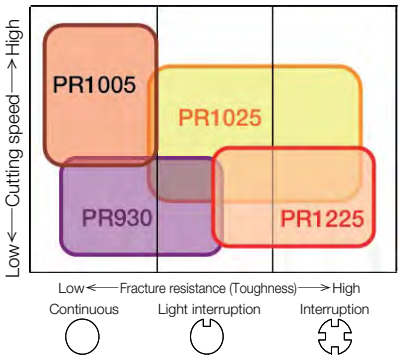
Features

- Good for low to high speeds and finishing to heavy roughing cutting
- Stable cutting with excellent toughness
- Smooth, fine surface of PVD coated carbide provides good surface finish and high precision cutting

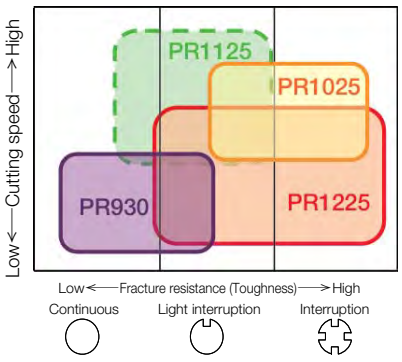
Features of PVD Coated Carbide

Workpiece Material	Symbol	Color	Main Component	Advantages
P Steel	**PR915** (Super Micro-Grain)	Bluish violet	TiAlN	• TiAlN base PVD coated super micro-grain carbide, superior wear and oxidation resistance • Application: Stable and reliable high precision cutting of steel
	PR930 (Super Micro-Grain)	Reddish gray	TiCN	• Hard TiCN base PVD coated super micro-grain carbide • Application: Low cutting speed, precise cutting with sharp edge
	PR1005	Reddish gray	TiCN	• TiCN base PVD coated hard micro-grain carbide • Application: Turning of free-cutting steel, long tool life achieved through anti-adhesion performance
	PR1025	Reddish gray	TiCN	• TiCN base PVD coated micro-grain carbide • Application: General purpose cutting of steel and stainless steel, stable and long tool life
	PR1115	Purple red	TiAlN	• Hard TiAlN base PVD coated super micro-grain carbide • Application: Superior anti-oxidation performance with well balanced wear resistance and toughness
	PR1215	Purple red	MEGACOAT	• Hard TiAlN base PVD coated super micro-grain carbide • Application: Grooving and multi-function cutting of steels, stainless steel, and cast iron
	PR1425	Purple red	MEGACOAT NANO	• Hard TiAlN base PVD coated super micro-grain carbide • Application: Superior anti-oxidation performance with well balanced wear resistance and toughness
M Stainless Steel	**PR1125**	Blackish red	TiAlN	• Hard TiAlN base PVD coated super micro-grain carbide, superior toughness and heat resistance • Application: Finishing and interrupted cutting of stainless steel
	PR1225	Blackish red	MEGACOAT	• Superior wear and oxidation resistant MEGACOAT on micro grain carbide substrate • Application: Light interrupted to interrupted cutting of stainless steel
K Cast Iron	**PR905**	Bluish violet	TiAlN	• Smooth fine surface PVD coated hard carbide with plastic deformation resistance • Application: Suitable for milling of gray and nodular cast iron and turning of heat-resistant alloys
S Heat-Resistant Alloys	**PR1305**	Blackish red	MEGACOAT	• MEGACOAT on hard and superior heat resistant carbide, superior wear resistance • Application: Finishing of heat resistant alloys
	PR1310	Blackish red	MEGACOAT	• MEGACOAT on hard and superior heat resistant carbide, superior wear and oxidation resistance • Application: First choice for continuous and light interrupted cutting and finishing of heat-resistant alloys
	PR1325	Blackish red	MEGACOAT	• MEGACOAT on tough carbide • Application: Light interrupted cutting and roughing of heat-resistant alloys

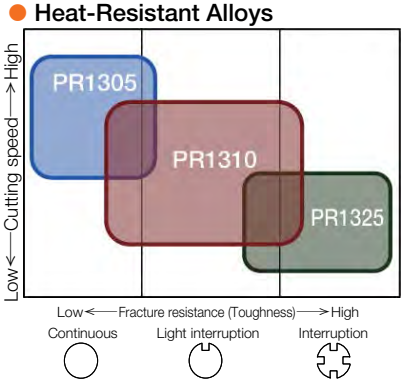
Steel



Stainless Steel



Heat-Resistant Alloys

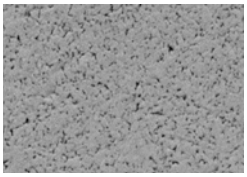


Advantages of PR13 Series

1) Superior wear and fracture resistance attained with uniform grain size and MEGACOAT on superior thermal shock resistant carbide

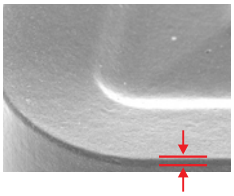
2) New edge preparation technology (FET: Fine Edge Treatment) controls and minimizes R horning and realizes large tip rake angle, and thus prevents burrs and notching.
It provides a good finished surface.

Special carbide substrate



Uniform grain size enables superior thermal shock resistance and constant hardness

New edge preparation technology



Edge control of FET technology
(FET: Fine Edge Treatment)

Carbide

Carbide

Due to its superior mechanical features carbide is used in a variety of applications. KYOCERA produces a variety of carbides, including KW10 for non-ferrous materials and micro-grain carbides for precision cutting.

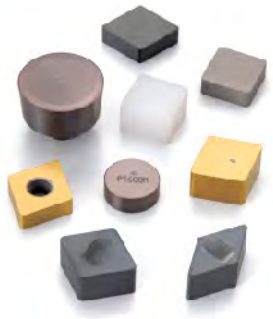
Features

- Tough and hard
- Good thermal conductivity
- Suitable for cutting non-ferrous metals and non-metals
- Stable cutting at low cutting speeds, including milling operations

Features of Carbide

Workpiece Material	Symbol	Color	Main Component	Advantages
P Steel	**PW30**	Gray	WC+Co+TiC+TaC	• ISO identification symbol P carbide (K10 relevant) • Application: Milling of steel, stable wear resistance and toughness
N Non-ferrous materials	**KW10**	Gray	WC+Co	• ISO identification symbol K carbide (K10 relevant) • Application: Stable cutting of cast iron, non-ferrous materials and non-metals
	GW15	Gray	WC+Co	• ISO identification symbol K carbide (equivalent to K10), tough micro-grain carbide • Application: High wear resistance and toughness for cast iron, non-ferrous materials and non-metals
	GW25	Gray	WC+Co	• ISO identification symbol K carbide (K30 relevant) • Application: Stable wear resistance and anti-chipping performance for milling operations of aluminum
S Heat-Resistant Alloys	**SW05**	Gray	WC+Co	• ISO identification symbol K carbide (K05 relevant) • Application: Continuous cutting and finishing of titanium alloys maintaining superior wear resistance
	SW10 (Made to order)	Gray	WC+Co	• ISO identification symbol K carbide (K10 relevant) • Application: Continuous and light interrupted cutting of titanium alloys maintaining superior wear resistance and stable result
	SW25 (Made to order)	Gray	WC+Co	• ISO identification symbol K carbide (K25 relevant) • Application: Interrupted and light interrupted cutting of titanium alloys maintaining stable result

Ceramic



Ceramic

Ceramics inserts are capable of running at high speeds, thus reducing expensive machining time. Hard turning of 38HRC to 64HRC hardened steel, or rough to finished turning of cast iron are recommended applications for ceramic inserts.
KYOCERA's ceramic grades are designed to resist oxidation and maintain hardness at elevated temperatures.

Features

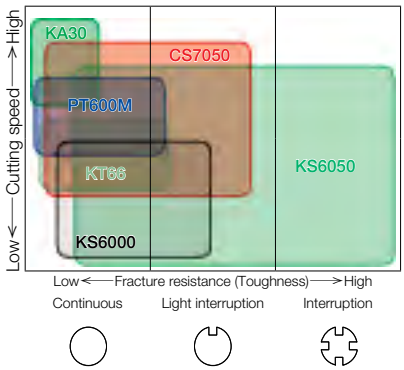
- Excellent wear resistance enables high cutting speeds
- Ceramic maintains good surface finishes due to the low affinity to workpiece materials
- Silicon nitride ceramic has improved thermal shock resistance allowing cast iron cutting using coolants

Features of Ceramic

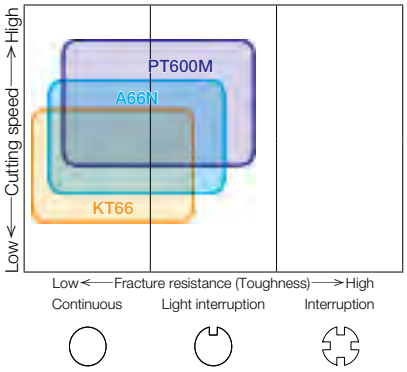
Workpiece Material	Symbol	Color	Main Component	Hardness of Coating (GPa)	Hardness of Substrate (GPa)	Fracture Toughness ($MPa \cdot m^{1/2}$)	Transverse Strength (MPa)	Advantages
K Cast Iron	KA30	White	Al_2O_3	-	17.5	4.0	750	• Aluminum Oxide ceramic (Al_2O_3) • Application: Finishing of cast iron at high cutting speeds without coolant
	KS6000	Gray	Si_3N_4	-	15.7	6.5	1230	• Silicon nitride ceramic (Si_3N_4) • Application: High feed and interrupted cutting of cast iron (with or without coolant)
	KS6050	Gray	Si_3N_4	-	15.6	7.8	1200	• Silicon nitride ceramic (Si_3N_4) • Application: Roughing and interrupted cutting of cast iron. Focusing on stability. (with or without coolant)
	CS7050	Grayish white	Si_3N_4 (Special Al_2O_3 COAT)	Thin coating	15.6	7.8	1200	• Silicon nitride ceramic (Si_3N_4) + CVD Coated Carbide (Special Al_2O_3 COAT) • Application: Finishing and continuous cutting, and high speed and high efficient cutting of cast iron. (with or without coolant)
K Cast Iron H Hardened Materials	KT66	Black	Al_2O_3+TiC	-	20.1	4.1	980	• Aluminum Oxide and Titanium Carbide ceramic (Al_2O_3+TiC) • Application: Semi-roughing to finishing of cast iron, and hardened materials.
	A66N (TiN coat)	Gold	Al_2O_3+TiC	20	20.1	4.1	980	• TiN PVD coated Aluminum Oxide and Titanium Carbide ceramic (TiN coated Al_2O_3+TiC) • Application: Semi-roughing to finishing of hardened materials
	PT600M (MEGACOAT)	Blackish red	Al_2O_3+TiC	30	20.1	4.1	980	• Heat-resistant MEGACOAT on Aluminum Oxide and Titanium Carbide ceramic (MEGACOAT Al_2O_3+TiC) • Application: Semi-roughing to finishing of cast iron, hardened materials and roll materials

Application Maps

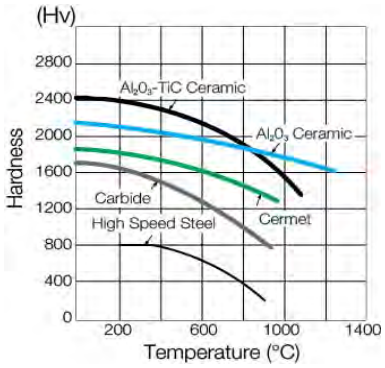
Cast Iron



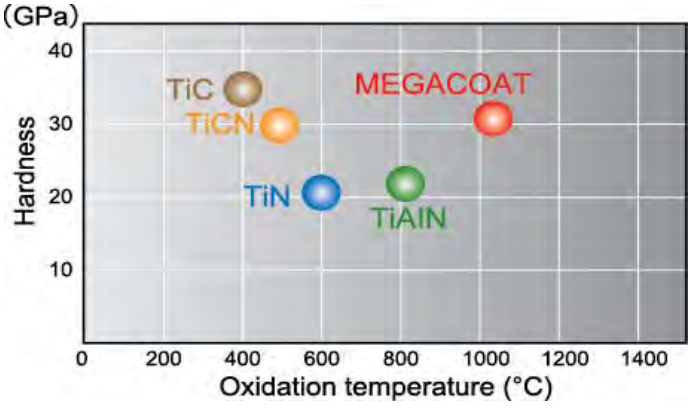
Hardened Materials



High-Temperature Hardness



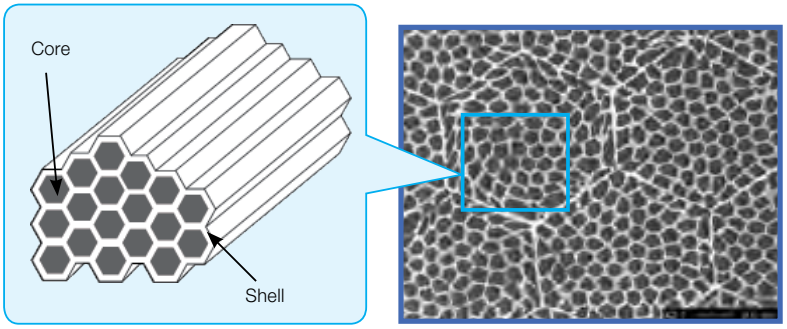
Properties of PVD Coating



Cell Fiber

Cell Fiber

Cell Fiber is composite material consisting of a controlled fibrous core (gray portion) and shell (white portion).



Features

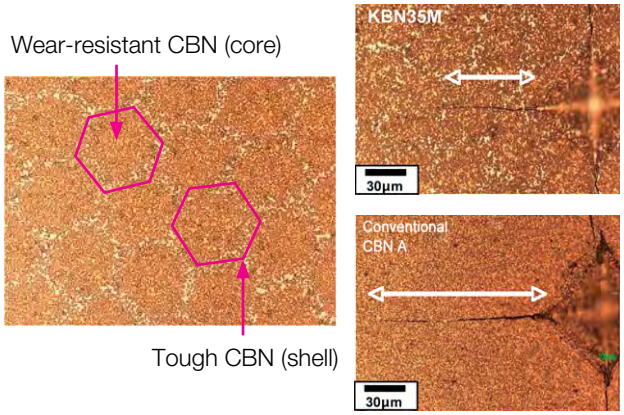
- Cell Fibers combine a hard, wear-resistant core and a tough shell into one insert.
- The tough shell stops cracks that form in the core.
- Characteristics of Cell Fiber are obtained through combinations of materials and structures.

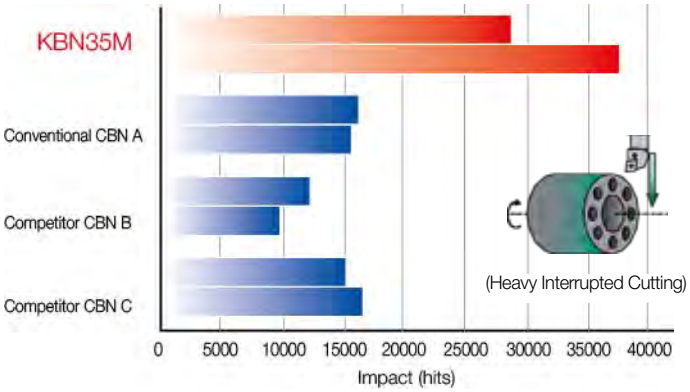
Features of Cell Fiber

Workpiece Material	Symbol	Color	Main Component	Advantages
H Hardened Materials	KBN35M (MEGACOAT)	Blackish red	CBN	• Cell Fiber CBN composite material consisting of wear resistant CBN (core) and tough CBN (shell) • Heat-resistant MEGACOAT on tough Cell Fiber CBN • Application: Stable cutting of hardened steel with interruptions
S Heat-Resistant Alloys	CF1	Gray	Ceramic	• Cell Fiber ceramic composite material consisting of wear resistant ceramic (core) and tough ceramic (shell) • Application: Cutting of heat-resistant alloys such as Inconel at hardnesses below 50Rc.

KBN35M (MEGACOAT Cell Fiber CBN)

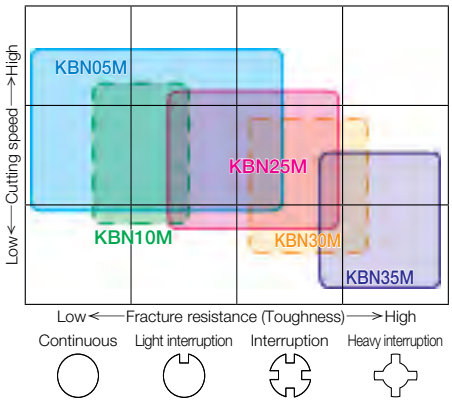
Tough CBN (shell) prevents crack growth



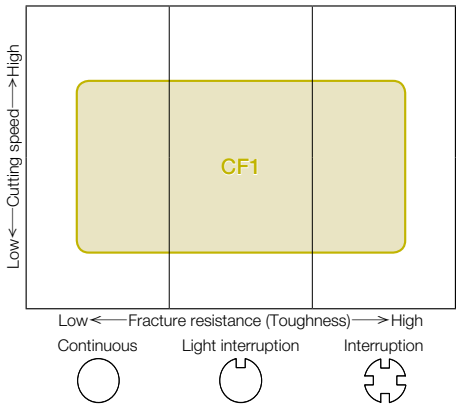


Application Map

Hardened Steel / Chilled Cast Iron



Heat-Resistant Alloys



PCD

PCD

KYOCERA diamond material is a synthetic diamond sintered under high temperatures and pressures. PCD (Polycrystalline diamond) is ideal for non-ferrous metals and non-metals.

Features

- Applicable for non-ferrous metals, non-metals turning, milling and other various type of cutting
- Long tool life due to extreme hardness
- Capable of high cutting speeds which increases cutting productivity
- Reduced edge build-up allows for high precision cutting
- Diversified applications for cutting of non-ferrous materials and non-metals
- Finished surface will be rainbow colored. (a mirror-like finished surface will not be obtained when single crystal diamond is used.)

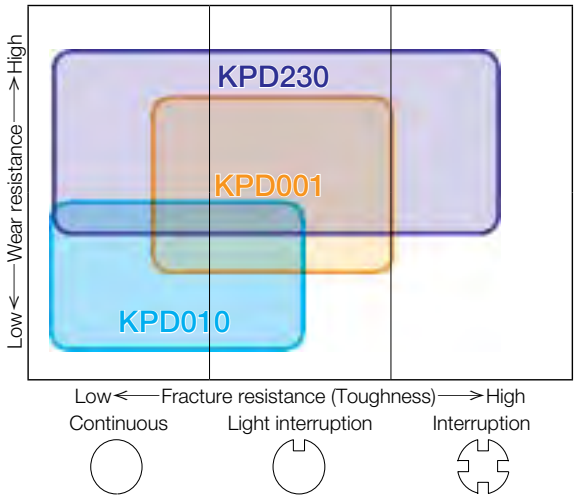
Features of PCD

Workpiece Material	Symbol	Av. grain size (μm)	Advantages
N Non-ferrous metals	KPD001	0.5	• Super Micro-Grain PCD features cutting edge strength, wear resistance, fracture resistance, good edge-sharpening performance and long, stable tool life. • Application: High speed cutting of aluminum alloys, brass, non-ferrous metals and non-metals including plastics, fiberglass, carbide and ceramics.
	KPD010	10	• Good wear resistance and toughness, good grindability • Application: General purpose, high speed cutting of aluminum alloys, non-ferrous metals and non-metals including plastics, fiberglass, carbide and ceramics.
	KPD230	2-30	• Superior abrasive wear resistance and toughness due to high density PCD with mixed rough and fine grains • Application: High speed milling of aluminum alloys, non-ferrous metals, plastics and fiberglass

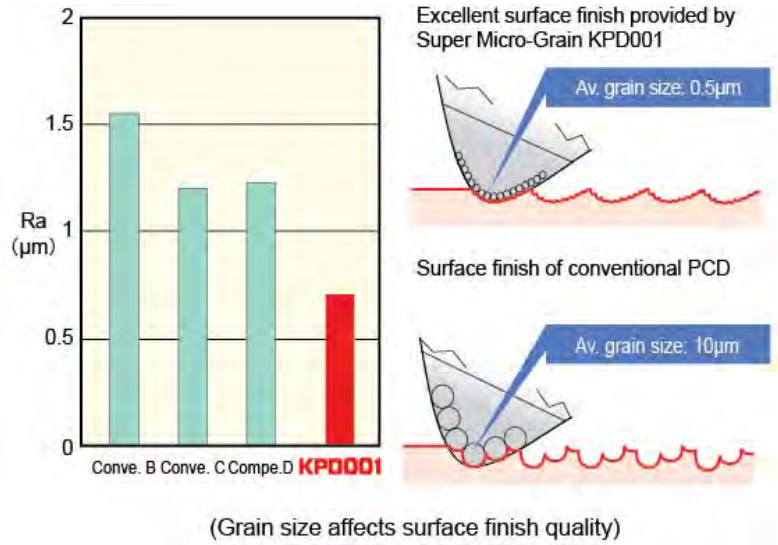
Applications

Workpiece Material		Non-ferrous materials (Aluminum / Non-ferrous metals / Non-metals)				Titanium / Titanium alloys			
Cutting Range		Finishing ⟷ Roughing				Finishing ⟷ Roughing			
Classification		N01	N10	N20	N30	S01	S10	S20	S30
Turning Milling	PCD	KPD001 KPD010 KPD230				KPD001 KPD010 KPD230			

Application Map



Surface Finish Roughness Comparison of Aluminum Cutting



(Grain size affects surface finish quality)

CBN

CBN

KYOCERA CBN is second only to diamond in hardness. CBN (Cubic Boron Nitride) is a synthetically produced material with high thermal conductivity which provides stable cutting.

Features

- Superior wear resistance when cutting hardened materials
- Suitable for high speed cutting of cast iron and sintered steel
- High thermal conductivity provides stable cutting

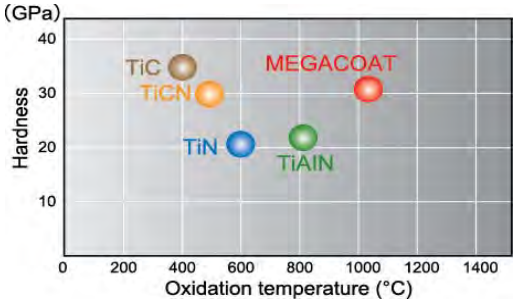
Features of CBN

Workpiece Material	Symbol	Color	Av. Grain Size (μm)	CBN Content Rate (%)	Hardness of Substrate (GPa)	Transverse Strength (MPa)	Advantages
H Hardened Materials	**KBN510**	Black	2	50	28	1,000	• Excellent wear resistance and crack resistance, non-coated CBN • Application: Finishing and continuous cutting of hardened die steel
	KBN525	Black	1 and under	45	25	1,250	• Good balance of toughness and wear resistance, non-coated CBN • Application: General grade for hardened steel, high stability at high speed and high feed cutting
	KBN05M (MEGACOAT)	Blackish red	0.5-1.5	55	27	1,000	• Heat-resistant MEGACOAT on highly heat-resistant CBN substrate • Application: High speed finishing of hardened steel
	KBN10M (MEGACOAT)	Blackish red	2	50	28	1,000	• Heat-resistant MEGACOAT on CBN with hard binder phase, superior anti-crater wear resistance • Application: High speed finishing of hardened die steel
	KBN25M (MEGACOAT)	Blackish red	1 and under	45	25	1,250	• Heat-resistant MEGACOAT on micro-grain CBN with heat resistant binder phase • Application: Stable cutting of hardened steel at high speed
	KBN30M (MEGACOAT)	Blackish red	1-4	65	30	1,350	• Heat-resistant MEGACOAT on tougher CBN • Application: Stable cutting of hardened steel for continuous to interrupted cutting
Sintered Steel	**KBN65B**	Black	2	85	32	1,150	• Excellent wear resistance due to CBN with heat-resistant binder phase, non-coated CBN • Application: Stable cutting of sintered steel (ferrous sintered alloy) at low speed
	KBN65M (MEGACOAT)	Blackish red	2	85	32	1,150	• Heat-resistant MEGACOAT on CBN with heat-resistant binder phase • Application: Stable cutting of sintered steel (ferrous sintered alloy) at low speed
	KBN70M (MEGACOAT)	Blackish red	2-4	90	34	1,350	• Heat-resistant MEGACOAT on CBN rich substrate • Application: General cutting of sintered steel (ferrous sintered alloy) at high speed
K Cast Iron	**KBN60M** (MEGACOAT)	Blackish red	0.5-6	80	33	1,250	• Heat-resistant MEGACOAT on CBN rich substrate with hard binder phase • Application: High speed finishing of gray cast iron
	KBN900 (TiN COAT)	Gold	9	90	31	1,050	• TiN coated solid CBN • Application: Heavy duty, interrupted cutting and finishing of hardened steel, hardened roll steel and cast iron

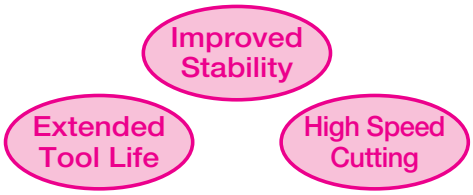
• For **KBN35M**, see page ⓐ**A13**.

MEGACOAT CBN

Properties of PVD coated layer



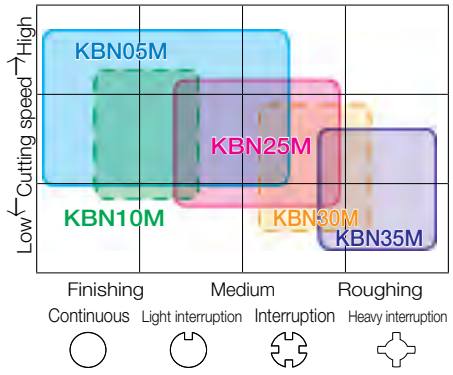
Advantages of MEGACOAT



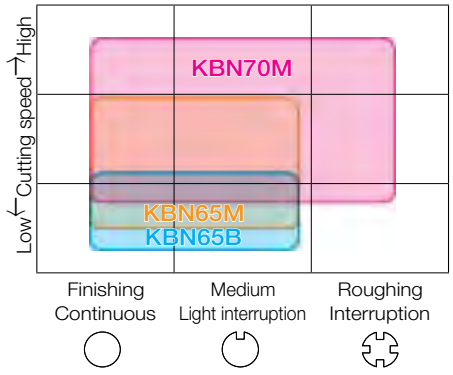
- Long tool life and stable cutting due to superior heat-resistance and hardness.
- Improvement of crater wear resistance.

Application Map

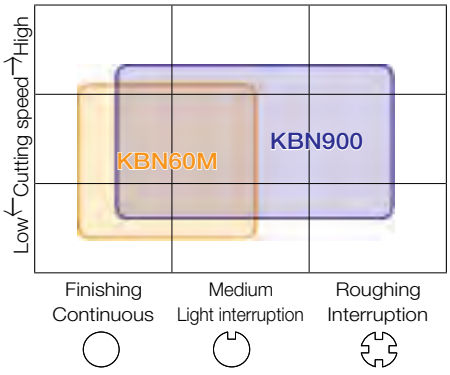
Hardened Materials



Sintered Steel



Cast Iron



Grade Properties

Cermet

Symbol	Color	Main Component	Coating Layer	Density	Hardness of Substrate		Fracture Toughness ($MPam^{1/2}$)	Flexural Toughness (MPa)
					(HV)	(GPa)		
TN6010	Gray	TiCN	-	6.5	1,700	16.7	7.0	2,000
TN6020	Gray	TiCN	-	6.4	1,500	14.7	10.0	2,500
TN60	Gray	TiCN+NbC	-	6.6	1,600	15.7	9.0	1,760
TN90	Gray	TiCN+NbC	-	6.4	1,450	14.2	10.0	1,960
TN100M	Gray	TiCN+NbC	-	6.7	1,520	14.9	10.5	1,860
TC40	Gray	TiC+TiN	-	6.0	1,650	16.2	9.0	1,570
TC60	Gray	NbC	-	8.1	1,500	14.7	10.5	1,670

PVD Coated Cermet

Symbol	Color	Main Component	Coating Layer	Density	Hardness of Substrate		Fracture Toughness ($MPam^{1/2}$)	Flexural Toughness (MPa)
					(HV)	(GPa)		
PV7005	Blackish red	MEGACOAT	Thin coating	6.0	1,650	16.2	8.5	1,470
PV7010	Blackish red	MEGACOAT	Thin coating	6.5	1,700	16.7	7.0	2,000
PV7025	Blackish red	MEGACOAT	Thin coating	6.4	1,500	14.7	10.0	2,500
PV7040	Blackish red	MEGACOAT	Thin coating	6.0	1,650	16.2	9.0	1,570
PV60	Gold	TiN	Thin coating	6.6	1,600	15.7	9.0	1,760
PV90	Gold	TiN	Thin coating	6.4	1,450	14.2	10.0	1,960

CVD Coated Carbide

Symbol	Color	Main Component	Coating Layer	Density	Hardness of Substrate		Fracture Toughness ($MPam^{1/2}$)	Flexural Toughness (MPa)
					(HV)	(GPa)		
CA4010	Gold	Columnar TiCN+Al_2O_3+TiN	Thick coating	14.8	1,670	16.4	10.0	3,000
CA4115	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4120	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA4505	Blackish gray	Micro columnar TiCN+Al_2O_3	Thick coating	14.9	1,780	17.4	9.5	2,350
CA4515	Blackish gray	Micro columnar TiCN+Al_2O_3	Thick coating	14.9	1,570	15.4	12.0	2,780
CA5505	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,730	17.0	10.0	2,540
CA5515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.7	1,550	15.2	12.0	2,750
CA5525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.5	1,400	13.7	12.0	2,780
CA5535	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thick coating	14.1	1,340	13.1	16.5	2,970
CA6515	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thin coating	14.7	1,530	15.0	12.0	2,780
CA6525	Gold	Micro columnar TiCN+Al_2O_3+TiN	Thin coating	14.7	1,370	13.4	16.0	3,100
CR9025	Gold	Columnar TiCN+TiN	Thick coating	14.5	1,400	13.7	12.0	2,780

PVD Coated Carbide

Symbol	Color	Main Component	Coating Layer	Density	Hardness of Substrate		Fracture Toughness ($MPam^{1/2}$)	Flexural Toughness (MPa)
					(HV)	(GPa)		
PR630	Gold	TiN	Thin coating	12.5	1,500	14.7	11.0	2,160
PR660	Gold	TiN	Thin coating	13.7	1,450	14.2	12.0	2,250
PR730	Gold	TiAlN+TiN	Thin coating	13.7	1,450	14.2	12.0	2,250
PR830	Gold	TiAlN+TiN	Thin coating	13.7	1,450	14.2	12.0	2,250
PR905	Bluish violet	TiAlN	Thin coating	14.8	1,670	16.4	10.0	3,000
PR915	Bluish violet	TiAlN	Thin coating	14.1	1,700	16.7	11.0	4,140
PR930	Reddish gray	TiCN	Thin coating	14.1	1,700	16.7	11.0	4,140
PR1005	Reddish gray	TiCN	Thin coating	14.9	1,800	17.6	10.0	3,300
PR1025	Reddish gray	TiCN	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1115	Purple red	TiAlN	Thin coating	14.7	1,700	16.7	11.0	3,000
PR1125	Purple red	TiAlN	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1210	Blackish red	MEGACOAT	Thin coating	14.8	1,670	16.4	10.0	3,000
PR1215	Blackish red	MEGACOAT	Thin coating	14.7	1,700	16.7	11.0	3,000
PR1225	Blackish red	MEGACOAT	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1230	Blackish red	MEGACOAT	Thin coating	13.7	1,450	14.2	12.0	2,250
PR1305	Blackish red	MEGACOAT	Thin coating	15.0	1,790	17.5	9.5	2,350
PR1310	Blackish red	MEGACOAT	Thin coating	14.8	1,670	16.4	10.0	3,000
PR1325	Blackish red	MEGACOAT	Thin coating	14.7	1,370	13.4	16.0	3,100
PR1425	Blackish red	MEGACOAT	Thin coating	14.5	1,600	15.8	13.0	3,400
PR1510	Blackish red	MEGACOAT	Thin coating	14.8	1,720	16.8	9.0	2,450
PR1525	Blackish red	MEGACOAT	Thin coating	14.5	1,600	15.8	13.0	3,400

Carbide

Symbol	Color	Main Component	Density	Hardness of Substrate		Fracture Toughness ($MPam^{1/2}$)	Flexural Toughness (MPa)
				(HV)	(GPa)		
PW30	Gray	WC+Co+TiC+TaC	12.5	1,500	14.7	12.0	2,160
KW10	Gray	WC+Co	15.0	1,650	16.2	10.0	1,470
GW15	Gray	WC+Co	14.7	1,700	16.7	11.0	3,000
GW25	Gray	WC+Co	14.5	1,600	15.8	13.0	3,400
SW05	Gray	WC+Co	15.0	1,790	17.5	9.5	2,350
SW10	Gray	WC+Co	14.8	1,670	16.4	10.0	3,000
SW25	Gray	WC+Co	14.7	1,370	13.4	16.0	3,100

Product Lineup & Inserts

B

B1~B24

Double-sided 4-edge insert, Newly Developed Endmill NEW

M-FOUR (MEW)

1. Economical 4-edge Insert
2. Kyocera's unique mold technology reduces cutting force

Ref. page E2

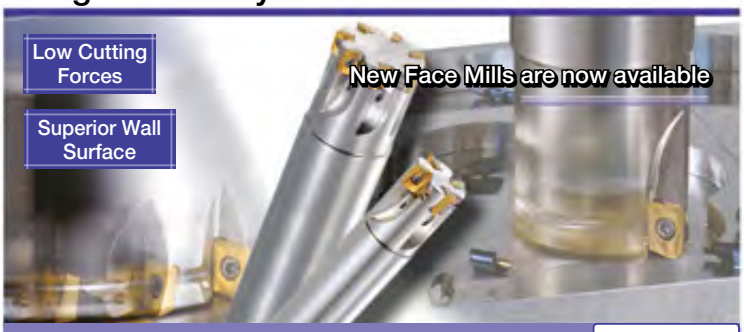
Double-sided 6-edge insert, Low Cutting Force 0°-Lead Cutter NEW

M-SIX (MFWN)

1. Economical 6-edge Insert
2. Tough Cutting Edge due to Thick Edge Design

Ref. page E10

High Efficiency Endmill MECX



Enable high efficiency cutting on turning mills and small machining centers

Ref. page E32

High Efficiency Endmill MEC

PR1225 for Stainless Steel (Fine grain carbide material)
JA Chipbreaker for Aluminum cutting
Low cutting force JS chipbreaker

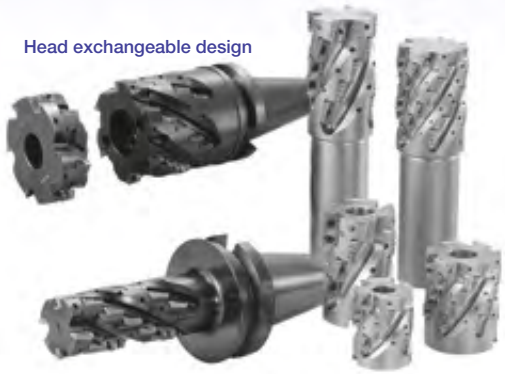
Multi-Flute Face Mills Available for Improved Efficiency
Expanded Insert Lineup

Ref. page E20

Helical Endmill MECH

Improved Productivity with Notched Inserts!

Head exchangeable design



Endmill & Shell Mill Designs, Intergral Arbor Styles, and Head Exchangable Designs Available

High efficiency cutting is achieved with large axial D.O.C.'s
MECH solves problems with heavy cutting

Ref. page E36

High Efficiency Mill MFPN

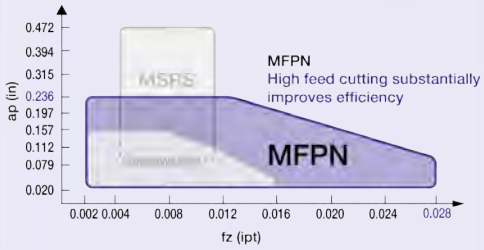
Now available with cylindrical shank

Five Advantages

1. A roughing and general-purpose mill with 10-edge pentagonal inserts
2. Low cutting force due to helical cutting-edge design
3. Dual Cutting Edge Design (High Toughness)
4. Molded chipbreaker improves chip evacuation
5. Long tool life with PR12-Series MEGACOAT Carbide inserts

Ref. page C2

•Selection of Face Mills



Face Mill for Heavy Milling MSRS15

Roughing is completed with 1 pass. MSRS15 changes heavy cutting! (Max. ap 0.472in)

Drastically increases metal removal rate

Ref. page D2

Heavy Milling Cutter MSR

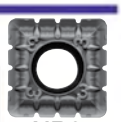
1.Notched inserts reduce cutting forces, decrease chatter and enable efficient cutting.

2.Chipbreaker design with specialized notches improves chip evacuation.

3.Enables heavy milling and deep cutting, and also drastically improves cutting efficiency. (Reduction of cycle time)

Ref. page E55

Shell Mill for Heavy Milling MSRS90



NB3

+

NB4

1.High performance, low friction and low vibration cutting tool

2.Neutral and inserts

Applicable to shouldering (cutting angle: 90°), high feed cutting (cutting angle: 30°), plunging, and side cutting. (custom ordered)

Ref. page E48

• Application Map (Standard Cutters)

Slot Mill MST

MSTA MSTB MSTC

•**MSTA** For narrow slot widths
Self Clamping type, width: 0.063 ~ 0.160in

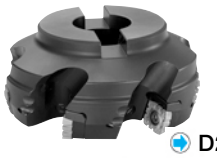
•**MSTB** For medium slot widths
Semi-adjustable type, width: 0.236 ~ 0.512in

•**MSTC** For wide slot widths
Full-adjustable type, width: 0.551 ~ 0.917in

Ref. page H2

Lead Angle 45° / Lead Angle 15°

Lead Angle	Shape \ Applications	Facing	Chamfering
45°	**MFPN45**  C2	•10-edge pentagonal inserts Double-sided pentagonal insert Economical with 10-edge insert •Low cutting force due to helical cutting-edge design •Fractures suppressed with double-edge position	
	MOF45  C9	•Octagonal Insert Economical with 8-edge insert •Insert sizes are available in 05 and 07 types •Easy edge change •Silver coated body •Insert max. external dia. matches cutter external dia.	
	MOFX45  C12	•The insert is fixed by top clamp •Excellent surface roughness by easy edge height adjustment •High cost performance provided by 8-edge insert •Cutter designed with high axial rake angle and double positive angle on chipbreaker provide low •SH Chipbreakers (for general purpose / low cutting force) and GT chipbreakers (Tough Edge)	
	MSO45  C15	•Use insert with 13.494mm/C •Insert max. external dia. matches cutter external dia.	

Lead Angle	Shape \ Applications	Facing	Chamfering
45°	**MFPN45**  C5	•10-edge pentagonal inserts Double-sided pentagonal insert Economical with 10-edge insert •Low cutting force due to helical cutting-edge design •Fractures suppressed with double-edge position •With weldon or cylindrical shank	
	MSE45  C14	•Low cutting force •For small machines and M/C •For thin workpiece milling of Steel / Cast Iron, Anti-vibration •Good anti-chatter performance	
15°	**MSRS15**  D2	•For Heavy Cutting •Max ap 0.472in •Metal removal rate is increased drastically	
	MSE15  D9	•Low cutting force •For thin workpiece milling of Steel / Cast Iron •Good anti-chatter performance	

Lead Angle 0°

Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0°	**MEC**  E24	•The twisted cutting edge improves cutting performance •Smooth surface of shoulder Wall •True 90° Corners •The silver coating prevents chip wear on the tool body •Available with coolant holes		
0°	**MECX**  E33	•Efficient machining due to small diameter cutter that holds multiple inserts •Recommended for small machines: low cutting force and high strength design •The silver coating prevents chip wear on the tool body •Available with coolant holes		

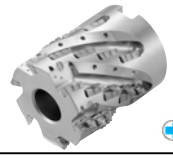
Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0°	**MSRS90** NEW  E48	•Notched insert reduces cutting forces •Stable cutting without chatter •Neutral insert allows the possibility off various custom-ordered cutters		

Lead Angle 0° (Double-sided Insert) NEW

Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0°	**MEW Endmill**  E4	•Economical 4-edge Insert •Obtuse edge increases cutting edge toughness •Smooth surface wall due to low cutting forces •Good anti-chatter performance		
0°	**MEW Face Mill**  E6			

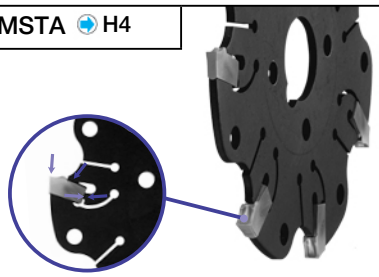
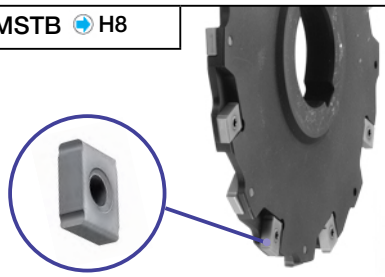
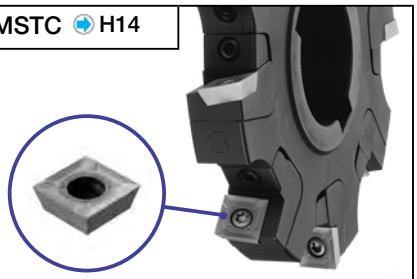
Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0°	**MFWN90 Face Mill**  E12	•Economical 6-edge Insert •Superior fracture resistance due to thick edge design •Dynamic slant design reduces shock when cutting edge enters the workpiece •Low cutting forces •Endmills have weldon or cylindrical shanks		
0°	**MFWN90 Endmill**  E15			

Lead Angle 0°

Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0° (Long Cutting Edge)	**MECH**  E38	•Notched insert promotes higher productivity •Large depth of cut provides high efficiency cutting •MECH is the best solution for problems with heavy milling		
	MECH Shell Mill Type  E40	•MECH shell mill type		
	MECH-BT50 **MECH-BT50SA**  E41	•High rigid BT50 Arbor integrated for MECH •Head exchangeable type is available (MECH-BT50SA)		

Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0° (Long Cutting Edge)	**MSR**  E56	•Low cutting force and restrain chattering with notched insert •Chipbreaker design with specialized notches improves chip evacuation •Chipbreaker achieves stabilized cutting for heavy roughing applications		
	MSR-BT50  E58	•Highly rigid BT50 Arbor integrated for MSR		
	MAP  E76	• Cutting dia. 1.000". •Low cutting force, good chip evacuation. •High-efficiency machining		
	CEM  E77	• Cutting dia. 0.375" to 1.500". • For small milling machines		

Slot Mill MST type

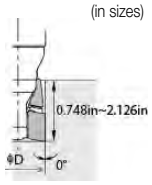
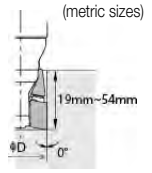
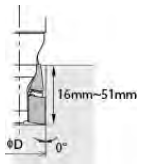
MSTA H4	MSTB H8	MSTC H14
		
•Self-clamping system •Remove insert with appropriate wrench	•Easy screw on tangential clamped insert	•Adjustable slotting width due to unique cam adjustment structure

Lead Angle 0°

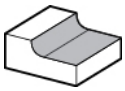
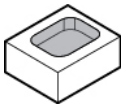
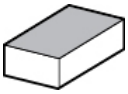
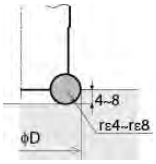
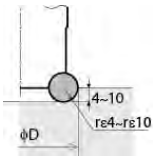
Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting	Deep Slotting
0°	**MSO90-S**  E19	•Screw clamping & 4-edge insert reduces cost •Good chip evacuation •Low cutting force			
0°	**MTE90**  E18	•Low cutting force •For shouldering of Cast iron, Non-ferrous metals			
0°	**MHD-SA**  E63	•Plus mill (Separate type) •Roughing of molds •Low cutting force •An additional front piece can extend the cutting edge length to 53.8mm or more			
0° (Long Cutting Edge)	**MHD-SB**  E63				
0° (Long Cutting Edge)	**MHD-C**  E63	•Integral arbor type •Roughing of molds •Low cutting force			
0°	**EM**  E72	•Extended Length Endmills			
0°	**EM-LE**  E73	•Long Edge Endmill			
0°	**FM-90**  E74	•Fixed Pocket Face Mills			
0°	**FM-AL**  E75	•Aluminum Cutting Face Mills •Fixed Pocket			
0°	**EM-AL**  E75				

Lead Angle	Shape \ Applications	Facing	Shouldering	Slotting
0°	**MEC**  E20	•High squareness •Low cutting force •The silver coating prevents chip wear on the tool body •With air hole (Over ø16)		
0°	**MECX**  E32	•Good squareness •Small size Insert with multi-edge specification •Low cutting force •The silver coating prevents chip wear on the tool body •With air hole		
0°	**MEA**  F7	•Low cutting force, Good chip evacuation •High-efficiency cutting of Steel and Cast iron •Notched inserts prevent chattering		
0°	**MEB**  F8	•Low cutting force, Good chip evacuation •High-efficiency cutting of Steel and Cast iron •Notched inserts prevent chattering		
0°	**DMC**  F2	•For small milling machine, M/C		
0°	**DMC-H**  F4	•High rake type •For small milling machine, M/C		
0°	**DMC-SX**  F3	•For small milling machine, M/C		
0°	**MTES**  F6	•For small dia., Low cutting force type		

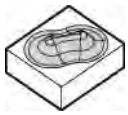
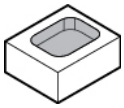
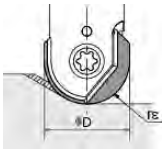
Multi-Function Cutting Endmill

Shape \ Applications	Facing	Shouldering	Slotting	Deep Slotting	Pocketing	Drilling	Lead Angle and Max ap	Cutting Dia. øD
MEY  G2	•Ultra drill mill •Multi-function cutting (Drilling / Ramping / Shouldering / Grooving) •High-efficiency mold cutting •Low cutting force, Good chip evacuation		•Full 2-Flute structure and high stability •Good chip control when Ramping		•Cutting diameters that are larger than the shank diameters enables wall shouldering •The silver coating prevents chip wear on the tool body		(in sizes) 	ø0.5in ø1.0in ø2.0in ø0.630in ø1.984in
							(metric sizes) 	ø10mm ø25mm ø50mm ø16mm ø50mm
MEZ-G  G8	•Silver drill mill •Multi-function cutting •High-efficiency mold cutting •Low cutting force, Good chip evacuation		•The silver coating prevents chip wear on the tool body •The clearance groove prevents chip welding					ø16mm ø49mm

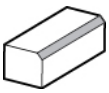
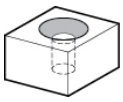
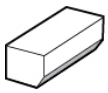
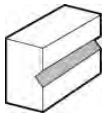
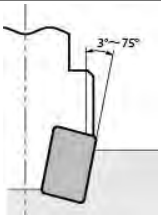
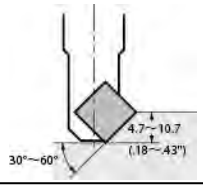
Radius

Shape \ Applications	Radius Milling / Profiling	Pocketing	Facing	Lead Angle and Max ap	Cutting Dia. øD (mm)
MRP-S  J4					ø32 ø50 ø63 ø80 ø100 ø125 ø160 ø200 ø12 ø63
MRP  J5					ø50 ø125

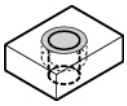
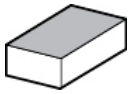
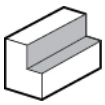
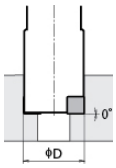
Ball-nose Endmill

Applications / Shape	Contouring / Profiling	Pocketing	Lead Angle and Max ap	Cutting Dia. ØD (mm)
				ø10 ø25 ø50 ø80
MRF  J2	• For high quality mold finishing • High R-accuracy (Insert's R-accuracy: Under ±0.01mm) • The bushing ensures insert installation accuracy			ø8 ø25
MRF-W  J2	• Carbide • For high quality mold finishing • High R-accuracy (Insert's R-accuracy: Under ±0.01mm) • The bushing ensures insert installation accuracy • Superior to anti vibration, and stable cutting is possible with long over hand length without chattering			ø8 ø12

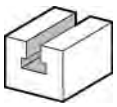
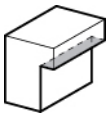
Chamfering

Application / Shape	Chamfering	Countersinking	Back Chamfering	V Shape Slotting	Lead Angle Max. D.O.C.
					
CM/CM-AL  K5	·Chamfering angles 3°-75° ·CM-AL for aluminum cutting				
MCSE  K10	·Chamfering angles for 30°, 45°, 60° ·Economical 4-sided insert				

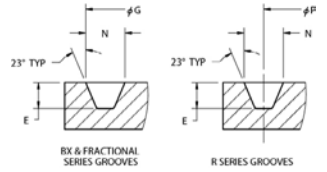
Bolt Countersinking

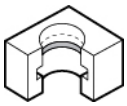
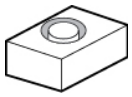
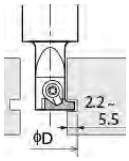
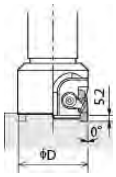
Shape \ Applications	Bolt Countersinking	Facing	Shouldering	Lead Angle and Max ap	Cutting Dia. øD (mm)
					ø10 ø25 ø50 ø80
MEF  K12	•Countersink for hexagon socket bolt (M6~M30) •Economical S-type Insert (4-Edge)				ø11 ø48

T-Slotting

Shape \ Applications	T-Slotting	Back side milling	Lead Angle and Max ap	Cutting Dia. øD (mm)
				ø10 ø25 ø50 ø80
METS  K14	•T-Slotting •Recommended for high feed cutting with 2 Flute design •Economical Square Insert (4 cutting edges)			ø21 ø50

Grooving

Application / Shape	API Ring Grooving		Application
API  K2	·The most economical and reliable tool to produce API ring grooves for the oil, gas, and petrochemical industries		

Applications / Shape	Internal Grooving	Face Grooving	Lead Angle and Max ap	Cutting Dia. øD (mm)
				ø10 ø25 ø50 ø80
MGI  K8	•Edge Width 1.0~4.0mm •Grooving for machining centers			
MVG  K7		Cutting Dia. ø30~ø75mm •Edge Width: 4.0~4.9mm •O-Ring Grooving (G Series)		

Milling Inserts Identification System

Symbol	Shape
A	85° Parallelogram
B	82° Parallelogram
C	80° Rhombic
H	Hexagon
L	Rectangle
M	87° Rhombic
N	86° Rhombic
O	Octagon
P	Pentagon
R	Round
S	Square
T	Triangle

①Shape

Symbol	Relief Angle(°)
N	0
A	3
B	6
C	7
P	11
D	15
E	20
F	25
G	30
H	0-11
J	0-14
K	0-17
L	0-20
M	11-14
R	11-17
S	11-20

②Relief Angle

Symbol	Tolerance		
	Corner Height	IC Size	Thickness
	B(±)	IC(±)	T(±)
A	0.0002	0.001	0.001
B	0.0002	0.001	0.005
C	0.0005	0.001	0.001
D	0.0005	0.001	0.001
E	0.001	0.001	0.001
G	0.001	0.001	0.005
K	0.0005	0.002 to 0.006	0.001
M	0.003 to 0.008	.002 to .006	0.005
U	.005 to .015	.003 to .010	0.005
R	-Blank with grind stock on all surfaces.		
S	-Blank with grind stock on top and bottom surfaces only.		

③Tolerance

Symbol	IC
1.2 (5)	5/32
1.5 (6)	3/16
1.8 (7)	7/32
2	1/4
2.5	5/16
3	3/8
3.5	7/16
4	1/2
4.5	9/16
5	5/8
5.5	11/16
6	3/4
7	7/8
8	1
10	11/4

⑤IC Size

Symbol	Size
.5 (1)	1/32
.6	.040
1 (2)	1/16
1.2	5.64
1.5 (3)	3/32
2	1/8
2.5	5/32
3	3/16
3.5	7/32
4	1/4
5	5/16
6	3/8
7	7/16
8	1/2

⑥Thickness

INSERT WITH RADIUS

- **0-** Sharp Corner
- **1-** 1/64 Inch Radius
- **2-** 1/32 Inch Radius
- **3-** 3/64 Inch Radius
- **4-** 1/16 Inch Radius
- **6-** 3/32 Inch Radius
- **8-** 1/8 Inch Radius

INSERTS WITH WIPER FLATS

- **A-** Square Insert 45° Chamfer
- **D-** Square Insert 30° Chamfer
- **E-** Square Insert 15° Chamfer
- **F-** Square Insert 3° Chamfer
- **K-** Square Insert 30° Double Chamfer
- **L-** Square Insert 15° Double Chamfer
- **M-** Square Insert 3° Double Chamfer
- **N-** Truncated Triangle Insert
- **P-** Flatted Corner Triangle
- **X-** Triangle Insert 15° Double Chamfer

⑦Cutting Point

Only appears following a letter in sixth position. Number of 1/64ths of an inch in primary faceted edge.

⑧Cutting Point Size

Other Condition

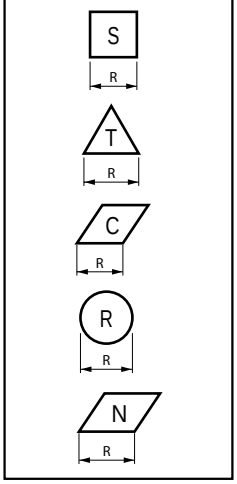
⑨

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩
ANSI	T	P	K	N	3	2	P	3		R
ISO	T	P	K	N	16	03	P	D	T	R

④Type

Symbol	Shape
F	2-side Chipbreakers, Without Hole
N	No Chipbreaker, Without Hole
R	1-side Chipbreaker, Without Hole
M	1-side Chipbreaker, With Hole
A	No Chipbreaker, With Hole

⑤Edge Length

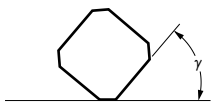


⑥Thickness

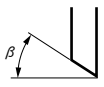
Symbol	T
02	2.38
03	3.18
T3	3.97
04	4.76
05	5.56
06	6.35

⑦⑧Cutting Edge Angle / Relief Angle / Corner-R

⑦Cutting Edge Angle	
A	45°
D	60°
E	75°
F	85°
H	87°
P	90°
X	65°



⑧Relief Angle	
A	3°
B	5°
C	7°
D	15°
E	20°
F	25°
G	30°
N	0°
P	11°
R	10°
S	14°
T	22°
U	23°



⑦⑧Corner-R	
04	0.4
08	0.8
12	1.2
16	1.6
20	2.0

⑩Tool Hand

Symbol	Hand
R	Right
L	Left
N	Without Hand

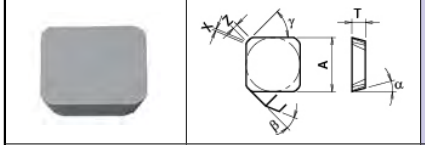
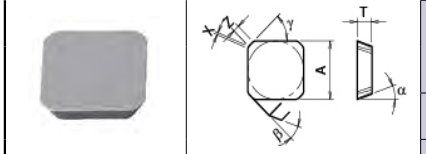
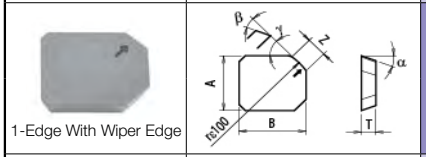
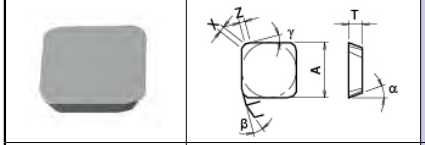
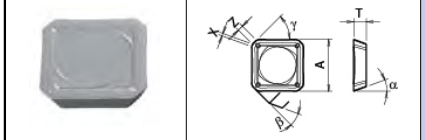
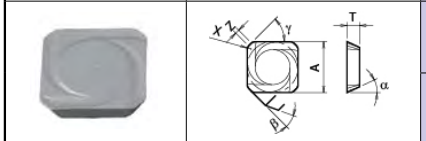
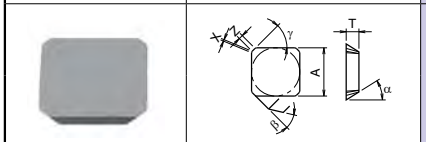
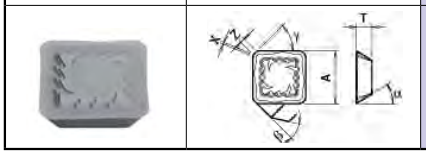
⑨Edge Preparation

Symbol	Shape
F	Sharp Edge
E	R-honed
T	Chamfer
S	Chamfer + R-honed

Milling Inserts

Classification of usage
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

		Carbon Steel / Alloy Steel	Mold Steel	Stainless Steel	Gray Cast Iron	Nodular Cast Iron	Non-ferrous Metals	Heat-resistant Alloys	Titanium Alloys	Hard Materials
		P	P	M	K	K	N	S	S	H
TN60	Cermet		■					★		□
TN100M	Cermet		■							□
TC60M	Cermet		★	★						
PR1225	MEGACOAT	★	★	★	★	★		★	★	□
PR1210	MEGACOAT									
PR630	PVD Coated Carbide									
PR730	PVD Coated Carbide	☆	☆							□
PR830	PVD Coated Carbide	★	★							□
PR1025	PVD Coated Carbide	☆	☆	★				☆		
PR660	PVD Coated Carbide			☆				☆		
PR905	PVD Coated Carbide				★	★			★	
PW30	Carbide				☆		★		☆	
KW10	Carbide									

Insert (Handed Insert shows Right-hand)	Description	Dimension (inch) A	T	X	Z	rε	Angle(°) α	β	γ	Ref. Page for Applicable Toolholders
	SDKN 42AUTN	0.500	0.125	0.020	0.047	-	15°	23°	45°	-
	SEEN 42AFTN	0.500	0.125	0.020	0.055	-	20°	25°	45°	C14
	SEKN 42AFTN									C14
	42AFFN									C14
	SEKN 43AFTN		0.187							-
	SEKN 53AFTN	0.625								-
1-Edge With Wiper Edge 	SEEN 42AFTR-W	0.500	0.125	-	0.138	B= 0.573	20°	25°	45°	C14
	42AFFR-W									C14
	SEKN 42EFTR	0.500	0.125	0.047	0.055	-	20°	25°	15°	D9
	SEKR 42AFEN-S	0.500	0.125	0.020	0.067	-	20°	25°	45°	C14
	SEMR 42AFER-H	0.500	0.125	R0.039	0.039	-	20°	25°	45°	C14
	SEMR 43AFER-H		0.187							-
	SOKN 13T3AXTN	0.531	0.156	0.020	0.043	-	27°	32°	45°	C15
	13T3AXFN									C15
	SOKR 13T3AXEN-J	0.531	0.156	0.020	0.043	-	27°	32°	45°	C15

● : Stock Std. ○ : World Express

SEEN...W type Inserts are sold in 5 piece boxes.

Inserts are sold in 10 piece boxes.

Milling Inserts

Classification of usage			
★ : Roughing / 1st Choice ☆ : Roughing / 2nd Choice ■ : Finishing / 1st Choice □ : Finishing / 2nd Choice (In case hardness is under 45HRC)	P	Carbon Steel / Alloy Steel	■ ★ ☆
		Mold Steel	■ ★ ☆
	M	Stainless Steel	★ ☆
	K	Gray Cast Iron	★ ★
		Nodular Cast Iron	★ ★
	N	Non-ferrous Metals	★
	S	Heat-resistant Alloys	★ ☆
		Titanium Alloys	★ ☆
	H	Hard Materials	□ □

Insert (Handed Insert shows Right-hand)	Description	Dimension (inch) A	T	X	Z	rε	Angle(°) α	β	γ	Cermet TN60	TN100M	TC60M	MEGACOAT PR1225	PR1210	PVD Coated Carbide PR630	PR730	PR830	PR1025	PR660	PR905	Carbide PW30	KW10	Ref. Page for Applicable Toolholders
	SPCN 42EDTR	0.500	0.125	R0.039	0.079	-	11°	15°	15°		○												-
	SPKN 42EDTL			R0.039							○												-
	SPKN 53EDTR 53EDFR	0.625	0.187	0.039	0.087					○	○	○	○	○	○	○			○	○		○	-
	SPEN 42EESR	0.500	0.125	0.039	0.055	-	11°	20°	15°					○									-
	SPCN 42XPTR	0.500	0.125	R0.039	0.079	-	11°	11°	25°		○												-
	SPKN 42XPTR			0.039						○	○	○			○	○				○	○		
	42XPTL			R0.039							○												
	42XPFR			0.039						○	○	○			○					○			
	SPKN 53XETR	0.625	0.187			-		20°	25°		○	○											
	SPCN 63EETR1	0.750	0.187	0.028	0.047	-	11°	20°	15°						●	○							-
	SPMR 42EDER-H	0.500	0.125	R0.039	0.079	-	11°	15°	15°	○	○	○	○									○	-
	SPM 422	0.500	0.125	-	-	0.031	11°	-	-	○	○									○			-
	423					0.047														○			
	SPM 432		0.187			0.031														○			
	433					0.047																○	
	SPG 321	0.375	0.125	-	-	0.016																○	
	322					0.031													●			○	
	SPG 421	0.500				0.016				●	●	●			●				●			●	
	422					0.031					○	○											
	SNCN 43XNTN	0.500	0.187	0.079	0.079	-	-	-	25°		○	○											-
	SNKN 43XNTN										○	○											
	SNMF 43XNTN	0.500	0.187	0.079	0.079	-	-	-	25°											○			-
	SNM 432	0.500	0.187	-	-	0.031	-	-	-											○			-
	433					0.047														○			

Inserts are sold in 10 piece boxes.

● : Stock Std. ○ : World Express

Milling Inserts

Classification of usage
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

		Cermet			MEGACOAT		PVD Coated Carbide						Carbide		
		TN60	TN100M	TC60M	PR1225	PR1210	PR630	PR730	PR830	PR1025	PR660	PR905	PW30	KW10	Ref. Page for Applicable Toolholders
P	Carbon Steel / Alloy Steel	■		★			☆	★	☆						
	Mold Steel	■		★			☆	★	☆						
M	Stainless Steel			★						★	☆				
K	Gray Cast Iron				★							★		☆	
	Nodular Cast Iron				★							★			
N	Non-ferrous Metals													★	
S	Heat-resistant Alloys			★						☆	☆				
	Titanium Alloys				★									☆	
H	Hard Materials			□				□	□						

Insert (Handed Insert shows Right-hand)	Description	A	T	X	Z	rε	α	β	γ	Cermet TN60	Cermet TN100M	Cermet TC60M	MEGACOAT PR1225	MEGACOAT PR1210	PVD Coated Carbide PR630	PVD Coated Carbide PR730	PVD Coated Carbide PR830	PVD Coated Carbide PR1025	PVD Coated Carbide PR660	PVD Coated Carbide PR905	Carbide PW30	Carbide KW10	Ref. Page for Applicable Toolholders
	TEKN 32PTTR	0.375	0.125	R0.031	0.039	-	20°	22°	30°	○	○		○		○	○					○		F6
				0.028										○						○			
	32PTFR																				●		
	TEKN 43PTTR	0.500	0.187	R0.039	0.055					○	○	○		○	○	○	○	○	○		○		E18
				0.028									○							○			
	43PTFR																					○	
	TEKR 43PTER-S	0.500	0.187	R0.039	0.055	-	20°	22°	30°		○		○			○	○		○	○			E18
	TEMR 32PTER-H	0.375	0.125	R0.031	0.047	-	20°	22°	30°				○		○	○							F6
	TPK 32PDTR	0.375	0.125	0.028	0.047	-	11°	15°	30°	●	○	○			○	○				○	○		-
	32PDFR																					●	
	TPMR 32PDER-H	0.375	0.125	R0.031	0.047	-	11°	15°	30°				○		●	○							-
	TPM 321	0.375	0.125	-	-	0.016	11°	-	-		○	○										●	-
	322					0.031					○	●			●	●						○	
	323					0.047																	
	432	0.500	0.187			0.031					○	●											
	TPG 181505	0.219	0.094			0.008				○												○	-
	18151					0.016				●												○	
	18152					0.031				○													
	321	0.375	0.125			0.016				●						●			●			●	-
	322					0.031				●	●	●				●			●			●	
	333					0.047																	

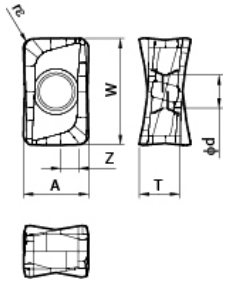
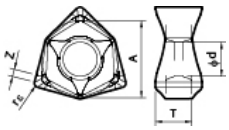
Cutting Range	Chipbreaker		Features
Finishing - Roughing	S		S chipbreaker for general-purpose machining. Low cutting resistance due to 13° chipbreaker rake angle. Recommended for various depths of cut with 3-step chipbreaker design. Ground wiper edge enables good surface finishes.
Medium - Roughing	H		H chipbreaker for general-purpose machining. Smooth chip evacuation due to the chipbreaker's smooth rake face. 20% less cutting force than flat-top inserts due to a 25° rake angle chipbreaker.

● : Stock Std. ○ : World Express

Inserts are sold in 10 piece boxes.

Milling Inserts (With Hole)

Classification of usage				NEW
★ : Roughing / 1st Choice	P	Carbon Steel / Alloy Steel	★	
☆ : Roughing / 2nd Choice		Mold Steel	★	
■ : Finishing / 1st Choice	M	Stainless Steel	★	
□ : Finishing / 2nd Choice	K	Gray Cast Iron		★
(In case hardness is under 45HRC)		Nodular Cast Iron		★
	N	Non-ferrous Metals		
	S	Heat-resistant Alloys	★	
		Titanium Alloys		★
	H	Hard Materials	□	

Insert (Handed Insert shows Right-hand)		Description	Dimension (inch)						Angle(°)			MEGACOAT NANO		Ref. Page for Applicable Toolholders
			A	T	ød	W	Z	rε	α	β	γ	PR1525	PR1510	
NEW  General Purpose		LOMU 100408ER-GM	0.260	0.157	0.134	0.429	0.067	0.031	-	-	-	●	●	E4-E7
		150508ER-GM	0.362	0.220	0.189	0.618	0.071	0.031				●	●	
NEW  Low Cutting Force		LOMU 100408ER-SM	0.260	0.157	0.134	0.429	0.067	0.031	-	-	-	●	●	
		150508ER-SM	0.362	0.220	0.189	0.618	0.071	0.031				●	●	
NEW  Tough Edge (For Heavy Milling)		LOMU 100408ER-GH	0.260	0.157	0.134	0.429	0.067	0.031	-	-	-	●	●	
		150508ER-GH	0.362	0.220	0.189	0.618	0.071	0.031				●	●	
NEW  General Purpose		WNMU 080608EN-GM	0.552	0.262	0.244	-	0.051	0.031	-	-	-	●	●	E12-E15
NEW  Low Cutting Force		WNMU 080608EN-SM										●	●	
NEW  Tough Edge (For Heavy Milling)		WNMU 080608EN-GH										●	●	
NEW  Surface-Finish Oriented (Precision Class)		WNEU 080608EN-GL					0.059					●	●	

Inserts are sold in 10 piece boxes.

● : Stock Std. ○ : World Express

Milling Inserts (With Hole)

Classification of usage			
★ : Roughing / 1st Choice	P	Carbon Steel / Alloy Steel	★ ■ ★ ☆☆
☆ : Roughing / 2nd Choice		Mold Steel	★ ■ ★ ☆☆
■ : Finishing / 1st Choice	M	Stainless Steel	★ ★ ☆
□ : Finishing / 2nd Choice	K	Gray Cast Iron	★ ★ ☆ ☆
(In case hardness is under 45HRC)		Nodular Cast Iron	★ ★ ☆
	N	Non-ferrous Metals	☆ ★
	S	Heat-resistant Alloys	★ ★ ☆
		Titanium Alloys	★ ★ ☆
	H	Hard Materials	□ □ □

Insert (Handed Insert shows Right-hand)	Description	Dimension (inch) A	T	ød	W (X)	rε (Z)	Angle(°) α	β	γ	MEGACOAT NANO PR1525	PR1510	Cermet TN100M	TC60M	MEGACOAT PR1225	PR1230	PR1210	PVD Coated Carbide PR630	PR730	PR830	PR1025	PR660	PR905	Carbide PW30	KW10	Ref. Page for Applicable Toolholders
NEW Wiper Edge	PNEU 1205ANER-W	0.703	0.219	0.244	0.091	0.319	-	-	-	●	●	●													C3-C5
Precision Class	PNEU 1205ANER-GL	0.689			0.106	Z= 0.106				●	●			●		●									
General Purpose	PNMU 1205ANER-GM	0.704			0.079	Z= 0.079				●	●			●		●									
Low Cutting Force	PNMU 1205ANER-SM									●	●			●		●									
Tough Edge (For Heavy Milling)	PNMU 1205ANER-GH	0.708	0.243							●	●			●		●									
	OFMR 070405EN-SH	0.708	0.194	-	-	Z= 0.047	26°	26°	45°					●		●			○	○		○			C12
	OFMR 070408EN-GT	0.703	0.202	-	-	Z= 0.043								●		●			○			○			
	OFMT 050405EN-GT	0.526	0.190	0.181	X= 0.020	Z= 0.055	26°	26°	45°					●		●			○			○			C9
	070408EN-GT	0.703	0.202	0.232	X= R0.031	Z= 0.047								●		●			●			○			
	OFMT 050405ER-SH	0.530	0.187	0.173	X= R0.020	Z= 0.173	26°	22°	45°					●		●			●	●		●			
	070405EN-SH	0.708	0.192	0.228		-		26°						●		●			●	●		●			
	SDKW 09T204TN 09T204FN	0.375	0.109	0.134	-	0.228	15°	-	-			○		○				○						○	K10
	SEKW 421TN	0.500	0.125	0.217			20°						○	●	○		○	○							K10
	421FN																							○	
	422TN					0.134							○	○	○		○	○							
	422FN																							○	
	SDKW 1204AESN	0.500	0.187	0.217	X= R0.039	Z= 0.059	15°	20°	45°					○											-
	43AETN															○									
	SEKW 43AFTN				X= 0.020	Z= 0.173	20°	25°					○		○	○		○			○	○			-
	SDMT 1204AESR-H	0.500	0.187	0.217	X= R0.039	Z= 0.031	15°	20°	45°					○											-

● : Stock Std. ○ : World Express

PNEU...W Inserts are sold in 5 piece boxes.

Inserts are sold in 10 piece boxes.

Milling Inserts (With Hole)

Classification of usage
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

		Cermet		MEGACOAT			PVD Coated Carbide						Carbide		
		TN100M	TC60M	PR1225	PR1230	PR1210	PR630	PR730	PR830	PR1025	PR660	PR905	PW30	KW10	Ref. Page for Applicable Toolholders
P	Carbon Steel / Alloy Steel	■		★	★			☆	☆						
P	Mold Steel	■		★	★			☆	☆						
M	Stainless Steel			★	★					☆	☆				
K	Gray Cast Iron					★						☆		☆	
K	Nodular Cast Iron					★						☆			
N	Non-ferrous Metals													★	
S	Heat-resistant Alloys			★	★					☆	☆				
S	Titanium Alloys					★								☆	
H	Hard Materials			□	□			□	□						

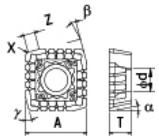
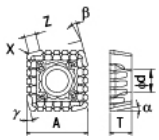
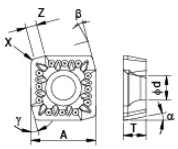
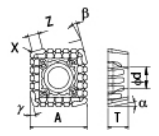
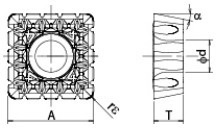
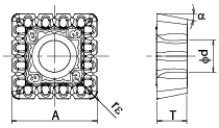
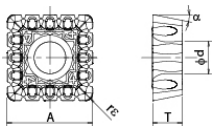
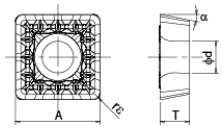
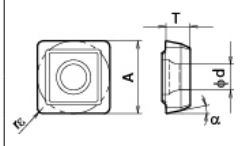
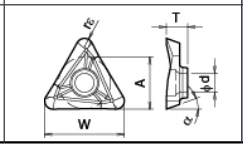
Insert (Handed Insert shows Right-hand)		Description	A	T	ød	W (X)	rε (Z)	α	β	γ														Ref. Page for Applicable Toolholders
		SDMT 31.81C	0.375	0.109	0.134	-	0.016	15°	-	-	○		○			●						○		K10
Low Cutting Force		SEMT 421C	0.500	0.125	0.217	-	0.016	20°	-	-			○			●						○		K10
		SDMT 221E-K	0.250	0.125	0.110	-	0.016	15°	-	-				○	○	○			○	○	○	○		K14
		080308E-K	0.315		0.134		0.031							○	○	○			○	○	○	○		K14
		432E-K	0.500	0.187	0.173									○	○	●			○	○	○	○		K14
		SEKT 43AFEN-S	0.500	0.187	0.217	X= 0.020	Z= 0.067	20°	25°	45°	○	●	●			●	○			●				-
		SEMM 150408PESR	0.625	0.187	0.217	-	0.031	20°	-	-	●		●		●	○	○	○	○	●	●	○		E19
2-Notched / General Purpose		SPMT 1806EDER-NB2	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°			●	●	●			●		○	●			D4-D5
3-Notched / General Purpose		SPMT 1806EDER-NB3	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°			●	●	●			●		○	●			D4-D5
2-Notched / Tough Edge		SPMT 1806EDSR-NB2T	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°				●	●			○			○			D4-D5
		SPMT 1806EDSL-NB2T												●				○						-
3-Notched / Tough Edge		SPMT 1806EDSR-NB3T	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°				●	●			○			○			D4
		SPMT 1806EDSL-NB3T												●				○						-

Inserts are sold in 10 piece boxes.

● : Stock Std. ○ : World Express

Milling Inserts (With Hole)

Classification of usage			
★ : Roughing / 1st Choice	P	Carbon Steel / Alloy Steel	★ ★ ☆ ☆
☆ : Roughing / 2nd Choice		Mold Steel	★ ★ ☆ ☆
■ : Finishing / 1st Choice	M	Stainless Steel	★ ★ ☆ ☆
□ : Finishing / 2nd Choice	K	Gray Cast Iron	★ ☆ ☆
(In case hardness is under 45HRC)		Nodular Cast Iron	★ ☆
	N	Non-ferrous Metals	★
	S	Heat-resistant Alloys	★ ★ ☆ ☆
		Titanium Alloys	★ ☆
	H	Hard Materials	□ □ □ □

Insert (Handed Insert shows Right-hand)		Description	Dimension (inch) A	T	ød	W (X)	rε (Z)	Angle(°) α	β	γ	Cermet TN100M	TC60M	MEGACOAT PR1225	PR1230	PR1210	PVD Coated Carbide PR630	PR730	PR830	PR1025	PR660	PR905	Carbide PW30	KW10	Ref. Page for Applicable Toolholders
 4-Notched / Low cutting force		SPMT 1806EDER-NB2P	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°			●	●	●			○			○			D4-D5
 5-Notched / Low cutting force		SPMT 1806EDER-NB3P	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°			●	●	●			○			○			
 Without notch		SPMT 1806EDER-V	0.709	0.250	0.268	X= R0.047	Z= 0.122	11°	15°	15°			●	●	●			●		●	●			
 3-Notched		SPMT 180616EN-NB3	0.709	0.250	0.268	-	0.063	11°	-	-				●	●									E50-E51
 4-Notched		SPMT 180616EN-NB4	0.709	0.250	0.268	-	0.063	11°	-	-				●	●									
 3-Notched / Low cutting force		SPMT 180616EN-NB3P	0.709	0.250	0.268	-	0.063	11°	-	-				●	●									
 4-Notched / Low cutting force		SPMT 180616EN-NB4P	0.709	0.250	0.268	-	0.063	11°	-	-				●	●									
 Without notch		SPMT 180616EN-V	0.709	0.250	0.268	-	0.063	11°	-	-				●	●									
		SPMT 060204E-Z	0.250	0.094	0.098	-	0.016	11°	-	-			●		●	○				○	○		○	K12
		SPMT 060208E-Z					0.031						●		●	○				○	○		○	
		SPMT 090304E-Z	0.375	0.125	0.134	-	0.016	11°	-	-			●		●	○				○	○		○	
		SPMT 090308E-Z					0.031						●		●	●				●	○		○	
		TEMT 250624-AQ	0.625	0.250	0.217	0.906	0.094	20°	-	-													○	-

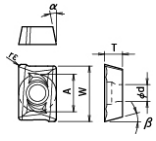
● : Stock Std. ○ : World Express

Inserts are sold in 10 piece boxes.

Milling Inserts (With Hole)

Classification of usage
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

		TN100M	TC60M	PR1225	PR1230	PR1210	PR630	PR730	PR830	PR1025	PR660	PR905	PW30	GW25
P	Carbon Steel / Alloy Steel			★	★				☆	☆				
	Mold Steel			★	★				☆	☆				
M	Stainless Steel			★	★				☆	☆				
K	Gray Cast Iron					★						☆		
	Nodular Cast Iron					★						☆		
N	Non-ferrous Metals													★
S	Heat-resistant Alloys			★	★					☆				
	Titanium Alloys					★								☆
H	Hard Materials			□	□				□					

Insert (Handed Insert shows Right-hand)	Description	Dimension (mm) A	T	ød	W	rε	Angle(°) α	β	γ	Cermet TN100M	Cermet TC60M	MEGACOAT PR1225	MEGACOAT PR1230	MEGACOAT PR1210	PVD Coated Carbide PR630	PVD Coated Carbide PR730	PVD Coated Carbide PR830	PVD Coated Carbide PR1025	PVD Coated Carbide PR660	PVD Coated Carbide PR905	Carbide PW30	Carbide GW25	Ref. Page for Applicable Toolholders
 	APKT 1003PDER-V	0.265	0.125	0.110	0.413	0.016	11°	15°	-	●				●		○	○		●	○	○		E76
	100308PDER-V					0.031						●		●		○							
	APKT 1604PDER-V	0.375	0.187	0.177	0.669	0.031				●				●		●	●		●	●			
	160416PDER-V					0.063				●									●				
 3-Notched	APMT 250608ER-NB3	0.625	0.250	0.256	0.984	0.031	15°	11°	-				●	●			●		○	●			E56-E58
	250616ER-NB3					0.063							●	●			●		●	●			
	250640ER-NB3					0.156							●	●			○		○	○			
	APMT 250616EL-NB3					0.063							●				●						-
 4-Notched	APMT 250608ER-NB4	0.625	0.250	0.256	0.984	0.031	15°	11°	-				●	●			●		○	●			E56-E58
	250616ER-NB4					0.063							●	●			●		●	●			
	250640ER-NB4					0.156							●	●			○		○	○			
	APMT 250616EL-NB4					0.063							●				●						-
 3-Notched / Low Cutting Force	APMT 250616ER-NB3P	0.625	0.250	0.256	0.984	0.063	15°	11°	-				●	●			○		○	○			E56-E58
 4-Notched / Low Cutting Force	APMT 250616ER-NB4P	0.625	0.250	0.256	0.984	0.063	15°	11°	-					●			○		○	○			
	BDMT 070302ER-JS	0.181	0.102	0.091	0.264	0.008	16°	15°	-			●					●	●		●			E32-E33
	070304ER-JS					0.016						●					●	●		●			
	070308ER-JS					0.031						●					●	●		●			
	BDMT 070302ER-JT	0.181	0.102	0.091	0.264	0.008	16°	15°	-			●		●			●	●		○			
	070304ER-JT					0.016						●		●			●	●		●			
	070308ER-JT					0.031						●		●			●	●		●			
 Non-ferrous Metals	BDGT 11T302FR-JA	0.264	0.150	0.110	0.433	0.008	18°	13°	-													○	E20-E22 E24
	11T304FR-JA					0.016																●	
	11T308FR-JA					0.031																●	
	BDGT 170404FR-JA	0.378	0.193	0.173	0.669	0.016	18°	13°	-													●	
	170408FR-JA					0.031																●	
	170420FR-JA					0.079																●	
	170431FR-JA					0.122																	
 Stainless Steel/Low cutting force	BDMT 110302ER-JS	0.248	0.118	0.110	0.433	0.008	18°	15°	-			●					○	○					
	110304ER-JS					0.016						●					●	●					
	110308ER-JS					0.031						●					●	●					
	BDMT 11T302ER-JS	0.264	0.150	0.110	0.433	0.008	18°	13°	-			●					●	○					
	11T304ER-JS					0.016						●					●	●					
	11T308ER-JS					0.031						●					●	●					
	BDMT 170404ER-JS	0.378	0.193	0.173	0.669	0.016	18°	13°	-			●					●	●					
	170408ER-JS					0.031						●					●	●					

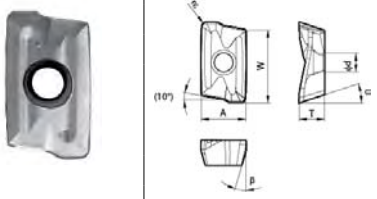
Inserts are sold in 10 piece boxes.

● : Stock Std. ○ : World Express

Milling Inserts (With Hole)

Classification of usage
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

		Cermet		MEGACOAT			PVD Coated Carbide						Carbide		
		TN100M	TC60M	PR1225	PR1230	PR1210	PR630	PR730	PR830	PR1025	PR660	PR905	PW30	KW10	Ref. Page for Applicable Toolholders
P	Carbon Steel / Alloy Steel	■		★★				☆☆							
	Mold Steel	■		★★				☆☆							
M	Stainless Steel			★★							☆				
K	Gray Cast Iron					★						☆		☆	
	Nodular Cast Iron					★						☆			
N	Non-ferrous Metals													★	
S	Heat-resistant Alloys			★★							☆				
	Titanium Alloys					★									
H	Hard Materials			□	□			□	□						

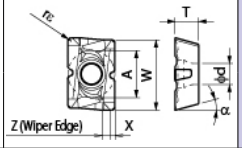
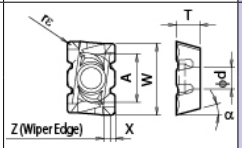
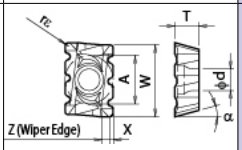
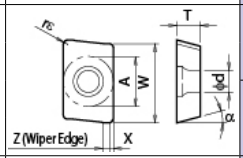
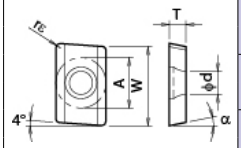
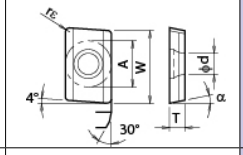
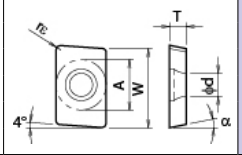
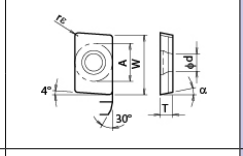
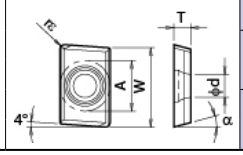
Insert (Handed Insert shows Right-hand)	Description	A	T	ød	W (X)	rε (Z)	α	β	γ	Ref. Page for Applicable Toolholders
	BDMT 110302ER-JT	0.248	0.118	0.110	0.433	0.008	18°	15°	-	E20-E24
	BDMT 110304ER-JT					0.016				
	BDMT 110308ER-JT					0.031				
	BDMT 11T302ER-JT	0.264	0.150	0.110	0.433	0.008	18°	13°	-	
	BDMT 11T304ER-JT					0.016				
	BDMT 11T308ER-JT					0.031				
	BDMT 11T312ER-JT					0.047				
	BDMT 11T316ER-JT					0.063				
	BDMT 11T320ER-JT					0.079				
	BDMT 11T324ER-JT					0.094				
	BDMT 11T331ER-JT					0.122				
	BDMT 170404ER-JT	0.378	0.193	0.173	0.669	0.016	18°	13°	-	
	BDMT 170408ER-JT					0.031				
	BDMT 170412ER-JT					0.047				
	BDMT 170416ER-JT					0.063				
	BDMT 170420ER-JT					0.079				
	BDMT 170424ER-JT					0.094				
	BDMT 170431ER-JT					0.122				
	BDMT 170440ER-JT					0.157				
 2-Notched	BDMT 11T308ER-N2	0.264	0.150	0.110	0.433	0.031	18°	13°	-	E38-E43
 3-Notched	BDMT 11T308ER-N3	0.264	0.150	0.110	0.433	0.031	18°	13°	-	
 3-Notched	BDMT 170408ER-N3	0.378	0.193	0.173	0.669	0.031	18°	13°	-	
 4-Notched	BDMT 170408ER-N4	0.378	0.193	0.173	0.669	0.031	18°	13°	-	
	GOMT 08T208ER-D	0.205	0.109	0.091	0.343	0.031	13°	17°	-	G4
	GOMT 100308ER-D	0.258	0.130	0.110	0.421					
	GOMT 13T308ER-D	0.329	0.152	0.134	0.520					
	GOMT 160408ER-D	0.395	0.187	0.173	0.657					
	JOMT 08T208ER-D	0.202	0.109	0.091	0.335	0.031	17°	13°	-	
	JOMT 100308ER-D	0.253	0.125	0.110	0.402					
	JOMT 13T308ER-D	0.317	0.146	0.134	0.520					
	JOMT 160408ER-D	0.381	0.187	0.173	0.657					
 Z (Wiper Edge)	NDKT 090304ER-V	0.250	0.125	0.110	W=0.37 X=0.010	rε=0.016 Z=0.049	15°	-	-	J10 E63-E65
	NDKT 150408ER-V	0.394	0.187	0.173	W=0.626 X=0.024	rε=0.031 Z=0.055				

● : Stock Std. ○ : World Express

Inserts are sold in 10 piece boxes.

Milling Inserts (With Hole)

Classification of usage			
★ : Roughing / 1st Choice	P	Carbon Steel / Alloy Steel	■ ☆
☆ : Roughing / 2nd Choice		Mold Steel	■ ☆
■ : Finishing / 1st Choice	M	Stainless Steel	☆
□ : Finishing / 2nd Choice	K	Gray Cast Iron	☆ ☆
(In case hardness is under 45HRC)		Nodular Cast Iron	☆
	N	Non-ferrous Metals	★
	S	Heat-resistant Alloys	☆
		Titanium Alloys	☆
	H	Hard Materials	□ □

Insert (Handed Insert shows Right-hand)	Description	Dimension (inch) A	T	ød	W (X)	rε (Z)	Angle(°) α	β	γ	Cermet TN100M	TC60M	MEGACOAT PR1225	PR1230	PR1210	PVD Coated Carbide PR630	PR730	PR830	PR915	PR660	PR905	Carbide PW30	KW10	Ref. Page for Applicable Toolholders
 1-Notched		**NDKT 090304ER-N1**	0.250	0.125	0.110	W=0.374 X=0.010	rε=0.016 Z=0.049	15°	-	-	○					○	○			○	○		○	F7 J10
 2-Notched		**NDKT 090304ER-N2**	0.250	0.125	0.110	W=0.374 X=0.010	rε=0.016 Z=0.049	15°	-	-	○					○	○			●	○		●	E63- E65
 3-Notched		**NDKT 150408ER-N3**	0.394	0.187	0.173	W=0.626 X=0.024	rε=0.031 Z=0.055	15°	-	-	○					○	○			○	○		○	F8
		**NDKW 090304ER**	0.250	0.125	0.110	W=0.374 X=0.010	rε=0.016 Z=0.049	15°	-	-	○						○			○	○		○	F7 J10 E63- E65
		NDKW 150408ER	0.394	0.187	0.173	W=0.626 X=0.024	rε=0.031 Z=0.055	15°	-	-	○										○		○	F8
		**NDCT 831R-B**	0.250	0.094	0.110	0.374	0.016	15°	-	-	●	○												E77
		831FR																			○	○	F2
		831TR									○	○												
		832R-B					0.031				●	●												E77
		832FR-B																						
		NDCT 032TR	0.313	0.094	0.134	0.500	0.031	15°	-	-	○	○												E77
		032FR																			○		F2
		NDCT 322R-B	0.375	0.125	0.177	0.591	0.031	15°	-	-													●	E77
		322FR-B																						
		322TR										●				○	○							E77
		322FR																			○	○		F3
		**NDCT 322TRX**	0.375	0.125	0.173	0.591	0.031	15°	-	-	○	○												F3- F4
		**NDCW 3205TR**	0.375	0.125	0.177	0.591	0.008	15°	-	-	○	●												F3
		321TR					0.016				●	●				●	○							
		322TR					0.031				●	●				●	○							
		325TR					0.079				○	○												
		3275TR					0.118				○	○												
		3210TR					0.157				○	○												
		**NDCW 322TRX**	0.375	0.125	0.173	0.591	0.031	15°	-	-	○	○												F3- F4
		322FRX																			○			
		**NDMM 831ER-SP**	0.250	0.094	0.110	0.374	0.016	15°	-	-	●	●				●	○		●					F2
		NDMM 031ER-SP	0.313	0.094	0.134	0.500	0.016				○	○				○	○		●					F4
		032ER-SP					0.031				○	●				○	○		●					
		NDMM 321ER-SP	0.375	0.125	0.173	0.591	0.016				○	●				○	○		●					F4
		322ER-SP					0.031				○	●				●	○		●					

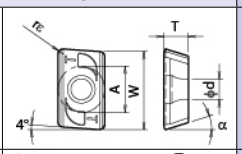
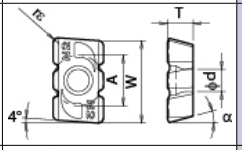
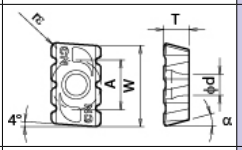
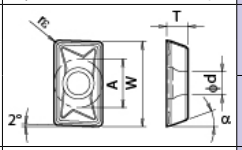
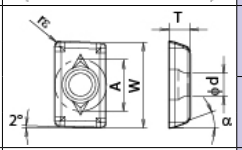
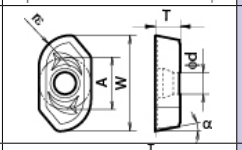
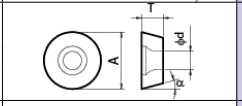
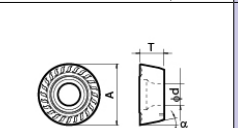
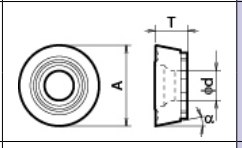
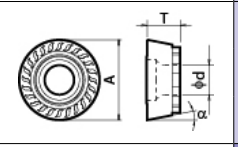
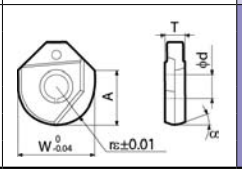
● : Stock Std. ○ : World Express

Inserts are sold in 10 piece boxes.

Milling Inserts (With Hole)

Classification of usage
★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

		Cermet		MEGACOAT			PVD Coated Carbide						Carbide		
		TN100M	TC60M	PR1225	PR1230	PR1210	PR630	PR730	PR830	PR915	PR660	PR905	PW30	KW10	Ref. Page for Applicable Toolholders
P	Carbon Steel / Alloy Steel	■		★	★			☆	☆						
	Mold Steel	■		★	★			☆	☆						
M	Stainless Steel			★	★						☆				
K	Gray Cast Iron					★						☆		☆	
	Nodular Cast Iron					★						☆			
N	Non-ferrous Metals													★	
S	Heat-resistant Alloys			★	★						☆				
	Titanium Alloys					★								☆	
H	Hard Materials			□	□			□	□						

Insert (Handed Insert shows Right-hand)	Description	A	T	ød	W	rε	α	β	γ														
 	NDMM 12T308ER-T	0.298	0.156	0.134	0.500	0.031	15°	-	-	○				○		○	○	●					J10 E63- E65
 2-Notched 	NDMM 12T308ER-N2	0.307	0.156	0.134	0.500	0.031	15°	-	-	○				○		○	○	○					E63- E65 E68
 3-Notched 	NDMM 12T308ER-N3	0.307	0.156	0.134	0.500	0.031	15°	-	-	○				○		○	○	○					
 	NDMT 080208ER-D	0.200	0.094	0.087	0.335	0.031	15°	-	-	○	○		○	●		●	○	○					G8
	NDMT 10T208ER-D	0.247	0.109	0.110	0.402					○	○		○	○	●	●	○	●					
	NEMT 120308ER-D	0.302	0.125	0.134	0.500	0.031	20°	-	-	○	○		○	○	●	●	○	●					
	NEMT 16T308ER-D	0.364	0.156	0.173	0.638					○	○		○	○	●	●	○	●					
 Tough Edge 	NDMT 080208ER-DH	0.200	0.094	0.087	0.335	0.031	15°	-	-	○	○		○	●		●	○						
	NDMT 10T208ER-DH	0.247	0.109	0.110	0.402					○	○		○	●		●	○	○					
	NEMT 120308ER-DH	0.302	0.125	0.134	0.500	0.031	20°	-	-	○	○		○	●		●	○	○					
	NEMT 16T308ER-DH	0.364	0.156	0.173	0.638					○	○		○	●		●	○	○					
 	FPMT 090340ER	0.261	0.125	0.110	0.362	0.157	11°	-	-					○		○	○	○					J10
 	RDHX 0702M0T	0.276	0.094	0.110	-	-	15°	-	-				○										-
	RDHX 1003M0T	0.394	0.125	0.150									○										
	RDHX 12T3M0T	0.472	0.156										○										
 Tough Edge 	RDMT 08T2M0-H	0.315	0.109	0.134	-	-	15°	-	-				○	○		●	○	○					J4
 Low Cutting Force 	RPMT 10T3M0	0.394	0.156	0.134	-	-	11°	-	-					○		○		●	○				J4- J5
	RPMT 1204M0	0.472	0.187	0.173									○	○				○	○				J10
 Tough Edge 	RPMT 1204M0-H	0.472	0.187	0.173	-	-	11°	-	-	●			○	○				○	○				J4-
	RPMT 1606M0-H	0.630	0.250	0.217						○			○	○		○		●	○				J5
	RPMT 2006M0-H	0.787	0.250	0.256									○	○									J10
	RDFG 08FR	0.260	0.083	0.122	0.315	0.157	15°	-	-								○						J2
	RDFG 10FR	0.315	0.106	0.142	0.394	0.197											○						
	RDFG 12FR	0.370	0.126	0.161	0.472	0.236											○						
	RDFG 16FR	0.445	0.165	0.201	0.630	0.315	10°	-	-								○						
	RDFG 20FR	0.555	0.205	0.240	0.787	0.394											○						
	RDFG 25FR	0.610	0.244	0.240	0.984	0.492											○						

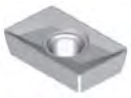
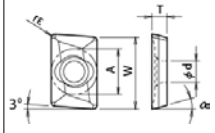
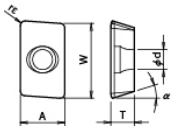
● : Stock Std. ○ : World Express

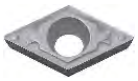
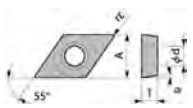
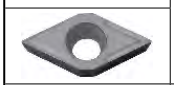
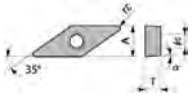
RDFG Inserts are sold in 2 piece boxes.

Inserts are sold in 10 piece boxes.

Milling Inserts (With Hole)

Classification of usage														
★ : Roughing / 1st Choice ☆ : Roughing / 2nd Choice ■ : Finishing / 1st Choice □ : Finishing / 2nd Choice (In case hardness is under 45HRC)	P	Carbon Steel / Alloy Steel		■	□		☆	★						
		Mold Steel		■	□		☆	★						
	M	Stainless Steel					☆	★						
	K	Gray Cast Iron							★					
		Nodular Cast Iron							★					
	N	Non-ferrous Metals										★		
	S	Heat-resistant Alloys					☆	★						
		Titanium Alloys							★					
	H	Hard Materials							□					

Insert Handed Insert shows Right-hand		Description	Dimension (inch)					Angle (°)			Insert Grade											Ref. Page for Applicable Toolholder
											Cermet			CVD Coated	PVD Coated					Carbide		
			A	T	Ød	W	rε	α	β	γ	TN100M	TC6020	TC60	CA2335	PR660	PR830	PR905	PR930		KW10	CW12	
		XPMT 090208	1/4	0.094	0.110	0.325	.031	15°			●	●		●	●	●	●					K5
		XPMT 090216					.063							●								E72-
		XPMT 090224					.094							●								E74
		XPMT 15T304	3/8	0.156	0.157	0.607	.016	15°	-	-			●	●	●	●	●					
		XPMT 15T308					.031				●	●	●	●	●	●	●	●		●		
		XPMT 15T316					.063						●	●		●	●					K5
		XPMT 15T324					.094						●	●	●	●	●					E72-
		XPMT 15T331					.122						●	●	●	●	●					E74
		XPMT 15T364					.250						●	●	●	●	●					
		APET 0803PDFR	1/4	0.125		0.300	.028	11°	-	-											●	
		APET 1604PDFR	3/8	0.188		0.630	.039	11°	-	-										●		K5
		160416					.060													●		E75
		160431					.125													●		

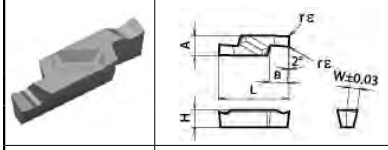
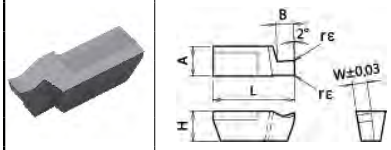
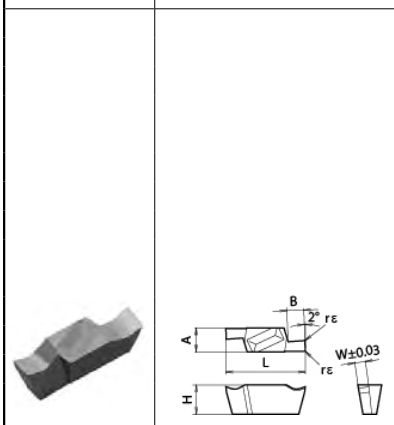
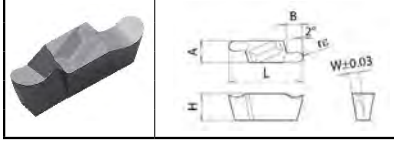
API Insert		Description	Dimension (inch)				Angle (°)	Cermet	CVD Coated Carbide			PVD Coated Carbide	Ref. Page for Applicable Toolholders
			I.C. (A)	T	Ød	rε	α	TN60	CA5525	CA6525	PR1225	PR660	
		DCMT 3252HQ	3/8	5/32	0.173	1/32	7°	●	●	●		●	
		DCMT 3253CQ	3/8	5/32	0.173	1/16	7°	●	●	●		●	K2-
		VCMT 222HQ	1/4	1/8	0.110	1/32	7°				●		K4
		VCMT 332HQ	3/8	3/16	0.173	1/32	7°	●	●	●		●	
		VCMT 333HQ				1/16	7°				●		

Inserts are sold in 10 piece boxes.

● : Stock Std. ○ : World Express

Inserts (MGI/MVG Grooving)

Classification of usage	P	Carbon Steel / Alloy Steel	☆	★								
		Mold Steel	☆	★								
★ : 1st Choice	M	Stainless Steel	☆	☆	★					★		
☆ : 2nd Choice	K	Gray Cast Iron										★
		Nodular Cast Iron										★
	N	Non-ferrous Metals										★
	S	Heat-resistant Alloys			★					★		
		Titanium Alloys			★							★
	H	Hard Materials										

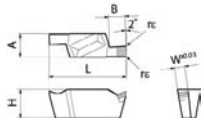
Insert (Handed Insert shows Right-hand)	Description	(Previous Description)	Dimension (mm) W	B	rε	A	L	H	Cermet TN90	Cermet TC40	Cermet TC60	MEGACOAT PR1225	PVD Coated PR660	Carbide KW10	Ref. Page for Applicable Toolholders
	GVFR 400-020B	GVFR 400B	4	5.3	0.2	5.8	20	5	○	○	○	●	○	○	K7
	GVFR 430-020B	GVFR 430B	4.3							○	○	●	○	○	
	GVFR 460-020B	GVFR 460B	4.6							○	○	●	○	○	
	GVFR 490-020B	GVFR 490B	4.9							○	○	●	○	○	
	GVR 100-020SS	GVR 100SS	1.00	2.3	0.2	3.6	9	3.0	○		○	●	○	○	K8
	GVR 125-020SS	GVR 125SS	1.25						○		○	●	○	○	
	GVR 145-020SS	GVR 145SS	1.45						○		○	●	○	○	
	GVR 200-020SS	GVR 200SS	2.00						○		○	●	○	○	
	GVR 250-020SS	GVR 250SS	2.50						○		○	●	○	○	
	GVR 300-020SS	GVR 300SS	3.00						○		○	●	○	○	
	GVR 100-020S	GVR 100S	1.00	2.3	0.2	4.0	11	4.0	○	○	○	●	○	○	K8
	GVR 125-020S	GVR 125S	1.25						○	○	○	●	○	○	
	GVR 145-020S	GVR 145S	1.45						○	○	○	●	○	○	
	GVR 185-020S	GVR 185S	1.85						○	○	○	●	○	○	
	GVR 200-020S	GVR 200S	2.00						○	○	○	●	○	○	
	GVR 250-020S	GVR 250S	2.50						○	○	○	●	○	○	
	GVR 340-020S	GVR 340S	3.40							○	○	●	○	○	
	GVR 100-020A	GVR 100A	1.00	2.3	0.2	4.0	12	5.0	○	○	○	●	●	○	K8
	GVR 125-020A	GVR 125A	1.25						○	○	○	●	○	○	
	GVR 145-020A	GVR 145A	1.45						○	○	○	●	○	○	
	GVR 185-020A	GVR 185A	1.85						○	○	○	●	○	○	
	GVR 200-020A	GVR 200A	2.00						○	○	○	●	○	○	
	GVR 250-020A	GVR 250A	2.50						○	○	○	●	○	○	
	GVR 300-020A	GVR 300A	3.00						○	○	○	●	○	○	
	GVR 340-020A	GVR 340A	3.40						○	○	○	●	○	○	
	GVR 145-020B	GVR 145B	1.45	2.8	0.2	4.5	15	5.5	○	○	○	●	○	○	K8
	GVR 185-020B	GVR 185B	1.85						○	○	○	●	○	○	
	GVR 200-020B	GVR 200B	2.00	3.2					○	○	○	●	○	○	
	GVR 230-020B	GVR 230B	2.30						○	○	○	●	○	○	
	GVR 250-020B	GVR 250B	2.50						○	○	○	●	○	○	
	GVR 280-020B	GVR 280B	2.80						○	○	○	●	○	○	
	GVR 300-020B	GVR 300B	3.00	4.2					○	○	○	●	○	○	
	GVR 340-020B	GVR 340B	3.40						○	○	○	●	○	○	
	GVR 400-020B	GVR 400B	4.00						○	○	○	●	○	○	
	GVR 280-020C	GVR 280C	2.80	4.5	0.2	5.8	21	6.5	○	○	○	●	○	○	K8
	GVR 300-020C	GVR 300C	3.00						○	○	○	●	○	○	
	GVR 340-020C	GVR 340C	3.40	5.5					○	○	○	●	○	○	
	GVR 400-020C	GVR 400C	4.00						○	○	○	●	○	○	
	GVR (430-020C)	GVR (430C)	4.30	6.3					○	○	○	●	○	○	
	GVR (460-020C)	GVR (460C)	4.60							○	○	●	○	○	
	GVR (500-020C)	GVR (500C)	5.00						○	○	○	●	○	○	
	GVR 200-100AR	GVR 100AR	2.00	2.3	1.00	4.0	12	5.0			○	●	○	○	K8
	GVR 250-125AR	GVR 125AR	2.50		1.25						○	●	○	○	
	GVR 300-150AR	GVR 150AR	3.00		1.50						○	●	○	○	
	GVR 200-100BR	GVR 100BR	2.00	3.2	1.00	4.5	15	5.5	○		○	●	○	○	
	GVR 300-150BR	GVR 150BR	3.00	4.2	1.50				○		○	●	○	○	

● : Stock Std. ○ : World Express

Inserts are sold in 10 piece boxes.

Milling Inserts (PCD)

Classification of usage				
★ : 1st Choice ☆ : 2nd Choice	P	Carbon Steel / Alloy Steel		
		Mold Steel		
	M	Stainless Steel		
	K	Gray Cast Iron		
		Nodular Cast Iron		
	N	Non-ferrous Metals		★
	S	Heat-resistant Alloys		★
		Titanium Alloys		★
	H	Hard Materials		

Insert Handed Insert shows Right-hand		Description		(Previous Description)		Dimension (mm) W	B	rε	A	L	H		No. of Edges	PCD KPD001	PCD KPD010	Ref. Page for Applicable Toolholders
 Internal Grooving		GVR	145-020A	GVR	145A	1.45	2.3	0.2	4.0	12	5.0		1		○	K8
			200-020A		200A	2.00									○	
			300-020A		300A	3.00									○	
		GVR	200-020B	GVR	200B	2.00	3.2	0.2	4.5	15	5.5				○	
			250-020B		250B	2.50									○	
			300-020B		300B	3.00	4.2								○	
		GVR	300-020C	GVR	300C	3.00	4.5	0.2	5.8	21	6.5				○	
			400-020C		400C	4.00	5.5								○	

CBN & PCD Inserts are sold in 1 piece boxes.

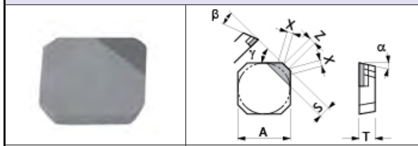
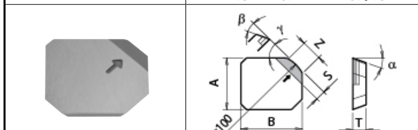
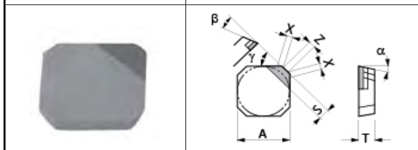
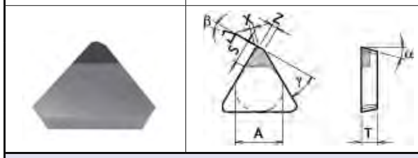
● : Stock Std. ○ : World Express

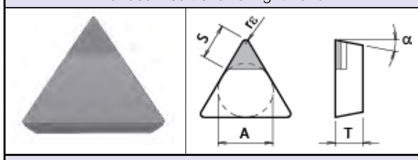
Milling Inserts (CBN & PCD)

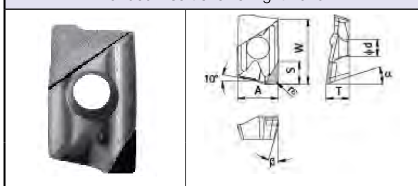
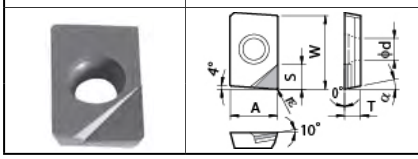
Classification of usage

★ : Roughing / 1st Choice
☆ : Roughing / 2nd Choice
■ : Finishing / 1st Choice
□ : Finishing / 2nd Choice
(In case hardness is under 45HRC)

ISO	Work Material	KBN510	KBN525	KPD001	KPD010	KPD230
P	Carbon Steel / Alloy Steel					
	Mold Steel					
M	Stainless Steel					
K	Gray Cast Iron					
	Nodular Cast Iron					
N	Non-ferrous Metals			□		■
S	Heat-resistant Alloys					
	Titanium Alloys			□		■
H	Hard Materials		■			

Insert (Handed Insert shows Right-hand)	Description	A	T	X	Z	S	B	α	β	γ	KBN510	KBN525	KPD001	KPD010	KPD230	Ref. Page for Applicable Toolholders
		Dimension (inch)						Angle(°)			CBN		PCD			
	SEEN 42AFFN-NE	0.500	0.125	0.020	0.055	0.118	-	20°	23°	45°						C14
	42AFFN					0.138							●	●		
 With Wiper Edge	SEEN 42AFFR-W	0.492	0.125	-	0.138	0.067	0.573	20°	25°	45°			○			-
	SOKN 13T3AXFN-NE	0.531	0.156	0.016	0.043	0.118	-	27°	32°	45°					○	C15
	TEEN 32PTFR-NE	0.375	0.125	0.024	0.055	0.161	-	20°	22°	30°					○	F6
	32PTFR					0.185							●	●		
	TEKN 43PTFR-NE	0.500	0.187	0.028	0.071	0.165	-	20°	22°	30°					○	E18
	43PTFR					0.189							○	●		

Insert (Handed Insert shows Right-hand)	Description	A	T	rε	S	α	KBN510	KBN525	KPD001	KPD010	KPD230	Ref. Page for Applicable Toolholders
		Dimension (mm)				Angle(°)	CBN		PCD			
	TPG 2205NE	0.250	0.125	0.008	0.134	11°			○			-
	221NE			0.016	0.126				○			
	222NE			0.031	0.114				○			

Insert (Handed Insert shows Right-hand)	Description	A	T	ød	W	rε	S	α	β	KBN510	KBN525	KPD001	KPD010	KPD230	Ref. Page for Applicable Toolholders
		Dimension (mm)						Angle(°)		CBN		PCD			
	BDMT 11T302FR	0.264	0.150	0.110	0.433	0.008	0.142	18°	13°			●		○	E20-E22
	11T304FR					0.016								○	
	BDMT 170402FR	0.378	0.193	0.173	0.669	0.008	0.173	18°	13°			●		○	
	170404FR					0.016								○	
	NDCW 3205FRX-NE	0.375	0.125	0.173	0.591	0.008	0.201	15°	-					○	F4
	3205FRX						0.224						○		

● : Stock Std. ○ : World Express

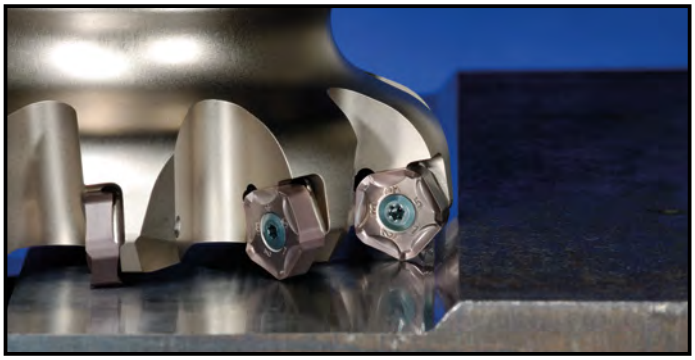
CBN & PCD Inserts are sold in 1 piece boxes.

45° Lead Angle

C1~C16

C

45° Lead Angle	C2~C16
MFPN45	C2-C8
MOF45	C9-C11
MOFX45	C12-C13
MSE45	C14
MSO45-S / MSO45	C15-C16



High Efficiency Mill

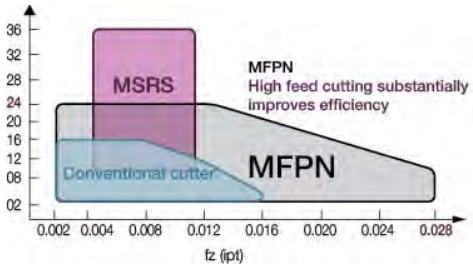
MFPN

Milling-Facing PeNtagonal type

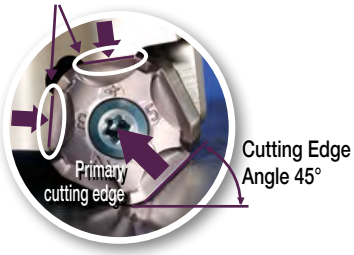
Five Advantages of the MFPN

1 A Roughing and General-purpose Mill with 10-Edge Pentagonal Inserts

- Stable cutting due to two-face contact
- 10-edge insert reduces cutting costs



Two-face contact

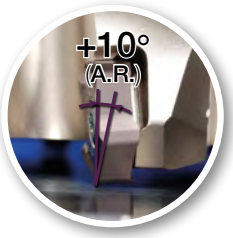


Insert pocket is designed to take advantage of cutting force direction to help secure insert

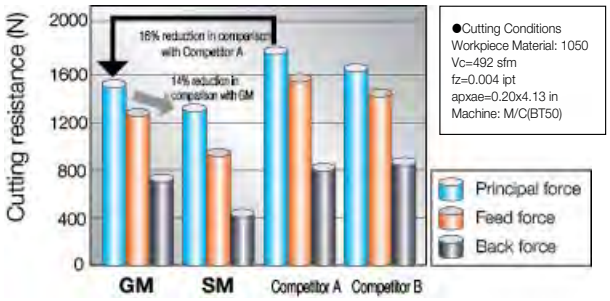
➡ Highly stabilized accuracy

2 Low Cutting Forces Due to Helical Cutting-Edge Design

- Helical cutting-edge design with low cutting force reduces chattering
- High Axial Rake Angle **(A.R. Max. +10°)**



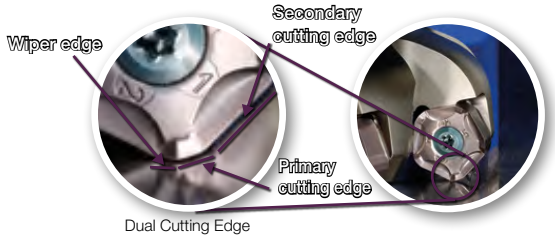
●Cutting Force Comparison



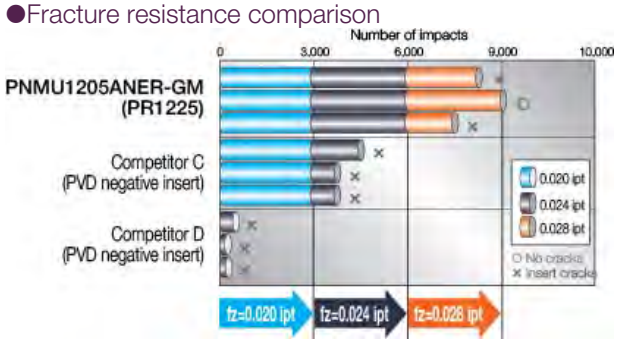
3 Tough and Reliable Dual Cutting Edge Design

- Dual Cutting Edge

· Primary edge makes chips thinner and reduces impact forces



●Fracture resistance comparison



●Cutting Conditions
Workpiece: 4140(25-30HRC)
(workpiece with 0.787in width slot)
machine: BT50 M/C
Vc=325sfm
fz=0.018~0.028ipt
apxae=0.079x3.937in

4 Molded Chipbreakers Improve Chip Evacuation

5 Longer Tool Life with PR12-Series MEGACOAT Carbide Inserts

■ MFPN45 Face Mill (Inch-Size)

Facing | Chamfering

Rake Angles (°)	Axial Rake	Radial Rake	
	max +10°	ØD=2.50-3.00 : -10°	ØD=4.00-10.00 : -6°

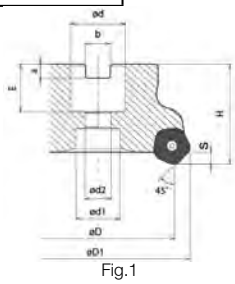


Fig.1

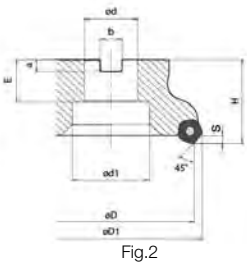


Fig.2

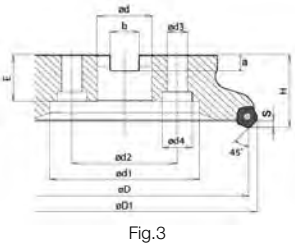


Fig.3

●Toolholder Dimensions

		Description	Stock	No. of Inserts	Dimension (inch)											Drawing	Weight (kg)	Shim	Applicable Inserts ➡B17
					ØD	ØD1	Ød	Ød1	Ød2	H	E	a	b	Ød3	Ød4				
Inch Spec	Coarse pitch	MFPN 452500R-4T	●	4	2.50	3.01	0.750	0.67	0.43	1.57	0.750	0.19	0.312			Fig.1	0.5		
		453000R-5T	●	5	3.00	3.51	1.00	0.87	0.55	1.97	1.06	0.24	0.375			Fig.1	1.1		
		454000R-6T	●	6	4.00	4.51	1.50	2.05	-	1.97	1.14	0.39	0.625	-	-	Fig.2	1.4		
		455000R-7T	●	7	5.00	5.51	1.50	2.28		2.48	1.42	0.39	0.625			Fig.2	2.6	Yes	
		456000R-8T	●	8	6.00	6.51	2.00	2.00	-	2.48	1.50	0.43	0.750			Fig.2	3.8		
		458000R-10T	●	10	8.00	8.51	2.50	3.94	4.00	2.48	1.57	0.55	1.000	0.71	1.02	Fig.3	6.6		
		4510000R-12T	●	12	10.00	10.51	2.50	3.94	4.00	2.48	1.57	0.55	1.000			Fig.3	9.3		
	Fine pitch	MFPN 452500R-5T	●	5	2.50	3.01	0.750	0.67	0.43	1.57	0.750	0.19	0.312			Fig.1	0.5		PNMU1205ANER-GM
		453000R-6T	●	6	3.00	3.51	1.00	0.87	0.55	1.97	1.06	0.24	0.375			Fig.1	1.1		PNMU1205ANER-SM
		454000R-8T	●	8	4.00	4.51	1.50	2.05	-	1.97	1.14	0.39	0.625	-	-	Fig.2	1.3		PNMU1205ANER-GH
		455000R-10T	●	10	5.00	5.51	1.50	2.28	-	2.48	1.42	0.39	0.625			Fig.2	2.6	No	PNEU1205ANER-GL
		456000R-12T	●	12	6.00	6.51	2.00	2.83	-	2.48	1.50	0.43	0.750			Fig.2	3.9		PNEU1205ANER-W
		458000R-14T	●	14	8.00	8.51	2.50	3.94	4.00	2.48	1.57	0.55	1.000	0.71	1.02	Fig.3	6.6		
		4510000R-16T	●	16	10.00	10.51	2.50	3.94	4.00	2.48	1.57	0.55	1.000			Fig.3	9.3		
	Extra fine pitch	MFPN 452500R-6T	●	6	2.50	3.01	0.750	0.67	0.43	1.57	0.750	0.19	0.312			Fig.1	0.5		
		453000R-8T	●	8	3.00	3.51	1.00	0.87	0.55	1.97	1.06	0.24	0.375			Fig.1	1.1		
		454000R-10T	●	10	4.00	4.51	1.50	2.05	-	1.97	1.14	0.39	0.625	-	-	Fig.2	1.3		
		455000R-13T	●	13	5.00	5.51	1.50	2.28	-	2.48	1.42	0.39	0.625			Fig.2	2.6	No	
		456000R-16T	●	16	6.00	6.51	2.00	2.83	-	2.48	1.50	0.43	0.750			Fig.2	3.9		
		458000R-18T	●	18	8.00	8.51	2.50	3.94	4.00	2.48	1.57	0.55	1.000	0.71	1.02	Fig.3	6.6		
		4510000R-20T	●	20	10.00	10.51	2.50	3.94	4.00	2.48	1.57	0.55	1.000			Fig.3	9.3		

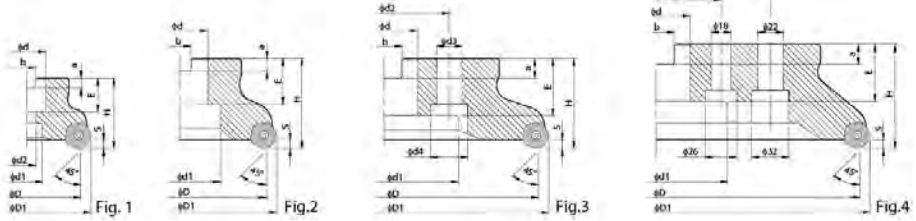
* Dimension S: 0.236in (GM, SM, GH Chipbreakers), 0.197in (GL Chipbreaker)

MFPN45 High Efficiency Mill

Facing | Chamfering

MFPN45 Face Mill (Metric-Size)

Rake Angles (°)	Axial Rake	Radial Rake	
	max +10°	ØD=63 : -10°	ØD=100-315 : -6°
		ØD=80 : -8°	



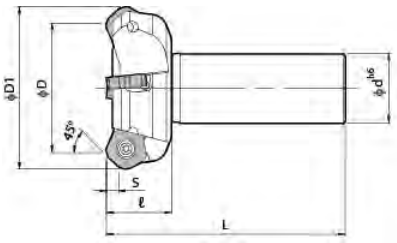
●Toolholder Dimensions

		Description	Stock	No. of Inserts	Dimension (mm) ØD	ØD1	Ød	Ød1	Ød2	H	E	a	b	Ød3	Ød4	Drawing	Weight (kg)	Shim	Applicable Inserts ➡B17
Metric	Coarse pitch	MFPN 45063R-4T-M	○	4	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig. 1	0.5	Yes	PNMU1205ANER-GM PNMU1205ANER-SM PNMU1205ANER-GH PNEU1205ANER-GL PNEU1205ANER-W
		45080R-5T-M	○	5	80	93	27	22	13	50	24	7	12.4				1.1		
		45100R-6T-M	○	6	100	113	32	48	-		30	8	14.4			Fig.2	1.4		
		45125R-7T-M	○	7	125	138	40	58		63	32	9	16.4				2.6		
		45160R-8T-M	○	8	160	173		68	66.7					14	20		3.8		
		45200R-10T-M	○	10	200	213			101.6		40	14	25.7	18	26	Fig.3	6.4		
		45250R-12T-M	○	12	250	263	60	110									9.1		
		NEW 45315R-14T-M	△	14	315	328			-	80				-	-	Fig.4	21.3		
	Fine pitch	MFPN 45063R-5T-M	○	5	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig. 1	0.5	No	
		45080R-6T-M	○	6	80	93	27	22	13	50	24	7	12.4				1.0		
		45100R-8T-M	○	8	100	113	32	48	-		30	8	14.4			Fig.2	1.4		
		45125R-10T-M	○	10	125	138	40	58		63	32	9	16.4				2.5		
		45160R-12T-M	○	12	160	173		68	66.7					14	20		3.8		
		45200R-14T-M	○	14	200	213			101.6		40	14	25.7	18	26	Fig.3	6.5		
		45250R-16T-M	○	16	250	263	60	110									9.1		
		NEW 45315R-18T-M	△	18	315	328			-	80				-	-	Fig.4	21.7		
	Extra fine pitch	MFPN 45063R-6T-M	○	6	63	76	22	19	11	40	21	6.3	10.4	-	-	Fig. 1	0.5	No	
		45080R-8T-M	○	8	80	93	27	22	13	50	24	7	12.4				1.1		
		45100R-10T-M	○	10	100	113	32	48	-		30	8	14.4			Fig.2	1.3		
		45125R-13T-M	○	13	125	138	40	58		63	32	9	16.4				2.6		
		45160R-16T-M	○	16	160	173		68	66.7					14	20		3.9		
		45200R-18T-M	○	18	200	213	60	110	101.6		40	14	25.7	18	26	Fig.3	6.6		
		45250R-20T-M	○	20	250	263											9.3		
Bore Dia. Inch spec	Coarse pitch	MFPN 45080R-5T	○	5	80	93	1.000"	22	13	50	27	6	0.375"	-	-	Fig. 1	1.1	Yes	
		45100R-6T	○	6	100	113	1.250"	48	-		32	8	0.500"			Fig.2	1.4		
		45125R-7T	○	7	125	138	1.500"	58		63	36	10	0.625"				2.6		
		45160R-8T	○	8	160	173	2.000"	72			38	11	0.750"				4.0		
		45200R-10T	○	10	200	213	1.875"	110	4.000"		40	14	1.000"	18	26	Fig.3	6.7		
		45250R-12T	○	12	250	263											9.4		
		NEW 45315R-14T	△	14	315	328			-	80				-	-	Fig.4	21.2		
	Fine pitch	MFPN 45080R-6T	○	6	80	93	1.000"	22	13	50	27	6	0.375"	-	-	Fig. 1	1.1	No	
		45100R-8T	○	8	100	113	1.250"	48	-		32	8	0.500"			Fig.2	1.4		
		45125R-10T	○	10	125	138	1.500"	58		63	36	10	0.625"				2.7		
		45160R-12T	○	12	160	173	2.000"	72			38	11	0.750"				4.0		
		45200R-14T	○	14	200	213	1.875"	110	4.000"		40	14	1.000"	18	26	Fig.3	6.9		
		45250R-16T	○	16	250	263											9.6		
		NEW 45315R-18T	△	18	315	328			-	80				-	-	Fig.4	21.5		
	Extra fine pitch	MFPN 45080R-8T	○	8	80	93	1.000"	22	13	50	27	6	0.375"	-	-	Fig. 1	1.1	No	
		45100R-10T	○	10	100	113	1.250"	48	-		32	8	0.500"			Fig.2	1.3		
		45125R-13T	○	13	125	138	1.500"	58		63	36	10	0.625"				2.7		
		45160R-16T	○	16	160	173	2.000"	72			38	11	0.750"				4.0		
		45200R-18T	○	18	200	213	1.875"	110	4.000"		40	14	1.000"	18	26	Fig.3	6.9		
		45250R-20T	○	20	250	263											9.6		

* Dimension S: 6 mm (GM, SM, GH Chipbreakers), 5 mm (GL Chipbreaker)

● : Stock Std. ○ : World Express △ : Made to Order

■ MFPN45 Endmill



Description	Stock	No. of Inserts	Unit	Dimension ØD	ØD1	Ød	L	ℓ	S	Rake Angle (°) A.R. (MAX)	R.R.	Shank Type	Spare Parts: Clamp Screw	Wrench	Anti-seize Compound	Applicable Inserts ➡B17
MFPN 452000R-W125-3T	●	3	inch	2.00	2.31	1.25	3.60	1.18	0.23 *(0.19)	+ 10°	- 12°	Weldon	SB-50140TR	TT-15	MP-1	PNMU1205ANER-GM
452500R-W125-4T	●	4		2.50	2.81						- 10°					PNMU1205ANER-SM
453000R-W125-5T	●	5		3.00	3.31						- 8°					PNMU1205ANER-GH
MFPN 45050R-S32-3T	○	3	mm	50	63	32	110	30	6 *(5)	+ 10°	- 12°	Cylindrical	SB-50140TR	TT-15	MP-1	PNEU1205ANER-GL
45063R-S32-4T	○	4		63	76						- 10°					PNEU1205ANER-W
45080R-S32-5T	○	5		80	93						- 8°			Tightening torque 4.2Nm		

* Dimension S: 0.23in (GM, SM, GH Chipbreakers), 0.19in (GL Chipbreaker)

● Spare Parts (inch/inch spec)

	Description	Spare Parts: Clamp Screw	Wrench TT	Wrench DTM	Shim	Shim Screw	Wrench	Anti-seize Compound	Mounting bolt
Coarse pitch	MFPN 452500R-4T	SB-50140TR for Insert Clamp Recommended torque 4.2Nm	TT-15	-	MFPN-45 for Shim Clamp Recommended torque 6.0Nm	SPW-7050	LW-5	MP-1	HH3/8x1.25
	MFPN 453000R-5T								HH1/2x1.25
	MFPN 454000R-6T ~ 4510000R-12T								-
Fine pitch	MFPN 452500R-6T	SB-40140TRN for Insert Clamp Recommended torque 4.2Nm	-	DTM-15	-	-	-	MP-1	HH3/8x1.25
	MFPN 453000R-8T								HH1/2x1.25
	MFPN 454000R-10T ~ 4510000R-20T								-
Extra Fine pitch	MFPN 452500R-6T	SB-40140TRN for Insert Clamp Recommended torque 3.5Nm	-	DTM-15	-	-	-	MP-1	HH3/8x1.25
	MFPN 453000R-8T								HH1/2x1.25
	MFPN 454000R-10T ~ 4510000R-20T								-

● Spare Parts (mm/mm & mm/inch spec)

	Description	Spare Parts: Clamp Screw	Wrench TT	Wrench DTM	Shim	Shim Screw	Wrench	Anti-seize Compound	Mounting bolt
Coarse pitch	MFPN 45063R-4T-M	SB-50140TR for Insert Clamp Recommended torque 4.2Nm	TT-15	-	MFPN-45 for Shim Clamp Recommended torque 6.0Nm	SPW-7050	LW-5	MP-1	HH10x30
	MFPN 45080R-5T-(M)								HH12x35
	MFPN 45100R-6T-(M) ~ 45315R-12T-(M)								-
Fine pitch	MFPN 45063R-5T-M	SB-50140TR for Insert Clamp Recommended torque 4.2Nm	TT-15	-	-	-	-	MP-1	HH10x30
	MFPN 45080R-6T-(M)								HH12x35
	MFPN 45100R-8T-(M) ~ 45315R-16T-(M)								-
Extra fine pitch	MFPN 45063R-6T-M	SB-40140TRN for Insert Clamp Recommended torque 3.5Nm	-	DTM-15	-	-	-	MP-1	HH10x30
	MFPN 45080R-8T-(M)								HH12x35
	MFPN 45100R-10T-(M) ~ 45250R-20T-(M)								-

Apply thin coat of anti-sieze compound (MP-1) on taper and thread of screw when indexing inserts.

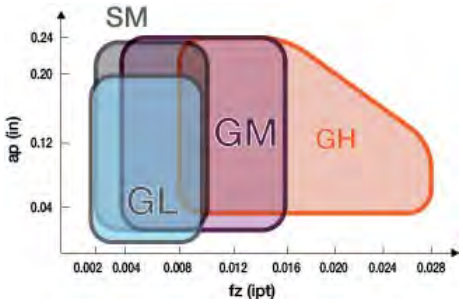
● : Stock Std. ○ : World Express

Applicable Inserts (fit both face mills and endmills)

Cutter Body	Applicable Inserts B17				
					
MFPN 45...	PNMU 1205ANER-GM	PNMU 1205ANER-SM	PNMU 1205ANER-GH	PNEU 1205ANER-GL	PNEU 1205ANER-W

Recommended Cutting Conditions C7

Aplicable Chipbreaker Range



How to Use the Wiper Inserts

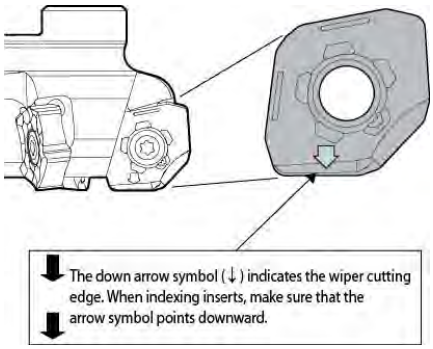
1) Use only one wiper insert per cutter load. (If you use more than 2 wiper inserts on one cutter, the workpiece surface finish may become hazy.)Load the remaining pockets with the GM or SM Chipbreakers

2) Combination of Wiper Insert with Other Chipbreakers

Chipbreaker / Combination	GM	SM	W
Recommended Combination	●		●
Recommended Combination		●	●

*Do not use the wiper insert with the GH or GL Chipbreakers

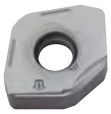
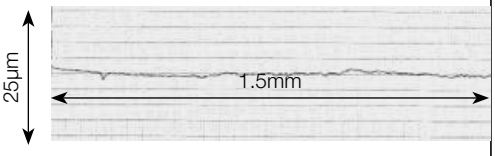
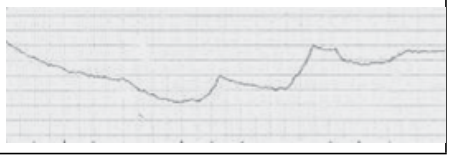
How to install wiper inserts in the MFPN cutter



Improved Surface Finish by using a Wiper Insert

Workpiece: Structural Steel

Cutting Conditions: Vc = 650sfm, n(510RPM), f_z = 0.008 ipt Vf=40.1ipm
MFPN45125R-10T : $a_p \times a_e$ = 0.12×3.94", DRY

Chipbreaker Combination	Insert	Surface Finish	Workpiece Surface	Surface Finish
PNEU1205ANER-W PR1525 (1pc, wiper) PNMU1205ANER-GM PR1525 (9pcs)		Ra = 0.48 μm Rz = 3.39 μm	 Shiny Surface	 25μm 1.5mm
PNEU1205ANER-GL PR1225 (10pcs) (No wiper insert loaded)		Ra = 2.50 μm Rz = 11.41 μm	 Shiny Surface	

The surface roughness also depends on the workpiece, cutting conditions or situation of each user.
When the surface roughness is unstable, please increase the cutting speed, decrease the feed rate, or use a wiper insert (TN100M).

● **Cutter type and chipbreaker selection**

Milling Purpose	Cutter Type			Chipbreaker				
	Coarse pitch	Fine pitch	Extra fine pitch	GM	SM	GH	GL	W
General milling for steel and alloy steel		●		●				
Steel and alloy steel (to prevent chattering due to low rigidity machine or poor clamping power)	●				●			
Steel, productivity oriented (Reduce machining cost; ap≥0.150 in, fz≥0.014 ipt)	●					●		
Focusing on finishing quality	●	●					●	
General milling of stainless steel		●			●			
Stainless steel (to prevent chattering due to low rigidity machine or poor work holding)	●				●			
Cast iron (for processing efficiency improvement)			●	●				
Cast iron (ap≥0.150 in, fz≥0.014 ipt)	●					●		
Improved surface finish in high-efficiency milling		●	●					●

■ Recommended Cutting Conditions

Workpiece Material	Insert Grades	Vc (sfm)	Chipbreaker	fz (ipt) 0.002 0.004 0.008 0.012 0.016 0.020 0.024 0.028
Carbon Steel	PR1525 (PR1225)	400~**600**~820	GM ★	0.004 **0.008** 0.016
			SM ☆	0.002 **0.005** 0.010
			GH	0.008 **0.016** 0.028
			GL	0.002 **0.005** 0.010
Alloy Steel	PR1525 (PR1225)	325~**525**~725	GM ★	0.004 **0.008** 0.016
			SM ☆	0.002 **0.005** 0.010
			GH ☆	0.008 **0.016** 0.024
			GL	0.002 **0.005** 0.010
Mold Steel	PR1525 (PR1225)	260~**460**~600	GM ★	0.004 **0.008** 0.014
			SM ☆	0.002 **0.004** 0.008
			GH ☆	0.008 **0.014** 0.020
			GL	0.002 **0.004** 0.008
Stainless Steel	PR1525 (PR1225)	325~**500**~650	GM ☆	0.004 **0.008** 0.016
			SM ★	0.002 **0.005** 0.010
			GL	0.002 **0.005** 0.010
Gray Cast Iron	PR1510 (PR1210)	400~**600**~820	GM ★	0.004 **0.008** 0.016
			SM	0.002 **0.005** 0.010
			GH ☆	0.008 **0.016** 0.028
			GL	0.002 **0.005** 0.010
Nodular Cast Iron	PR1510 (PR1210)	325~**500**~650	GM ★	0.004 **0.008** 0.014
			SM	0.002 **0.004** 0.008
			GH ☆	0.008 **0.014** 0.020
			GL	0.002 **0.004** 0.008
Titanium Alloys	PR1510 (PR1210)	100~**165**~230	SM ★	0.002 **0.003** 0.006
			GL	0.002 **0.003** 0.006
Cutter Specification	Coarse pitch (with shim)			0.002 →
	Fine pitch (without shim) (For GH chipbreaker, recommend under fz=0.016ipt.)			0.002 → 0.028
	Extra fine pitch (without shim) (The use of the GH breaker is not recommended.)			0.002 →

* The bold-faced number indicates a median starting condition.

★ 1st Choice, ☆ 2nd Choice

MFPN45 High Efficiency Mill

Precautions for use (How to change an insert)

1. Be sure to remove dust and chips from the insert mounting pocket.
2. After applying anti-seize compound on portion of taper and thread, while pressing the insert against the constraint surfaces, put the screw into the hole of the insert and tighten the screw with appropriate torque. Ref. to **Fig.1** and **Fig.2**.
   Recommended tightening torque ➡ The torque for coarse pitch and fine pitch (using M5 screw) is 4.2 Nm
   The torque for extra fine pitch (using M4 screw) is 3.5 Nm.
3. After tightening the screw, make sure that there is no clearance between the insert seat surface and the bearing surface of the holder and between the insert side surfaces and the constraint surface of the toolholder.
4. To change the cutting edge of the insert, turn the insert counterclockwise (ref. to **Fig.3**).
   Insert corner identification number is stamped on the top surface of insert (**Fig.4**). To protect the wiper edge, use the corners of insert in the sequence of corner numbers.

Fig.1


Fig.2


Fig.3

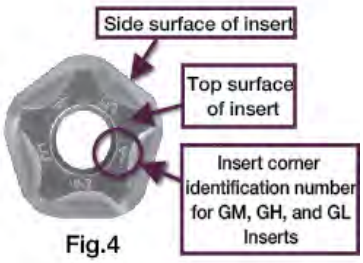


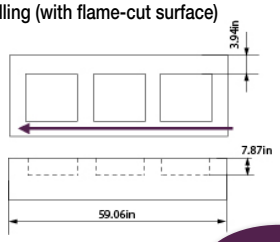
Fig.4

Case studies

Structural Steel

- Construction machine part
- Vc=550 sfm
- apxae=0.16x3.94"
- fz=0.012ipt
- Vf=51.2ipm
- DRY
- Cutter
  MFPN45125R-10T (10 flutes)
- Insert
  PNMU1205ANER-GM
  (PR1225)

Face milling (with flame-cut surface)



3 times longer tool life

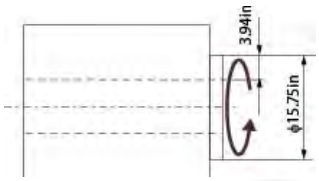
MFPN (PR1225)	3 pcs/edge
Competitor A	1 pcs/edge

- MFPN face mill enables stable milling due to reduced chip-biting and edge cracks.
- MFPN face mill, did not chatter, showed 3 times longer tool life than competitor.

(Customer Evaluation)

Alloy Steel

- Construction machine part
- Vc=574 sfm
- apxae=0.06x3.94in
- fz=0.010 ipt
- Vf=41.8 ipm
- DRY
- Cutter
  MFPN45160R-12T (12 flutes)
- Insert
  PNMU1205ANER-GM
  (PR1225)



Twice the tool life

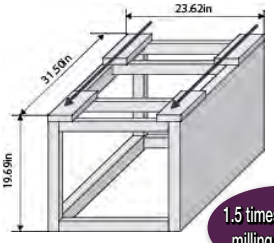
MFPN (PR1225)	2 pcs/edge
Competitor B	1 pcs/edge

- MFPN face mill showed 2 times longer tool life than competitor.
- Competitor's insert was damaged due to chip-biting. MFPN face mill had no cracks and allowed stable milling.
- MFPN facemill enabled twice the table feed rate compared with the competitor.
  Milling efficiency improved two-fold.

(Customer Evaluation)

304SS

- Case
- Vc=295 sfm
- apxae=0.016x1.97in
- fz=0.008 ipt
- Vf=17.2 ipm
- DRY
  Cutter
- MFPN45080R-6T (6 flutes)
  Insert
- PNMU1205ANER-SM
  (PR1225)



1.5 times increased milling efficiency

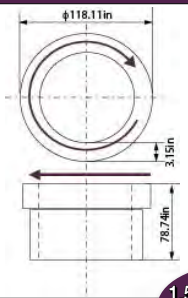
MFPN (PR1225)	1.5 pcs/edge	
Competitor C (Roughing)	1 pcs/edge	

- Even when the cutting depth, cutting speed and feed rate cannot be raised due to the low rigidity of a workpiece, MFPN face mill enables stable milling without chattering and also has an improved tool life of 1.5 times.

(Customer Evaluation)

Ductile Iron

- Pipe
- Vc=600 sfm
- apxae=0.08x3.15in
- fz=0.017
- Vf=79.2ipt
- DRY
- Cutter
  MFPN45125R-10T (10 flutes)
- Insert
  PNMU1205ANER-GM
  (PR1210)



1.5 times longer tool life

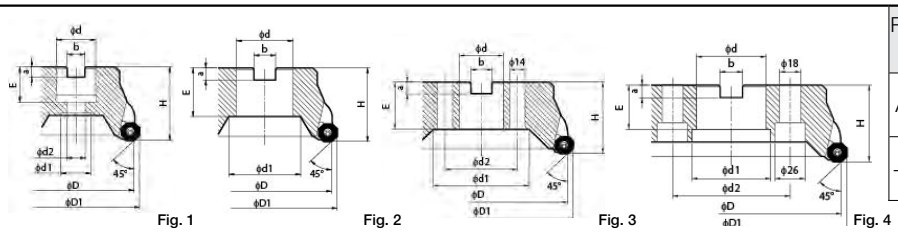
MFPN (PR1210)	3 pcs/edge
Competitor D	2 pcs/edge

- MFPN facemill showed 1.5 times longer tool life than the competitor.
- High feed rate of MFPN allowed 1.3 times higher milling efficiency compared to the competitor.

(Customer Evaluation)

Facing | Chamfering

■ MOF45 Face Mill (05 type & 07 type)



Rake Angle (°)	
A.R.	R.R.
+15°	+5°

●Toolholder Dimensions

Description			Stock	No. of Inserts	Dimension (mm)										Drawing	Weight (kg)	Applicable Inserts ➡ B17
					ØD	ØD1	Ød	Ød1	Ød2	H	E	a	b	S			
Metric	MOF	45040R-05-3T-M	○	3	40	49	16	13.5	8.5	40	19	5.6	8.4	-	Fig.1	0.3	OFMT05
		45050R-05-4T-M	○	4	50	59	22	17	11		21	6.3	10.4			0.4	
		45063R-05-5T-M	○	5	63	72										0.6	
		45080R-05-6T-M	○	6	80	89	27	20	13	50	24	7	12.4			1.1	
		45100R-05-7T-M	○	7	100	109	32	45	-		32	8	14.4		Fig.2	1.8	
		45125R-05-8T-M	○	8	125	134	40	55		63	33	9	16.4			3.7	
		45160R-05-10T-M	○	10	160	169	40	88	66.7		30				Fig.3	5.1	
		45200R-05-12T-M	○	12	200	209	60	68	101.6		38	14	25.7		Fig.4	8.0	
	MOF	45063R-07-4T-M	○	4	63	75	22	17	11	40	21	6.3	10.4	-	Fig.1	0.6	OFMT07
		45080R-07-5T-M	○	5	80	92	27	20	13	50	24	7	12.4			1.2	
		45100R-07-6T-M	○	6	100	112	32	45	-		32	8	14.4		Fig.2	1.9	
		45125R-07-8T-M	○	8	125	137	40	55		63	33	9	16.4			3.7	
		45160R-07-10T-M	○	10	160	172		88	66.7		30				Fig.3	5.1	
		45200R-07-12T-M	○	12	200	212	60	68	101.6		38	14	25.7		Fig.4	8.0	
Bore Dia. Inch spec	MOF	45080R-05-6T	○	6	80	89	1.000"	20	13	50	26	6	0.375"	-	Fig.1	1.1	OFMT05
		45100R-05-7T	○	7	100	109	1.250"	45	-		32	8	0.500"		Fig.2	1.8	
		45125R-05-8T	○	8	125	134	1.500"	55		63	38	10	0.625"			3.7	
		45160R-05-10T	○	10	160	169	2.000"	88				11	0.750"			5.1	
		45200R-05-12T	○	12	200	209	1.875"	68	101.6			14	1.000"		Fig.4	8.0	
	MOF	45080R-07-5T	○	5	80	92	1.000"	20	13	50	26	6	0.375"	-	Fig.1	1.2	OFMT07
		45100R-07-6T	○	6	100	112	1.250"	45	-		32	8	0.500"		Fig.2	1.8	
		45125R-07-8T	○	8	125	137	1.500"	55		63	38	10	0.625"			3.7	
		45160R-07-10T	○	10	160	172	2.000"	88				11	0.750"			5.1	
		45200R-07-12T	○	12	200	212	1.875"	68	101.6			14	1.000"		Fig.4	8.0	

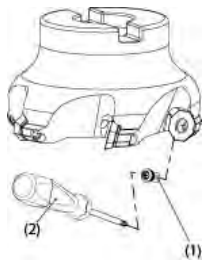
● : Stock Std. ○ : World Express

● Spare Parts

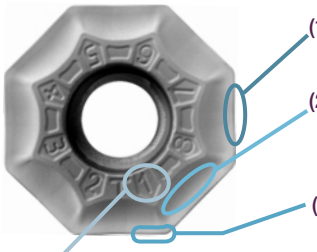
Description		(1)Clamp Screw	(2)Wrench	Arbor clamp screw
MOF	45040R-05-3T-M	SB-4082TPR	DTP-15	HH8X25
	45050R-05-4T-M			HH10X30M
	45063R-05-5T-M			
	45080R-05-6T-M			HH12X35M
	45100R-05-7T-M			-
	45125R-05-8T-M			
	45160R-05-10T-M			
	45200R-05-12T-M			
MOF	45063R-07-4T-M	SB-50120TRS	DTP-15	HH10X30S
	45080R-07-5T-M			HH12X35M
	45100R-07-6T-M			-
	45125R-07-8T-M			
	45160R-07-10T-M			
	45200R-07-12T-M			
MOF	45080R-05-6T	SB-4082TPR	DTP-15	HH12X35M
	45100R-05-7T			-
	45125R-05-8T			
	45160R-05-10T			
	45200R-05-12T			
MOF	45080R-07-5T	SB-50120TRS	DTP-15	HH12X35M
	45100R-07-6T			-
	45125R-07-8T			
	45160R-07-10T			
	45200R-07-12T			

●Max. ap and usable edges

Usable edges	Max. ap (in)	
	OFMT05 type	OFMT07 type
4 edges (using 2 edges at a time)	0.28in	0.40in
8 edges (using 1 edge at a time)	0.10in	0.16in



General purpose “SH Chipbreaker”, Tough Edge type “GT Chipbreaker”



(1) High Fracture Resistance
Large land is applied

(2) Low Cutting Force Chipbreaker
Even at higher feedrates

(3) With Wiper Edge
Surface finish is greatly improved

GT Chipbreaker

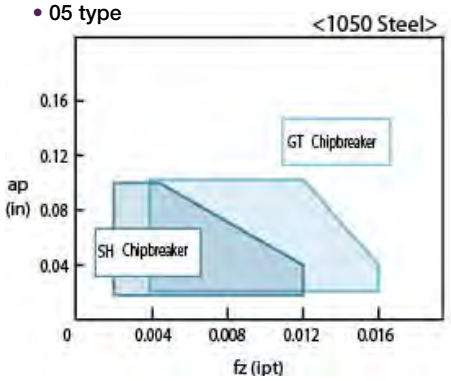
(4) With corner identification mark

	OFMT05 type	OFMT07 type
GT Chipbreaker (Tough Edge type)		
SH Chipbreaker (General purpose)		

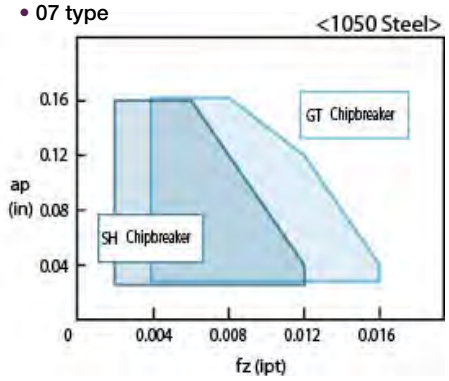
Note 1) OFMT07 type insert cannot be used with MOFX type cutters (Ref. page B17).

Applicable Chipbreaker Range

• 05 type



• 07 type



●Recommended Cutting Conditions (MOF / MOFX)

Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed Vc: sfm)				
			MEGACOAT		PVD Coated Carbide		
	GT Chipbreaker (Tough Edge type)	SH Chipbreaker (General purpose)	**PR1225**	**PR1210**	**PR830**	**PR1025**	**PR905**
Stainless Steel	-	0.003~**0.005**~0.010	★ 400~**525**~725	-	-	☆ 400~**500**~675	-
Carbon Steel	0.004~**0.010**~0.016	0.004~**0.006**~0.012	★ 400~**600**~820	-	☆ 400~**500**~675	☆ 325~**400**~600	-
Alloy Steel	0.004~**0.010**~0.014	0.004~**0.006**~0.012	★ 325~**525**~ 725	-	☆ 325~**500**~600	-	-
Mold Steel	0.004~**0.008**~0.014	0.003~**0.005**~0.010	★ 250~**460**~ 600	-	☆ 250~**400**~500	-	-
Gray Cast Iron	0.004~**0.010**~0.016	0.004~**0.006**~0.012	-	★ 400~**600**~820	-	-	☆ 325~**500**~675
Nodular Cast Iron	0.004~**0.008**~0.014	0.003~**0.005**~0.010	-	★ 325~**500**~ 675	-	-	☆ 250~**400**~525

★: 1st Recommendation ☆: 2nd Recommendation

Octagonal MOFX Mill

Facing | Chamfering

■ MOFX45 Face Mill

Rake Angle (°)	A.R.	+15°
	R.R.	+5°

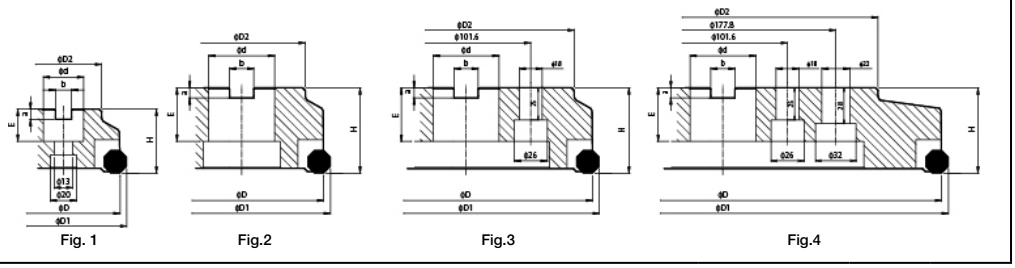
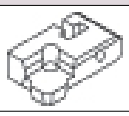


Fig. 1 Fig.2 Fig.3 Fig.4

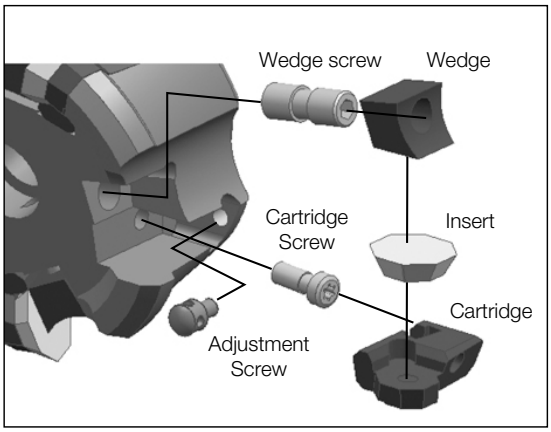
●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)										Drawing	Weight (kg)	Applicable Inserts ➡B17
				ØD	ØD1	ØD2	Ød	Ød1	Ød2	a	b	E	H			
Metric	MOFX 45080R07-5T-MSF	○	5	80	91	70	27	20	14	7	12.4	22	50	Fig.1	1.4	OFMR07 type
	45100R07-6T-MSF	○	6	100	111	85	32	-	-	8	14.4	28	50	Fig.2	2.1	
	45125R07-8T-MSF	○	8	125	136	100	40			9	16.4	30	63		3.9	
	45160R07-10T-MSF	○	10	160	171	120				10		30	63		6	
	45200R07-12T-MSF	○	12	200	211	140	60			15	25.4	38	63	Fig.3	7.4	
	45250R07-16T-MSF	○	16	250	261	180									12.6	
	45315R07-20T-MSF	△	20	315	326	240								Fig.4	20.7	
Bore Dia. Inch spec	MOFX 45080R-07-5T-SF	○	5	80	91	70	1.000"	20	14	6	0.375"	25	50	Fig.1	1.4	OFMR07 type
	45100R-07-6T-SF	○	6	100	111	80	1.250"	-	-	8	0.500"	32		Fig.2	2.1	
	45125R-07-8T-SF	○	8	125	136	100	1.500"			10	0.625"	38	63		3.9	
	45160R-07-10T-SF	○	10	160	171	120	2.000"			11	0.750"				5.8	
	45200R-07-12T-SF	○	12	200	211	130	1.875"			14	1.000"			Fig.3	7.6	
	45250R-07-16T-SF	○	16	250	261	180									12.9	
	45315R-07-20T-SF	△	20	315	326	240								Fig.4	20.7	

●Spare Parts

Cartridge	Cartridge Screw	Wedge	Wedge screw	Adjustment Screw
				
LOF07R	SH-50150TR	WOF07R	W8×21	AJ-412

Wrench (for Wedge)	Wrench (for Cartridge)
	
TH-4	TTC-20



Advantages

1) Wedge clamp system
2) Exceptional surface finish (Easy edge adjustment system)
3) 8-edge insert provides high cost efficiency
4) High axial rake angle and double positive angle on chipbreaker provide low cutting forces
5) SH chipbreaker (for general purpose / low cutting force) and GT chipbreaker (Tough edge)

● : Stock Std. ○ : World Express △ : Made to Order

●Applicable Inserts

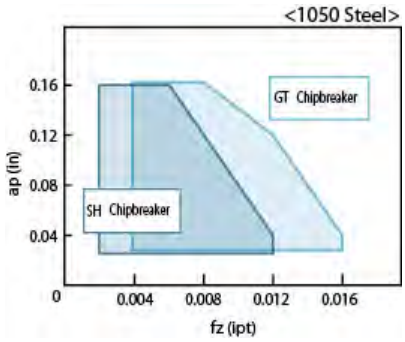
Description	Applicable Inserts B17	
		
MOFX45...-SF	OFMR 070405EN-SH	OFMR 070408EN-GT

Recommended Cutting Conditions C11

Note 1) OFMR0704○○EN-GT / SH is a neutral insert. It can be also used for Left-hand (L) cutter (special order item).

Note 2) Inserts for MOFX type cutter cannot be used for MOF type cutters (Ref. page C10).

Chipbreaker range

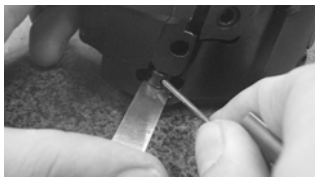


Max ap and usable edges

Usable edges	Max. ap (in)
	OFMR07 type
4 edges (using 2 edges at the same time)	0.40in
8 edges (using only 1 edge at a time)	0.16in

■ How to Adjust Edge Height

1.Set the edge height adjustment screw

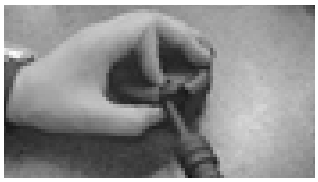


· Set the distance between the bottom of edge height adjustment screw and the cutter bo to approximately 0.040".

2.Set the cartridge

· Set the cartridge to the cutter body with the cartridge screw. Recommended torque: 5Nm

3.Set the wedge



· After setting the insert to the cartridge, set the wedge with the wedge screw. Recommended torque: 6Nm

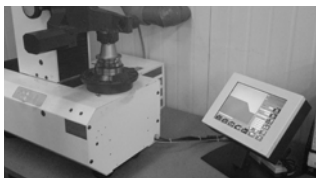
4.Loosen the screws (Preparation for edge height adjustment)

· Loosen the wedge screw by approximately 10°.
· Loosen the cartridge screw by approximately 45°.

5.Correct the edge height

· Measure the front edge height. Using the most protruding insert as the reference, turn the edge height adjustment screw counterclockwise to raise the front edge height to match.

6.Make the final adjustment

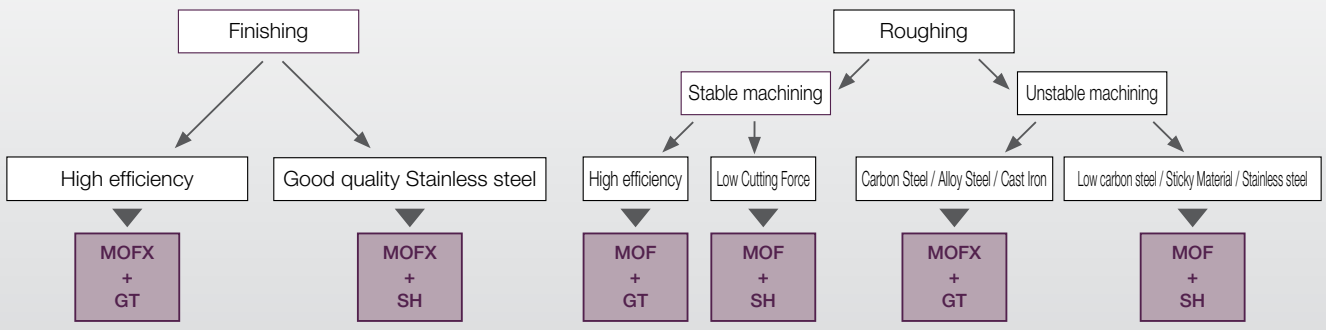


· Tighten the cartridge screw Recommended torque: 5Nm
Tighten the wedge screw Recommended torque: 6Nm
· Measure the front edge height again.

Outlines of MOFX / MOF Mill

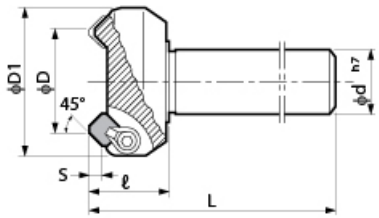
[MOFX]
High durability of cutter body due to the cartridge design.
Best for finishing due to easy edge height adjustment.

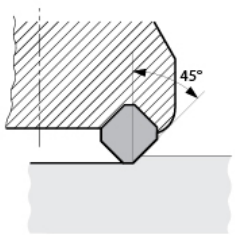
[MOF] (Ref. page C10)
Excellent chips evacuation when roughing sticky materials such as low carbon steel and stainless steel.



MOFX is suitable for high precision machining and unstable machining.

■ MSE45 Endmill (High Rake)





●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)						Rake Angle (°)		Spare Parts			
				ØD	ØD1	Ød	L	ℓ	S	A.R.	R.R.	Clamp Set	Wrench	Shim	Shim Screw
MSE	4550	O	3	50	73	32	120	40	6	+20°	-3°	CPS-6M	LW-3	MSE-4245	SP3X8
	4563	O	4	63	86										
	4580-32	O	4	80	103										

●Applicable Inserts

Description	Applicable Inserts B13			Applicable Inserts B27
				
MSE45○○-○○	SEMR 42AFER-H	SEKR 42AFEN-S	SEEN 42AFTN SEKN 42AFTN 42AFFN	SEEN 42AFFN-NE 42AFFN (PCD)

●Recommended Cutting Conditions

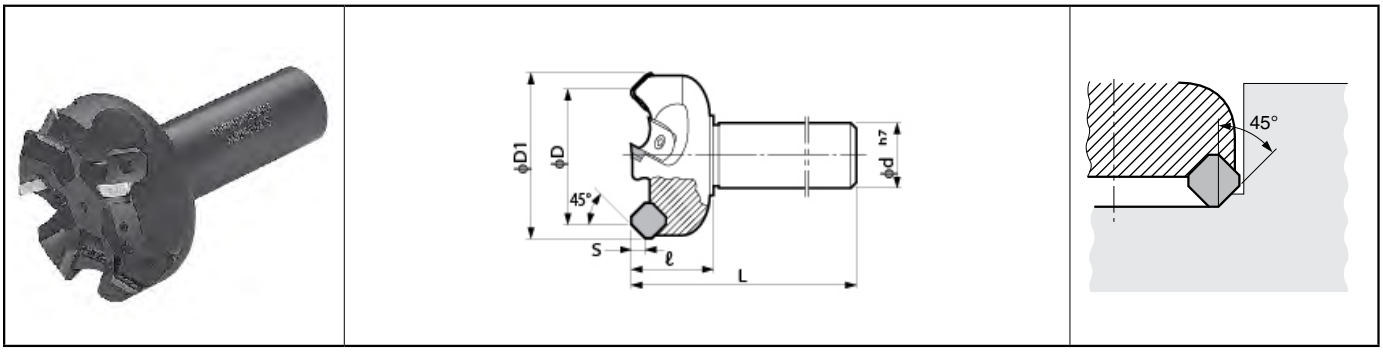
Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)													
		Cermet			MEGACOAT		PVD Coated Carbide						Carbide		PCD
		TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR1025	PR905	PW30	KW10	KPD001 (KPD010)
Stainless Steel	~0.010		☆ 400~675	☆ 400~675	★ 400~725		☆ 400~675	☆ 400~675	☆ 400~675	☆ 325~675	☆ 325~675		☆ 250~400		
Carbon Steel	~0.012	☆ 500~725	★ 400~675	☆ 400~675	★ 400~820		☆ 400~675	☆ 400~675	☆ 400~675	☆ 325~600	☆ 325~600		☆ 250~500		
Alloy Steel	~0.012	☆ 400~675	★ 325~600	☆ 325~600	★ 325~725		☆ 325~600	☆ 325~600	☆ 325~600	☆ 250~500			☆ 250~500		
Mold Steel	~0.010	☆ 400~675	★ 325~600	☆ 325~600	★ 250~600		☆ 250~500	☆ 250~500	☆ 250~500	☆ 200~425			☆ 250~500		
Cast Iron	~0.012					★ 325~725						☆ 325~675		☆ 250~500	
Non-ferrous Metals	~0.008													★ 325~1000	★ 1000~2500

★: 1st Recommendation ☆: 2nd Recommendation

● : Stock Std. ○ : World Express

Facing | Chamfering

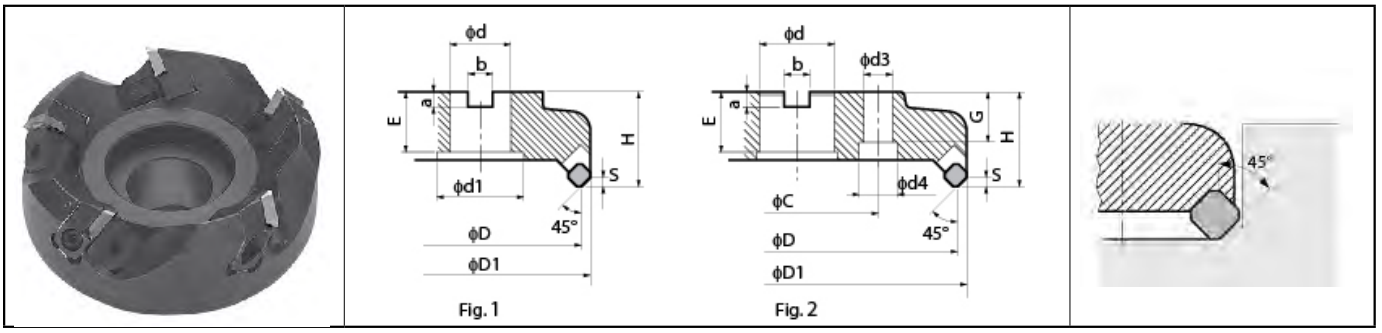
■ MSO45-S Endmill (High Rake)



●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)						Rake Angle (°)		Spare Parts				
				ØD	ØD1	Ød	L	ℓ	S	A.R.	R.R.	Shim	Shim Screw	Clamp	Clamp Screw	Clamp Screw
MSO	4550-S	O	4	50	66	32	120	40	7.1	+27°	-8°	MSO-4T245	SP3X6	CH-20R	TH8X15	TH-4
	4563-S	O	5	63	79											
	4580-S	O	5	80	96											

■ MSO45 Face Mill (High Rake)

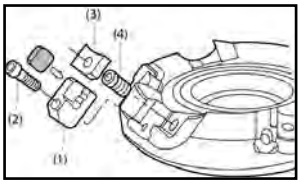


●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)														Rake Angle (°)		Drawing	Weight (kg)
				ØD	ØD1	Ød	Ød1	Ød2	Ød3	Ød4	ØC	H	E	G	a	b	S	A.R.	R.R.		
MSO	45100R	O	5	100	114.8	1.250"	48	-	-	-	-	60	32	-	8	0.500"	7.1	+27°	-8°	Fig.1	2.5
	45125R	O	6	125	140.0	1.500"	58						38		10	0.625"					3.7
	45160R	O	8	160	174.5	2.000"	68								11	0.750"					5.4
	45200R	O	10	200	214.5	1.875"	-		18	26	101.6			32	14	1.000"				Fig.2	8.4

●Spare Parts

Description	(1)Cartridge	(2)Cartridge Screw	(3)Clamp	(4)Clamp Screw	Clamp Screw
MSO 45...R	LSO-445R	HH4X16	CH-20R	TH8X15	TH-4



●Applicable Inserts

Description	Applicable Inserts B13		Applicable Inserts B27
MSO 45...	SOKR 13T3AXEN-J	SOKN 13T3AXTN 13T3AXFN	SOKN 13T3AXFN-NE (PCD)

◆**Recommended Cutting Conditions**

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)												
		Cermet			MEGACOAT		PVD Coated Carbide					Carbide		PCD
		TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10	KPD230
Stainless Steel	~0.010		☆ 400~675	☆ 400~675	★ 400~725	-	☆ 400~675	☆ 400~675		☆ 325~675	-		-	-
Carbon Steel	~0.012		★ 400~675	☆ 400~675	★ 400~820	-	☆ 400~675	☆ 400~675		☆ 325~600	-		-	-
Alloy Steel	~0.012		★ 325~600	☆ 325~600	★ 325~725	-	☆ 325~600	☆ 325~600		☆ 250~500	-		-	-
Mold Steel	~0.010		★ 325~600	☆ 325~600	★ 250~600	-	☆ 250~500	☆ 250~500		☆ 200~425	-		-	-
Cast Iron	~0.012		-	-	-	★ 325~725	-	-		-	☆ 325~675		☆ 250~500	-
Non-ferrous Metals	~0.008		-	-	-	-	-	-		-	-		★ 325~1000	★ 1000~2500

★: 1st Recommendation ☆: 2nd Recommendation

15° Lead Angle

D1~D9

D

MSRS15 Heavy Milling Face Mill

Facing

MonSteR Square Mill

Square (4-edge) type MSRS15 Face Mill

Roughing takes place in one pass.
MSRS15 type changes heavy cutting! (Max. ap 0.472 in)

Conventional Tools

Metal removal rate is drastically increased

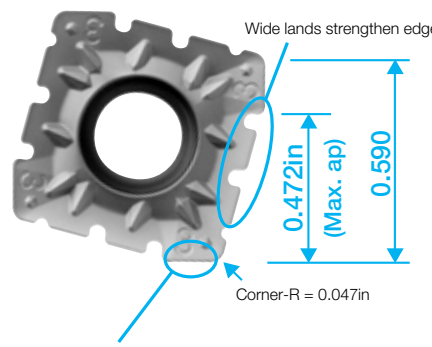
MSRS15

D

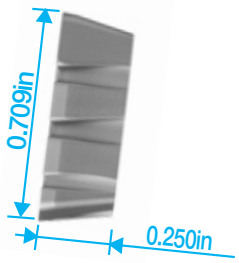
15° Lead Angle

Large depths of cut and high feed rates improve metal removal efficiency.

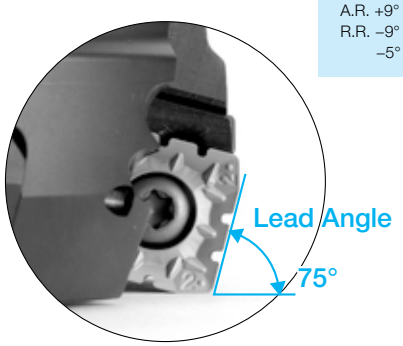
●Recommended ap: 5~10mm (0.200 - 0.400")



Large wiper edges enable increased feed rates.

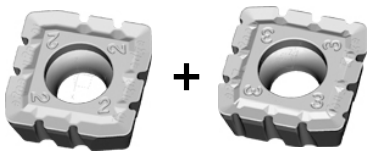
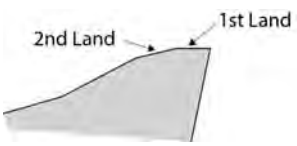
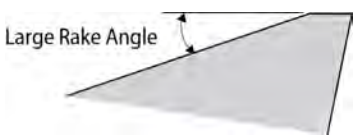
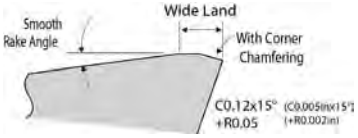


Strong inserts due to 6.35mm (0.250") thickness.



A.R. +9°
R.R. –9° (ø80mm)
–5° (> ø100mm)

●Chipbreaker Selection

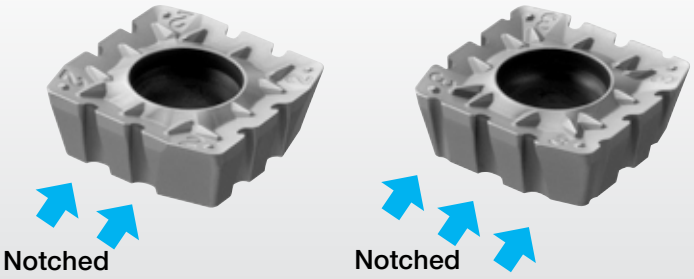
	Low Cutting Force Oriented	General Purpose	Edge Strength Oriented
Insert Type	 NB2P (4-Notched) NB3P (5-Notched)	 NB2 (2-Notched) NB3 (3-Notched)	 NB2T (2-Notched) NB3T (3-Notched)
Applications	Ideal when using extended arbors or for cutting thin-plate workpieces	General purpose with good balance of strength and low cutting resistance	Ideal for interrupted cutting Ideal when feed rate is increased or workpiece material is Cast Iron
Edge preparation	As many as four (or five) Notches help to alleviate the shock when biting into the workpiece 	Strength, cutting resistance, and chip control are all well balanced 	Strength is increased by the edge shape and moderate rake angle of the chamfer edge 

A supplemental chipbreaker may be used when it is necessary to increase strength and bite while focusing on low cutting resistance, as when machining welded areas.

●About insert no. of NB2P (4-Notched) and NB3P (5-Notched)
In order to promote proper insert indexing to the corresponding pockets of the milling cutter, "2+" is marked for NB2P (4-Notched) and "3+" is marked on NB3P (5-Notched).

Notched inserts reduce cutting forces, chattering and enables efficient cutting

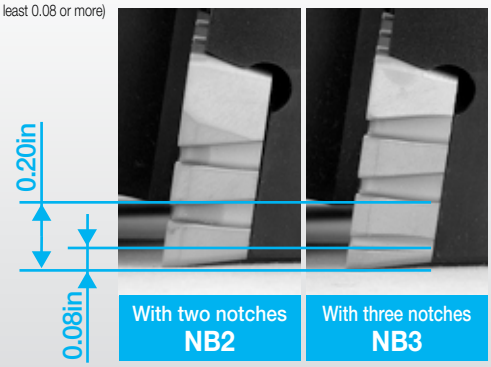
Notched Inserts



NB2 | NB3

Notch effect

The effects of the notch can be seen at more than 0.20in of vertical axial ap (effects for NB3 appears from at least 0.08 or more)



With two notches NB2 | With three notches NB3

Designed to suppress chattering by reducing cutting forces

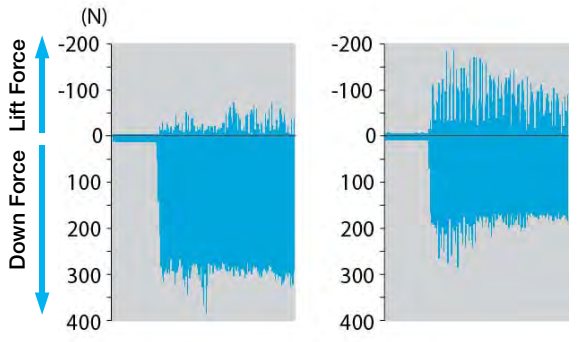
Possible to cut thin-plate workpieces

MSRS15160R-8T

Workpiece Material: 1050 Steel
Vc=675sfm(n=398RPM)
fz=0.006ipt(Vf=18.78 ipm), ap×ae=0.24×3.94in
(Cutting of unsupported overhang from a thickness of 0.600in to 0.350in)

Comparison of cutting force (radial force)

MSRS suppresses chattering by generating less "lifting force" during cutting.

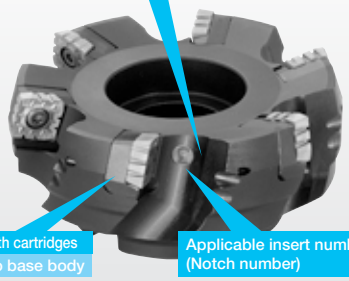


MSRS15 | Competitor A

Features of Toolholder

Coarse pitch

Designed with large chip pockets
Good Chip Evacuation



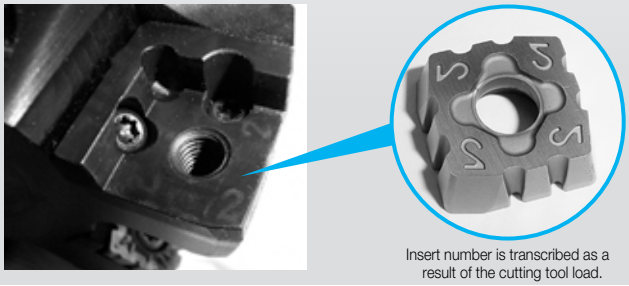
Designed with cartridges
Prevents damage to base body

Applicable insert number
(Notch number)

Fine pitch

Higher productivity due to close pitch design

Insert Replacement Identification



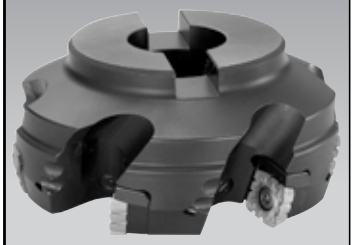
Insert number is transcribed as a result of the cutting tool load.

* Depending on the cutting conditions, marks may not be transcribed.

MSRS15 Heavy Milling Face Mill

Facing

MSRS15



(Coarse Pitch Shown)

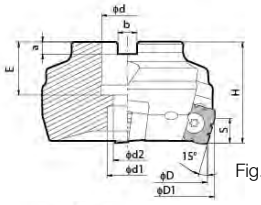


Fig.1

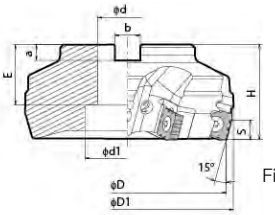


Fig.2

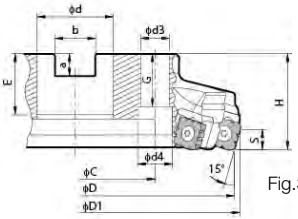


Fig.3

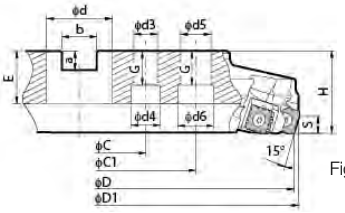


Fig.4

Rake Angle (°)		
Description	A.R.	R.R.
MSRS15080R-···	+9°	-9°
MSRS15100R-··· ~ MSRS15315R-···	+9°	-5°

●Toolholder Dimensions (Bore ød: Inch)

Description		Stock	Unit	No. of Inserts	Dimension																Drawing	Weight (kg)	Applicable Inserts B18-B19
					øD	øD1	ød	ød1	ød2	H	E	a	b	S	ød3	ød4	ød5	ød6	øC	øC1	G			
Coarse pitch	MSRS153000R-4T	●	inch	4	3	3.27	1	0.87	0.551	1.97	0.75	0.31	0.5	0.47	-	-	-	-	-	-	-	Fig.1	1.3	SPMT1806EDER-NB2 SPMT1806EDER-NB3 SPMT1806EDSR-NB2T SPMT1806EDSR-NB3T SPMT1806EDER-NB2P SPMT1806EDER-NB3P SPMT1806EDER-V
	154000R-4T	●		4	4	4.27	1.5	1.38	-		1	0.4	0.625									Fig.2	2.0
	155000R-6T	●		6	5	5.27	1.5	2.13				0.4	0.625										3.6
	156000R-8T	●		8	6	6.27	2	2.68		2.48		0.47	0.75										5.0
	158000R-10T	●		10	8	8.27	2.5	-			1.25	0.53	1		0.675	1.045	-	-	4	-	1.25	Fig.3	7.7
	1510000R-12T	●		12	10	10.27																	12.0
	1512000R-14T	△		14	12	12.27											0.795	1.25		2.65		Fig.4	17.0
Fine pitch	MSRS153000R-6T	●	inch	6	3	3.27	1	0.87	0.551	1.97	0.75	0.31	0.5	0.47	-	-	-	-	-	-	-	Fig.1	1.3	
	154000R-6T	●		6	4	4.27	1.5	1.38	-		1	0.4	0.625									Fig.2	1.9	
	155000R-8T	●		8	5	5.27	1.5	2.13				0.4	0.625										3.5	
	156000R-10T	●		10	6	6.27	2	2.68		2.48		0.47	0.75										4.9	
	158000R-12T	●		12	8	8.27	2.5	-			1.25	0.53	1		0.675	1.045	-	-	4	-	1.25	Fig.3	7.6	
	1510000R-14T	●		14	10	10.27																	11.9	
	1512000R-16T	△		16	12	12.27											0.795	1.25		2.65		Fig.4	17.0	
Coarse pitch	MSRS15080R-4T	○	mm	4	80	87	25.4	20	13	50	26	6	9.5	12	-	-	-	-	-	-	-	Fig.1	1.3	
	15100R-4T	○		4	100	107	31.75	42	-		32	8	12.7									Fig.2	2.0	
	15125R-6T	○		6	125	132	38.1	54		60	38	10	15.9				-	-		-			3.6	
	15160R-8T	○		8	160	167	50.8	68				11	19.0										5.0	
	15200R-10T	○		10	200	207	47.625	-				14	25.4		18	26			101.6		32	Fig.3	7.7	
	15250R-12T	○		12	250	257																	12.0	
	15315R-14T	○		14	315	322											22	32		177.8	25	Fig.4	17.0	
Fine pitch	MSRS15080R-6T	○	mm	6	80	87	25.4	20	13	50	26	6	9.5	12	-	-	-	-	-	-	-	Fig.1	1.3	
	15100R-6T	○		6	100	107	31.75	42	-		32	8	12.7									Fig.2	1.9	
	15125R-8T	○		8	125	132	38.1	54		60	38	10	15.9				-	-		-			3.5	
	15160R-10T	○		10	160	167	50.8	68				11	19.0										4.9	
	15200R-12T	○		12	200	207	47.625	-				14	25.4		18	26			101.6		32	Fig.3	7.6	
	15250R-14T	○		14	250	257																	11.9	
	15315R-16T	△		16	315	322											22	32		177.8	25	Fig.4	17.0	

· Mounting bolts (HH12X35) are included in MSRS15080R-○T. (HH1/2-1.25) are included with MSRS153000R-○T.

· Cartridge is included in the coarse pitch cutters, but no Cartridge in the fine pitch.

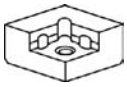
● : Stock Std. ○ : World Express △ : Made to Order

●Toolholder Dimensions (Bore ød: Metric)

	Description	Stock	No. of Inserts	Dimension (mm)																	Drawing	Weight (kg)	Applicable Inserts ➡B18-B19
				fD	fD1	fd	fd1	fd2	H	E	a	b	S	fd3	fd4	fd5	fd6	fC	fC1	G			
Coarse pitch	MSRS 15080R-4T-M	○	4	80	87	27	20	13	50	24	7	12.4	12	-	-	-	-	-	-	-	Fig.1	1.3	SPMT1806EDER-NB2 SPMT1806EDER-NB3 SPMT1806EDSR-NB2T SPMT1806EDSR-NB3T SPMT1806EDER-NB2P SPMT1806EDER-NB3P SPMT1806EDER-V
	15100R-4T-M	○	4	100	107	32	45	-		29	8	14.4									Fig.2	2.0	
	15125R-6T-M	○	6	125	132	40	55		60	33	9	16.4										3.6	
	15160R-8T-M	○	8	160	167		68	-						14	20			66.7	-	28	Fig.3	5.0	
	15200R-10T-M	○	10	200	207	60	-			38	15	25.7		18	26			101.6		32		7.7	
	15250R-12T-M	○	12	250	257																	12.0	
	15315R-14T-M	○	14	315	322											22	32		177.8		Fig.4	17.0	
Fine pitch	MSRS 15080R-6T-M	○	6	80	87	27	20	13	50	24	7	12.4	12	-	-	-	-	-	-	-	Fig.1	1.3	
	15100R-6T-M	○	6	100	107	32	45	-		29	8	14.4									Fig.2	1.9	
	15125R-8T-M	○	8	125	132	40	55		60	33	9	16.4										3.5	
	15160R-10T-M	○	10	160	167		68	-						14	20			66.7	-	28	Fig.3	4.9	
	15200R-12T-M	○	12	200	207	60	-			38	15	25.7		18	26			101.6		32		7.6	
	15250R-14T-M	○	14	250	257																	11.9	
	15315R-16T-M	△	16	315	322											22	32		177.8		Fig.4	17.0	

· Mounting bolts (HH12X35) are included in MSRS15080R-○T-M. (HH1/2-1.25) are included with MSRS153000R-○T.
· Cartridge is included in the coarse pitch cutters, but no Cartridge in the fine pitch.

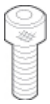
●Spare Parts (Inch-Size)

	Description	Spare Parts (Inch)						
		Clamp Screw	Wrench	Cartridge	Clamp Screw	Wrench	Anti-seize Compound	Mounting bolt
								
Coarse pitch	MSRS 153000R-4T	SB-60120TR	TT-25L	MAP-1806	SB-40140TR	DT-15	MP-1	HH1/2-1.25
	MSRS 154000R-4T							HH3/4-2.3
	155000R-6T							-
	156000R-8T	for Insert Clamp Recommended torque 66 in/lb		for Shim Clamp Recommended torque 31.2 in/lb				
	158000R-10T							
	1510000R-12T							
	1512000R-14T							
Fine pitch	MSRS 153000R-6T	SB-60120TR	TT-25L	-	-	-	MP-1	HH1/2-1.25
	MSRS 154000R-6T							HH3/4-2.3
	155000R-8T							-
	156000R-10T	for Insert Clamp Recommended torque 66 in/lb						
	158000R-12T							
	1510000R-14T							
	1512000R-16T							

Apply a thin coat of anti-sieze compound (MP-1) on clamp screw when installing insert.

● : Stock Std. ○ : World Express △ : Made to Order

●Spare Parts (Metric-Size)

Description		Spare Parts (mm)						
		Clamp Screw	Wrench	Cartridge	Clamp Screw	Wrench	Anti-seize Compound	Mounting bolt
								
Coarse pitch	**MSRS 15080R-**OO**(M)**	SB-60120TR	TT-25L	MAP-1806	SB-40140TR	DT-15	MP-1	HH12×35
	MSRS 15100R-OO**(M)** ~ **15315R-**OO**(M)**	for Insert Clamp Recommended torque 7.5Nm		for Shim Clamp Recommended torque 3.5Nm				-
Fine pitch	**MSRS 15080R-**OO**(M)**	SB-60120TR	TT-25L	-	-	-	MP-1	HH12×35
	MSRS 15100R-OO**(M)** ~ **15315R-**OO**(M)**	for Insert Clamp Recommended torque 7.5Nm						-

Apply a thin coat of anti-sieze compound (MP-1) on clamp screw when installing insert.

●Applicable Inserts

Description	Applicable Inserts B18 Right-hand inserts shown			
	 2-Notched	 3-Notched	 2-Notched / Tough Edge	 3-Notched / Tough Edge
MSRS... MSRS...M	SPMT 1806EDER-NB2	SPMT 1806EDER-NB3	SPMT 1806EDSR-NB2T	SPMT 1806EDSR-NB3T
For custom-ordered left-hand cutter	-	-	SPMT 1806EDSL-NB2T	SPMT 1806EDSL-NB3T

Description	Applicable Inserts B19		
	 4-Notched / Low cutting force	 5-Notched / Low cutting force	 Solid Edge
MSRS... MSRS...M	SPMT 1806EDER-NB2P	SPMT 1806EDER-NB3P	SPMT 1806EDER-V

Chipbreaker Selection D2

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)			Recommended Insert Grades (Cutting Speed Vc: sfm)					
				MEGACOAT			PVD Coated Carbide		
	NB2P + NB3P	NB2 + NB3	NB2T + NB3T	**PR1225**	**PR1230**	**PR1210**	**PR660**	**PR830**	**PR905**
Carbon Steel	0.006	0.008	0.012	☆ 400~**600**~820	★ 400~**600**~725	-	☆ 400~**525**~675	☆ 400~**575**~725	-
Alloy Steel	0.006	0.008	0.012	☆ 400~**600**~820	★ 400~**600**~725	-	☆ 400~**525**~675	☆ 400~**575**~725	-
Mold Steel	0.004	0.006	0.008	☆ 325~**525**~725	★ 325~**525**~675	-	☆ 325~**475**~600	☆ 325~**500**~675	-
Gray Cast Iron	0.008	0.010	0.014	-	-	★ 400~**600**~820	-	-	☆ 400~**575**~800
Nodular Cast Iron	0.006	0.008	0.012	-	-	★ 325~**525**~725	-	-	☆ 325~**500**~675
Stainless Steel	Not recommended								
Aluminum / Copper	Not recommended								

★: 1st Recommendation ☆: 2nd Recommendation

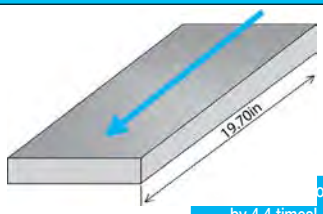
MSRS15 Heavy Milling Face Mill

Case Studies - Improved productivity / Shortened Cutting Time

Structural Steel

Plate
- Vc=492 sfm (n=382RPM)
- ap×ae=0.39×4.92in
- fz=0.008 ipt (Vf=18.03ipm)
- Dry · 6 flutes
- MSRS15125R-6T
- SPMT1806EDER-NB2
- SPMT1806EDER-NB3

(PR830)



oved by 4.4 times!

MSRS15	Metal Removal Rate 34.91in³/min.
Competitor's Cutter A	7.87in³/min.

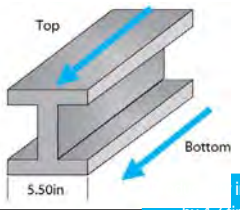
[Competitor's Cutter A]
ø125mm, 6 flutes
Vc=492sfm (n=382RPM)
ap×ae=0.12×4.92in
fz=0.006ipt (Vf=13.54ipm)

[User's Comments]
Because conditions can be raised drastically, this cutter was very effective at reducing cycle time.
Productivity improved by 4.4 times.
(Customer Evaluation)

1050 Steel

Rail
- Vc=492 (n=300RPM)
- ap×ae=0.24×5.51in
- fz=0.008 ipt (Vf=18.90ipm)
- Dry · 8 flutes
- MSRS15160R-8T
- SPMT1806EDER-NB2
- SPMT1806EDER-NB3

(PR830)



improved by 4.7 times!

MSRS15	Metal Removal Rate 24.59in³/min.
Competitor's Cutter B	5.21in³/min.

[Competitor's Cutter B]
Machining at 0.08in×3 passes
Vc=492sfm (n=300RPM)
ap×ae=0.08×5.51in
fz=0.005ipt (Vf=11.81ipm)

[User's Comments]
MSRS can complete cutting with 1 pass what needed to be cut with 3 passes previously. Cutting sound of MSRS was still quiet. Productivity improved by 4.7 times.
(Customer Evaluation)

Cast Steel

Industrial Machine Components
- Vc=325 sfm (n=200RPM)
- ap×ae=0.394×4.490in
- fz=0.016 ipt (Vf=635mm/min)
- Dry · 8 flutes
- MSRS15160R-8T
- SPMT1806EDER-NB2
- SPMT1806EDER-NB3

(PR830)

Productivity improved by 2.5 times!

MSRS15	Metal Removal Rate 44.18in³/min.
Competitor's Cutter C	17.70in³/min.

[Competitor's Cutter C]
Ø6in, 8 flutes
Vc=820sfm (n=522min⁻¹)
ap×ae=0.394×4.490in
fz=0.010ipt (Vf=40.00ipm)

[User's Comments]
Before MSRS, ap could not be increased due to high cutting resistance, but MSRS can increase ap without increasing load on the main spindle.
Productivity improved by 2.5 times
(Customer Evaluation)

1045 Steel

Gear
- Vc=675 sfm (n=255RPM)
- ap×ae=0.394×7.874in
- fz=0.007 ipt (Vf=23.62ipm)
- Dry · 14 flutes
- MSRS15250R-14T
- SPMT1806EDER-NB2
- SPMT1806EDER-NB3

(PR830)

ductivity improved by 2.6 times!

MSRS15	Metal Removal Rate 73.23in³/min.
Competitor's Cutter D	28.00in³/min.

[Competitor's Cutter D]
ø250mm, 12 flutes
Vc=400sfm (n=153RPM)
ap×ae=0.20×7.87in
fz=0.010ipt (Vf=18.07ipm)

[User's Comments]
Cutting sound is quiet even when cutting width is less than 80 % of cutter dia.
Productivity improved by 2.6 times.
(Customer Evaluation)

Q&A

Q-1 What amount of cutting width (ae) is recommended in a radial direction?

A-1 The estimated amount is 70 to 80% of diameter of the cutting tool.

Q-2 Why does the MSRS15 have a cutting angle of 75° (15° lead)?

A-2 45° cutting angles can reduce the impact in cutting a workpiece but also increase thrust force. On the other hand, a 90° cutting angle can reduce thrust forces but increases the impact when the insert cuts the workpiece. The 75° cutting angle of the MSRS15 can suppress both a thrust force and impact, offering a good balance and enabling smooth machining even in heavy cutting

MSE15 Endmill

Facing

MSE15 Endmill (High Rake)

●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)						Rake Angle (°)		Spare Parts				
				ØD	ØD1	Ød	L	ℓ	S	A.R.	R.R.	Clamp Set	Wrench	Shim	Shim Screw	
MSE	**1550**	○	3	50	57	32	120	40	8.5	+20°	+3°	CPS-6M	LW-3	MSE-4215	SP3X8	
	1563	○	3	63	71						+6°					
	1580-32	○	4	80	87											

●Applicable Inserts

Applicable Inserts B13

SEKN 42EFTR

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)													
		Cermet			MEGACOAT		PVD Coated Carbide					Carbide		PCD	
		TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10	KPD001	KPD010
Stainless Steel	~0.008		☆ 400~675	☆ 400~675	★ 400~725	-	☆ 400~675	☆ 400~675							
Carbon Steel	~0.010		★ 400~675	☆ 400~675	★ 400~820	-	☆ 400~675	☆ 400~675							
Alloy Steel	~0.010		★ 325~600	☆ 325~600	★ 325~725	-	☆ 325~600	☆ 325~600							
Mold Steel	~0.008		★ 325~600	☆ 325~600	★ 250~600	-	☆ 250~500	☆ 250~500							
Cast Iron	~0.010		-	-	-	★ 325~725	-	-							
Non-ferrous Metals	-		-	-	-	-	-	-							

★: 1st Recommendation ☆: 2nd Recommendation

0° Lead Angle

E

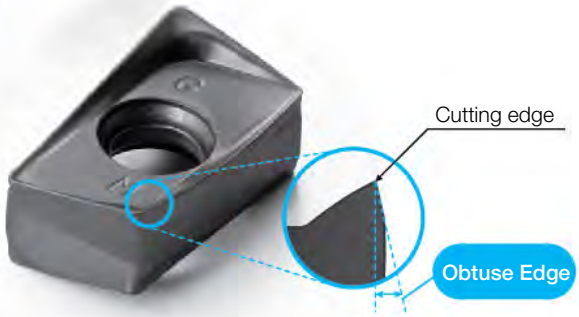
E1~E77

M-Four (MEW)

Double-sided 4-edge Insert

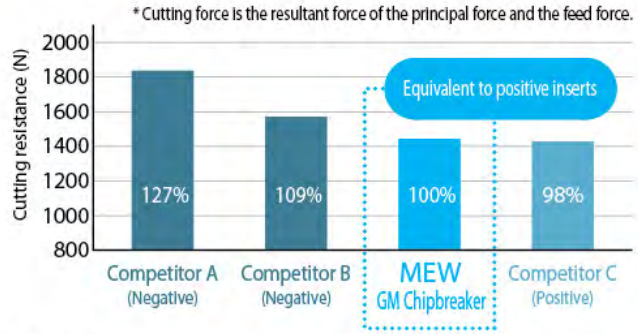
The Newly Developed Endmill Features Kyocera's unique insert forming technology which reduces cutting forces equivalent to positive inserts

Obtuse edge increases cutting edge toughness



Low cutting forces equivalent to positive inserts

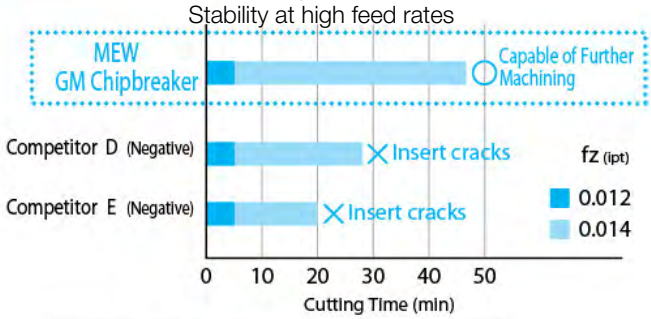
● Cutting Force Comparison



<Cutting Conditions>
Vc=490sfm ap×ae=0.12×0.59" fz=0.006ipt 1050 Stee; Cutter ϕ20mm (0.787")

(Internal evaluation)

● Fracture Resistance Comparison



<Cutting Conditions>
Vc=390 sfm ap×ae=0.12×0.39" fz=0.012~0.014ipt
SM440H (37~39Hs) Cutterϕ20mm (0.787")

(Internal evaluation)

Improved surface finish and minimized vibration

Sharp cutting and superior resistance to vibration and burrs, due to helical cutting edge and optimum axial rake design

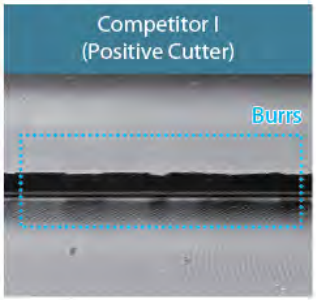
MEW GM Chipbreaker	Competitor F (Negative)	Competitor G (Positive)
+20°	+17°	+17°

Large actual rake angle lowers cutting forces

Surface of shoulder wall

Smooth surface of MEW without chattering

Burr comparison with positive cutters

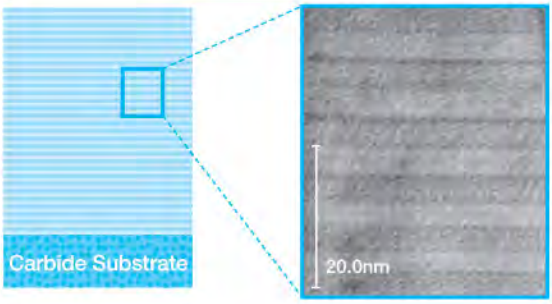


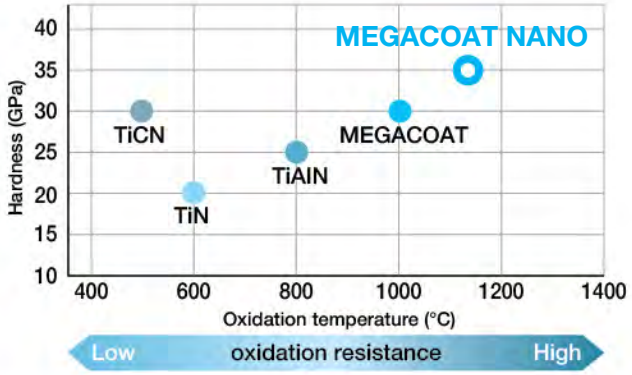
Fewer burrs than positive cutters due to sharp cutting performance

Extended tool life by New MEGACOAT NANO technology

Special multi-layer nano coating **"MEGACOAT NANO"** enables stable milling and extended tool life

MEGACOAT base multi-layer structure





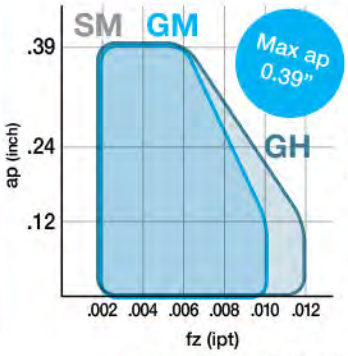
Prevents wear and fracturing with high hardness (35GPa) and superior oxidation resistance (oxidation temperature: 1,150°C)

Chipbreaker Lineup

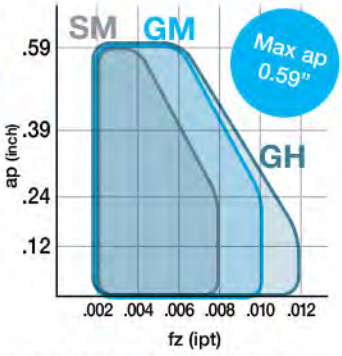
3 newly developed chipbreakers for various applications

Chipbreaker	Applications	Shape
GM	General Purpose	
SM	Low cutting force	
GH	Heavy Cutting	

● LOMU10 type



● LOMU15 type



<Cutting Conditions> Vc=500 sfm ae=⌀D/2 Workpiece Material: 1050 Steel


Chips (grooving)


Chips (shouldering)

Improved Toolholder Durability and Precision

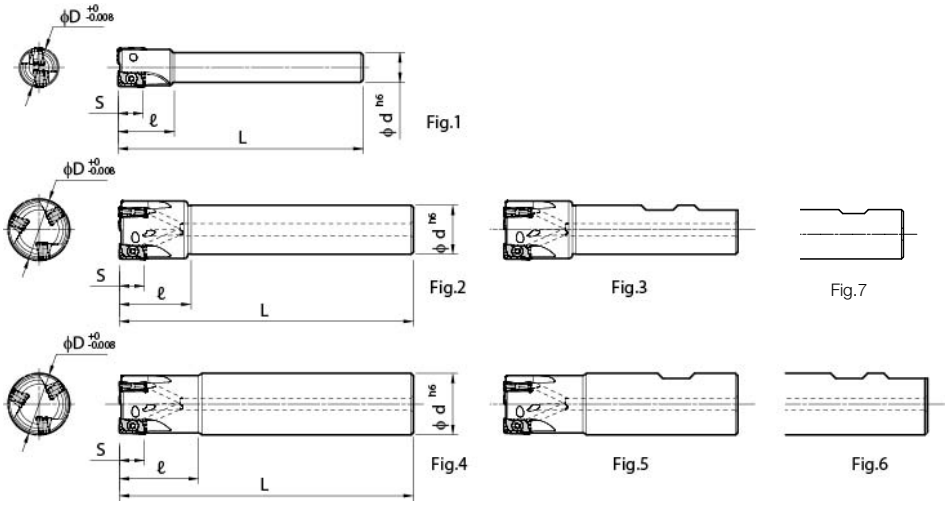
MEW

Smooth Chip Evacuation

Properly curled chips

(This photo was taken by a high-speed camera)

MEW Endmill (inch size)



●Toolholder Dimensions

Description			Stock	No. of Inserts	Dimension (inch)					Rake Angle (°)		Coolant Hole	Drawing	Max. Revolution* (min^{-1})	Applicable Inserts
					øD	ød	L	ℓ	S	A.R. (MAX)	R.R.				
Weldon	Standard Shank	MEW 0625-W500-10-2T	●	2	0.625	0.500	2.75	0.969	0.393	+7°	-22°	No	Fig.7	43,900	LOMU 100408ER-□□ Page B16
		0625-W625-10-2T	●	2	0.625	0.625	3.00	1.046			-22°	Yes	Fig.5	43,900	
		0750-W625-10-2T	●	2	0.750	0.625	3.25	1.145			-20°		Fig.3	42,000	
		0750-W750-10-2T	●	2	0.750	0.750		1.170					Fig.5	42,000	
		0750-W750-10-3T	●	3	0.750	0.750								42,000	
		1000-W750-10-3T	●	3	1.000	0.750		1.219					Fig.3	37,200	
		1000-W100-10-2T	●	2	1.000	1.000	3.75	1.413					Fig.6	37,200	
		1000-W100-10-3T	●	3	1.000	1.000								37,200	
		1250-W100-10-4T	●	4	1.250	1.000		1.469					Fig.3	34,000	
		1250-W125-10-3T	●	3	1.250	1.250	4.00	1.663					Fig.6	34,000	
		1250-W125-10-4T	●	4	1.250	1.250								34,000	
		1500-W125-10-5T	●	5	1.500	1.250	4.125	2.070			-19°		Fig.3	30,700	
Cylindrical	Long	MEW 0750-S750-7-10-2T	●	2	0.750	0.750	7.00	1.586	0.393	+7°	-20°	Yes	Fig.4	42,000	
		1000-S100-8-10-2T	●	2	1.000	1.000	8.00	1.980						37,200	
Weldon	Standard Shank	MEW 1000-W750-15-2T	●	2	1.000	0.750	3.25	1.219	0.590	+10°	-22°	Yes	Fig.3	34,700	LOMU 150508ER-□□ Page B16
		1000-W100-15-2T	●	2	1.000	1.000	3.75	1.413					Fig.6	34,700	
		1250-W100-15-2T	●	2	1.250	1.000		1.469					Fig.3	30,100	
		1250-W125-15-2T	●	2	1.250	1.250	4.00	1.663					Fig.6	30,100	
		1250-W125-15-3T	●	3	1.250	1.250								30,100	
		1500-W125-15-3T	●	3	1.500	1.250	4.125	2.069			-21°		Fig.3	25,600	
		1500-W125-15-4T	●	4	1.500	1.250								25,600	

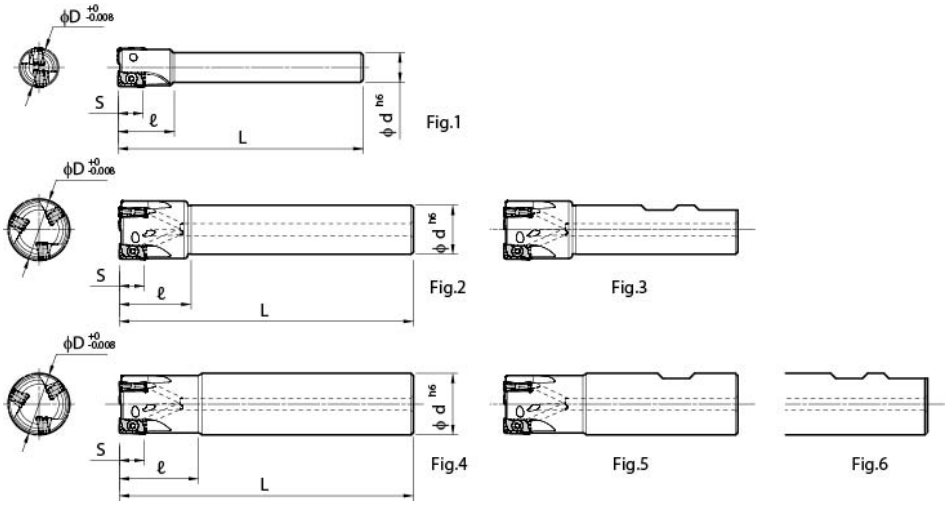
***Max. Revolution**

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force.

● : Stock Std. ○ : World Express

MEW Endmill (metric size)

Cylindrical



●Toolholder Dimensions

Description				Stock	No. of Inserts	Dimension (mm)					Rake Angle (°)		Coolant Hole	Drawing	Max. Revolution* (min^{-1})	Applicable Inserts
						øD	ød	L	ℓ	S	A.R. (MAX)	R.R.				
Weldon	Standard Shank	MEW	16-W16-10-2T	△	2	16	16	75	25	10	+7°	-22°	Yes	Fig.5	43,750	LOMU 100408ER-□□ Page B16
			20-W20-10-2T	△	2	20	20	77				-20°			41,000	
			20-W20-10-3T	△	3	20	20	77							41,000	
			25-W25-10-2T	△	2	25	25	90	32					Fig.6	37,500	
			25-W25-10-3T	△	3	25	25	90							37,500	
			32-W32-10-4T	△	4	32	32	102	40						33,900	
			40-W32-10-5T	△	5	40	32	111	50			-19°		Fig.3	30,000	
		MEW	25-W25-15-2T	△	2	25	25	90	32	15	+10°	-22°	Yes	Fig.6	35,000	LOMU 150508ER-□□ Page B16
			32-W32-15-3T	△	3	32	32	102	40						30,000	
			40-W32-15-4T	△	4	40	32	111	50			-21°		Fig.3	25,000	
Cylindrical	Standard Shank	MEW	16-S12-10-2T	○	2	16	12	100	23	10	+7°	-22°	No	Fig.1	43,750	LOMU 100408ER-□□ Page B16
			16-S16-10-2T	○	2	16	16		26			-21°	Yes	Fig.4	43,750	
			18-S16-10-2T	○	2	18	16		25					Fig.2	43,000	
			20-S16-10-2T	○	2	20	16	110	26			-20°			41,000	
			20-S20-10-2T	○	2	20	20		30					Fig.4	41,000	
			20-S20-10-3T	○	3	20	20								41,000	
			22-S20-10-3T	○	3	22	20		26					Fig.2	39,600	
			25-S20-10-3T	○	3	25	20	120	29						37,500	
			25-S25-10-2T	○	2	25	25		32					Fig.4	37,500	
			25-S25-10-3T	○	3	25	25								37,500	
			28-S25-10-3T	○	3	28	25		29					Fig.2	35,800	
			30-S25-10-4T	○	4	30	25	130	32						34,800	
			32-S25-10-4T	○	4	32	25								33,900	
			32-S32-10-3T	○	3	32	32		40					Fig.4	33,900	
			32-S32-10-4T	○	4	32	32								33,900	
			40-S32-10-5T	○	5	40	32	150	50			-19°		Fig.2	30,000	
			50-S32-10-5T	○	5	50	32	120	40						22,500	
	Long Shank	MEW	20-S20-10-150-2T	○	2	20	20	150	40	10	+7°	-20°	Yes	Fig.4	41,000	
			25-S25-10-170-2T	○	2	25	25	170	50						37,500	
	Standard Shank	MEW	25-S20-15-2T	○	2	25	20	120	29	15	+10°	-22°	Yes	Fig.2	35,000	LOMU 150508ER-□□ Page B16
			25-S25-15-2T	○	2	25	25		32					Fig.4	35,000	
			32-S25-15-2T	○	2	32	25	130						Fig.2	30,000	
			32-S32-15-2T	○	2	32	32		40					Fig.4	30,000	
			32-S32-15-3T	○	3	32	32								30,000	
			40-S32-15-3T	○	3	40	32	150	50			-21°		Fig.2	25,000	
			40-S32-15-4T	○	4	40	32								25,000	
			50-S32-15-4T	○	4	50	32	120	40						17,000	

Max. Revolution
When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force.

● : Stock Std. ○ : World Express △ : Made to Order

MEW Face Mill (inch size)

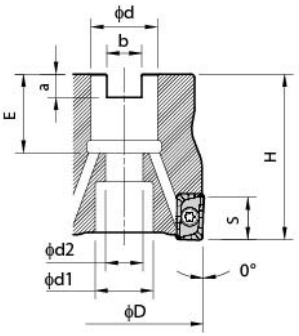


Fig.1

Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (inch)									Rake Angle (°)		Coolant Hole	Drawing	Weight (kg)	Max. Revolution* (min⁻¹)	Applicable Inserts
				øD	ød	ød1	ød2	H	E	a	b	S	A.R. (MAX)	R.R.					
MEW	1500R-10-5T	●	5	1.50	0.750	0.669	0.433	1.575	0.826	0.188	0.312	0.393	+7°	-19°	Yes	Fig.1	0.2	30,700	LOMU 100408ER-□□ Page B16
	2000R-10-5T	●	5	2.00													0.4	22,300	
	2500R-10-6T	●	6	2.50													0.6	20,400	
MEW	2000R-15-4T	●	4	2.00	0.750	0.669	0.433	1.575	0.826	0.188	0.312	0.59	+10°	-21°	Yes	Fig.1	0.4	16,800	LOMU 150508ER-□□ Page B16
	2500R-15-5T	●	5	2.50													0.5	14,400	
	3000R-15-6T	●	6	3.00	1.000									-20°			1.0	12,250	

Max. Revolution
When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force.

Spare parts for inch-size cutters and applicable inserts (endmill / face mill)

Description		Spare Parts				Applicable Inserts B16		
		Insert Screw	Wrench	Anti-seize Compound	Arbor bolt	General Purpose	Low Cutting Force	Tough Edge Heavy Milling
MEW	...-10-_T	SB-3065TRP for Insert Screw Recommended torque 1.2Nm	DTPM-8	MP-1	-	LOMU 100408ER-GM	LOMU 100408ER-SM	LOMU 100408ER-GH
MEW	1500R-10-5T				HH3/8-1.25 (HH3/8-1.25H)			
	2000R-10-5T							
	2500R-10-6T							
MEW	...-15-_T	SB-4090TRP for Insert Screw Recommended torque 3.5Nm	DTPM-15	MP-1	-	LOMU 150508ER-GM	LOMU 150508ER-SM	LOMU 150508ER-GH
MEW	2000R-15-4T				HH3/8-1.25 (HH3/8-1.25H)			
	2500R-15-5T							
	3000R-15-6T				HH1/2-1.25 (HH3/8-1.25H)			

Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

***If through spindle coolant is required please order arbor bolt in ( ) serperately.**

Recommended Cutting Conditions E8

● : Stock Std. ○ : World Express

MEW Face Mill (metric size)

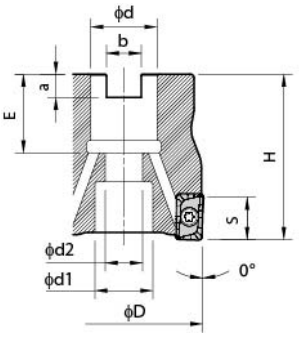


Fig.1

●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)									Rake Angle (°)		Coolant Hole	Drawing	Weight (kg)	Max. Revolution* (min^{-1})	Applicable Inserts
				øD	ød	ød1	ød2	H	E	a	b	S	A.R. (MAX)	R.R.					
MEW	032R-10-4T-M	○	4	32	16	14	9	125	19	5.6	8.4	10	+7°	-20°	Yes	Fig.1	0.1	33,900	LOMU 100408ER-□□ Page B16
	040R-10-5T-M	○	5	40				40						-19°			0.2	30,000	
	050R-10-5T-M	○		50	22	18	11		21	6.3	10.4						0.4	22,500	
	063R-10-6T-M	○	6	63													0.5	20,500	
MEW	040R-15-4T-M	○	4	40	16	14	9	40	19	5.6	8.4	15	+10°	-21°	Yes	Fig.1	0.2	25,000	LOMU 150508ER-□□ Page B16
	050R-15-4T-M	○		50	22	18	11		21	6.3	10.4						0.3	17,000	
	063R-15-5T-M	○	5	63													0.5	14,500	
	080R-15-6T-M	○	6	80	27	20	13	50	25	7	12.4			-20°			1.0	12,000	
	080R-15-6T	○			25.4				27	6	9.5						1.0	12,000	

Max. Revolution
When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force.

◆ Spare parts for metric-size cutters and applicable inserts (endmill / face mill)

Description		Spare Parts				Applicable Inserts B16		
		Insert Screw	Wrench	Anti-seize Compound	Arbor bolt	General Purpose	Low Cutting Force	Tough Edge Heavy Milling
MEW	...-10-_T	SB-3065TRP	DTPM-8	MP-1	-	LOMU 100408ER-GM	LOMU 100408ER-SM	LOMU 100408ER-GH
MEW	032R-10_-M				HH8×25 (HH8×25H)			
	040R-10_-M							
	050R-10_-M	for Insert Screw Recommended torque 1.2Nm			HH10×30 (HH10×30H)			
	063R-10_-M							
MEW	...-15-_T	SB-4090TRP	DTPM-15	MP-1	-	LOMU 150508ER-GM	LOMU 150508ER-SM	LOMU 150508ER-GH
MEW	040R-15_-M				HH8×25 (HH8×25H)			
	050R-15_-M				HH10×30 (HH10×30H)			
	063R-15_-M	for Insert Screw Recommended torque 3.5Nm						
	080R-15_-(M)				HH12×35 (HH12×35H)			

Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

***If through spindle coolant is required please order arbor bolt in ( ) serperately.**

Recommended Cutting Conditions E8

●About wrench specifications

Wrenches and clamp screws are “Torx Plus”.

1) Ref. to Fig. 2 for “Torx Plus” Wrench. (Blue grip)
2) Ref. to Fig. 3 for “Torx” Wrench. (Black grip)

A “Torx Plus” Wrench and a “Torx” Wrench have different top shapes. Please use a “Torx Plus” Wrench.

* If a “Torx” Wrench is used to tighten, the screw head might become damaged and then the screw cannot be removed.

Fig. 2 “Torx Plus” Wrench (For MEW)

Fig. 3 “Torx” Wrench (Do NOT use it for MEW)

● : Stock Std. ○ : World Express

How to mount an insert

1. Be sure to remove dust and chips from the insert mounting pocket.
2. Apply anti-seize compound on portion of taper and thread of clamp screw.
   (1) Attach the screw (magnetic head) to the front end of the wrench.
   (2) While lightly pressing the insert against the pocket walls,
   put the screw into the hole of the insert and tighten. (Ref. to Fig. 1.)
   Tighten M3 screws (SB-3065TRP) slightly inclined from the insert.
   (Ref. to Fig. 2.) surface of the insert.
3. When tightening the screw, make sure that the wrench is parallel to the screw.
   For recommended torque, Ref. to E7
4. After tightening the screw, make sure that there is no clearance between the insert seat surface and the pocket floor of the holder or between the insert side surfaces and the pocket walls of the holder.
   If there is any clearance, remove the insert and mount it again according to the above steps.

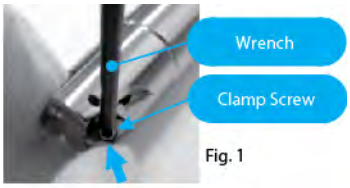


Fig. 1

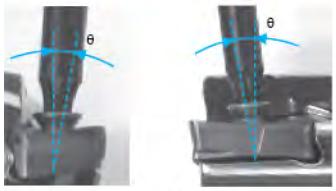


Fig.2

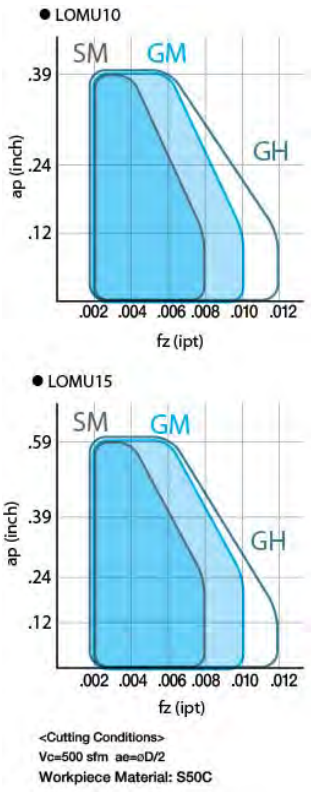
◆Recommended Cutting Conditions

Chipbreaker	Workpiece Material	fz (ipt) Description MEW0625~M0750 MEW16~MEW18	fz (ipt) Description MEW1000~MEW1500 MEW1500R~MEW3000R MEW20~MEW50 MEW032R~MEW080R	Recommended Insert Grades (Cutting Speed:sfm) MEGACOAT NANO PR1525	PR1510
GM	Carbon Steel	0.002~**0.004**~0.008	0.003~**0.006**~0.010	★ 390~**600**~820	-
	Alloy Steel	0.002~**0.004**~0.006	0.003~**0.006**~0.008	★ 325~**530**~720	-
	Mold Steel	0.002~**0.003**~0.005	0.003~**0.005**~0.008	★ 260~**450**~600	-
	Stainless Steel	0.002~**0.003**~0.005	0.003~**0.005**~0.006	☆ 325~**530**~650	-
	Gray Cast Iron	0.002~**0.004**~0.007	0.003~**0.007**~0.010	-	★ 390~**600**~820
	Nodular Cast Iron	0.002~**0.003**~0.005	0.003~**0.006**~0.008	-	★ 325~**500**~650
	Titanium Alloys	0.002~**0.003**~0.005	0.003~**0.006**~0.008	-	★ 100~**160**~225
SM	Carbon Steel	0.002~**0.004**~0.007	0.003~**0.006**~0.008	★ 390~**600**~820	-
	Alloy Steel	0.002~**0.003**~0.005	0.003~**0.005**~0.007	★ 325~**530**~720	-
	Mold Steel	0.002~**0.003**~0.005	0.003~**0.004**~0.006	★ 260~**450**~600	-
	Stainless Steel	0.002~**0.003**~0.005	0.003~**0.004**~0.006	★ 325~**530**~650	-
	Titanium Alloys	0.002~**0.003**~0.005	0.003~**0.005**~0.007	-	★ 100~**160**~225
GH	Carbon Steel	0.002~**0.004**~0.008	0.003~**0.008**~0.012	★ 390~**600**~820	-
	Alloy Steel	0.002~**0.004**~0.006	0.003~**0.008**~0.010	★ 325~**530**~720	-
	Mold Steel	0.002~**0.003**~0.005	0.003~**0.006**~0.009	★ 260~**450**~600	-
	Stainless Steel	0.002~**0.003**~0.005	0.003~**0.005**~0.006	★ 325~**500**~650	-
	Gray Cast Iron	0.002~**0.004**~0.008	0.003~**0.009**~0.012	-	★ 390~**600**~820
	Nodular Cast Iron	0.002~**0.003**~0.006	0.003~**0.007**~0.010	-	★ 325~**500**~650
	Titanium Alloys	0.002~**0.003**~0.005	0.003~**0.006**~0.008	-	★ 100~**160**~225

* Cutting with coolant is recommended for titanium alloys.

★: 1st Recommendation ☆: 2nd Recommendation

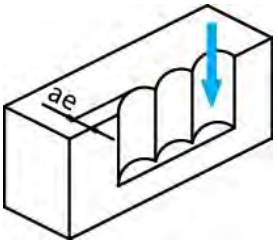
Applicable chipbreaker range (Shouldering)



Ramping, Helical milling and Vertical milling

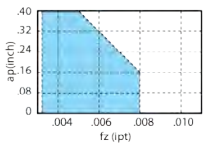
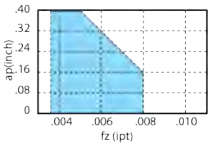
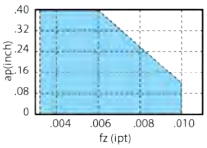
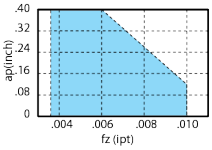
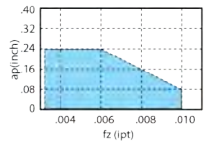
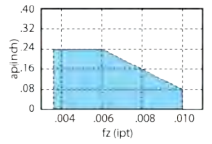
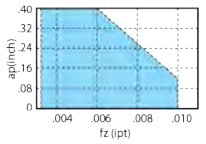
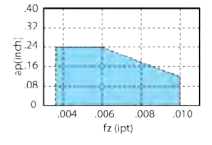
1. Available for vertical milling.
2. NOT available for ramping and helical milling, because interference between workpiece and insert may occur.

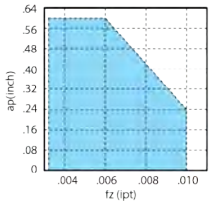
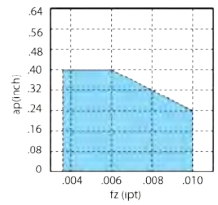
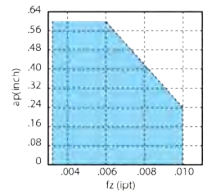
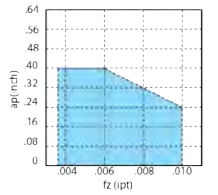
Vertical milling



Insert Description	Max. Width of Cut (ae)
LOMU10	0.197" (5mm)
LOMU15	0.276" (7mm)

Cutting Performance

Description	Shouldering (Cutting width ae = øD/2)	Slotting
MEW0625...-10 MEW0750...-10 MEW16...-10 MEW18...-10		
MEW1000...-10 ~ MEW1500...-10 MEW20...-10 ~ MEW50...-10		
MEW0750...-2T MEW1000...-2T (Long Shank) MEW20-...-2T MEW25-...-2T (Long Shank)		
MEW1500R...-10 ~ MEW2500R...-10 MEW032R...-10 ~ MEW063R...-10		

Description	Shouldering (Cutting width ae = øD/2)	Slotting
MEW1000...-15 ~ MEW1500...-15 MEW25...-15 ~ MEW50...-15		
MEW2000R...-15 ~ MEW3000R...-15 MEW040R...-15 ~ MEW080R...-15		

<Cutting Conditions>
· Vc=600 sfm
· GM Chipbreaker
· Workpiece Material: S50C
· Overhang Length
1. Endmill: Same length as ℓ of the dimension
2. Face mill: H of the dimension + minimum overhang length of the arbor

Case Studies

Structural Steel 1018

· Construction machine part
· Vc=820sfm
· ap×ae=0.158×0.787in
· fz=0.006ipt(Vf=53ipm)
· Wet
· MEW32-S32-10-4T(4 flutes)
· LOMU100408ER-GM(PR1525)

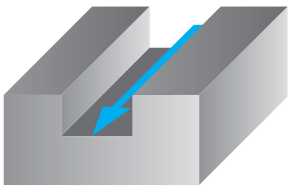
PR1525	Chip Removal=6.59in³/min.
Competitor A (Positive Cutter)	Chip Removal=4.39in³/min.

MEW showed stable milling without chattering at higher feed, improving the cutting efficiency by 150%.
Burrs are prevented and excellent surface finish is achieved.

(Customer Evaluation)

Structural Steel 1018

· Machine parts
· Vc=820sfm
· ap×ae=0.128×0.787in (Grooving)
· fz=0.008ipt (Vf=94ipm)
· DRY
· MEW20-S20-10-3T(3 flutes)
· LOMU100408ER-GM(PR1525)



PR1525	Chip Removal =8.79in³/min (Stable milling)
Competitor B (Positive Cutter)	Chip Removal = 6.97in³/min (Unstable)

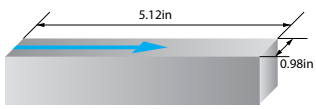
No chattering with MEW, while Competitor B chattered at the same cutting conditions.

No burrs with MEW and excellent surface finish is gained..

(Customer Evaluation)

Stainless Steel 15-5PH(42HRC)

· Aircraft Part
· Vc=590sfm
· ap×ae=0.079×0.984in
· fz=0.004ipt (Vf=28ipm)
· Wet
· MEW32-S32-10-4T(4 flutes)
· LOMU100408ER-GM(PR1525)



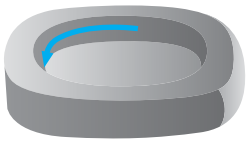
PR1525	Chip Removal = 2.18in³/min (Further Milling Possible)
Competitor C (Positive Cutter)	Chip Removal = 1.64in³/min (Unable to continue cutting)

No chattering and more stable milling is possible with MEW.
Despite the milling difficulty because of the properties of the material, PR1525 kept good cutting edge form, minimizing wear and adhesion.

(Customer Evaluation)

Hot Die Steel SKD61(45HRC)

Mold Part
· Vc=330sfm
· ap×ae=0.138×1.181in
· fz=0.004ipt (Vf=15ipm)
· DRY
· MEW32-S32-10-4T(4 flutes)
· LOMU100408ER-GH(PR1525)



PR1525	Chip Removal = 2.56in³/min (Further Milling Possible)
Competitor D (Positive Cutter)	Chip Removal = 1.28in³/min (Unable to continue cutting)

MEW doubled cutting efficiency. Furthermore, MEW inserts have double number of edges (4-edge), which enables a drastic cost reduction.

(Customer Evaluation)

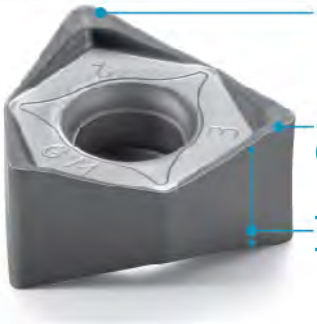
6 Advantages

M-Six (MFWN)

Double-sided 6-edge Insert

90°Cutters

Low cutting forces and reduced chattering



Dynamic Slant Design

Economical Double-sided 6-edge Insert

Tough Cutting Edge due to Thick Edge Design

E

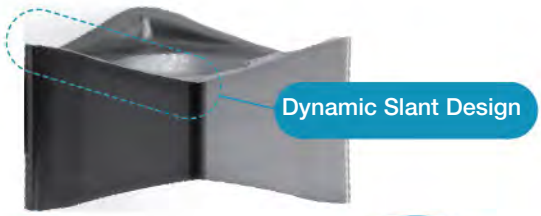
0° Lead Angle

NEW ITEM

Advantage 1 Sharp cutting due to lower cutting forces

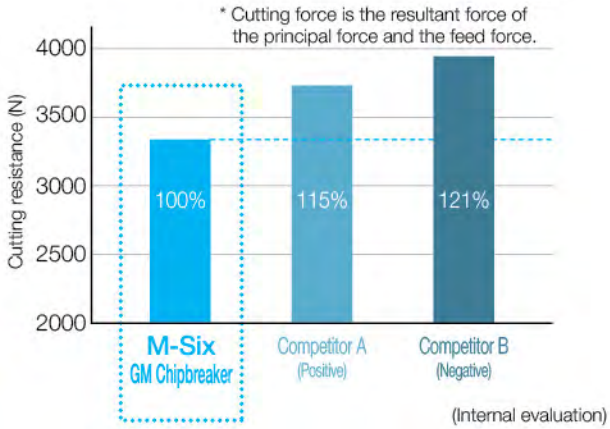
●Low cutting forces due to steep rake angle

●Dynamic Slant Design reduces shock when cutting edge enters the workpiece



●Cutting Force Comparison

<Cutting Conditions>
Vc = 590sfm
ap×ae = 0.275×0.400in
fz = 0.008ipt
Workpiece Material: S50C
ø125mm Cutter



(Internal evaluation)

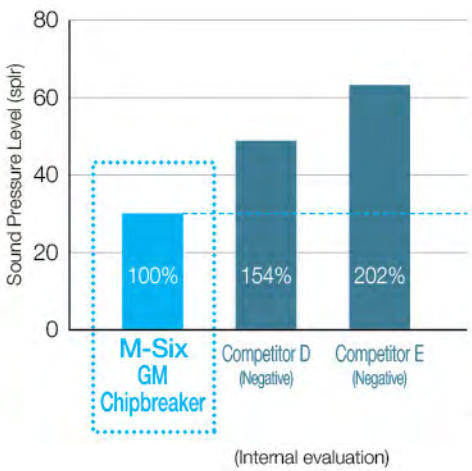
Advantage 2 Reduced Chattering

Applicable to long overhang

●Surface Roughness Comparison

●Cutting Noise Comparison

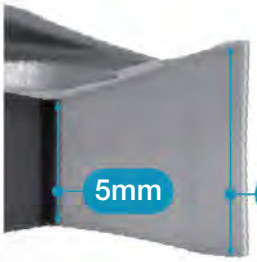
<Cutting Conditions>
Vc = 656sfm
ap×ae = 0.118×0.590in
fz = 0.004ipt
Workpiece Material: S50C
f80mm Cutter(7 flutes)



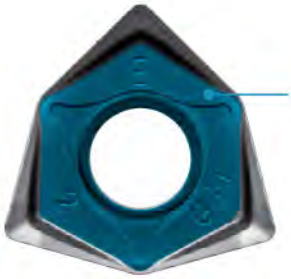
(Internal evaluation)

Advantage 3

Superior Fracture Resistance due to Thick Edge Design



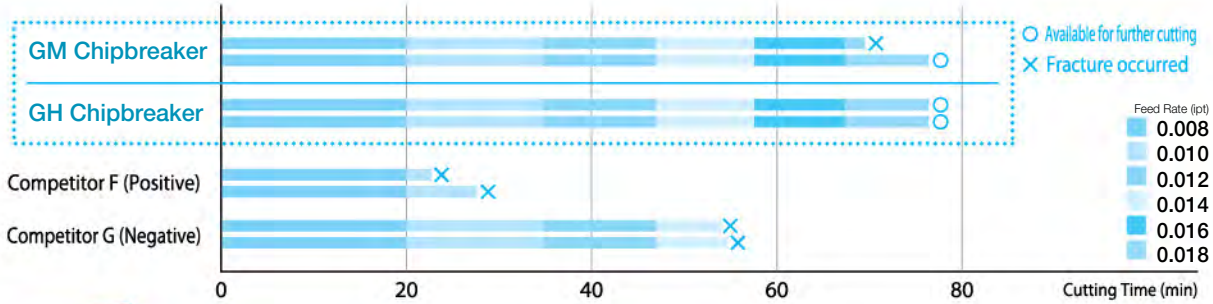
Cutting Edge Thickness: 8.5~5mm



Stable Clamping due to the Unique Insert Face Design

●Fracture Resistance Comparison

Cutting Condition: Workpiece Material: SCM440H (38~42HS) Vc=328sfm apxae = .080" x 4.000" | Interruption with a slot on the workpiece fz = .008~.018ipt DRY

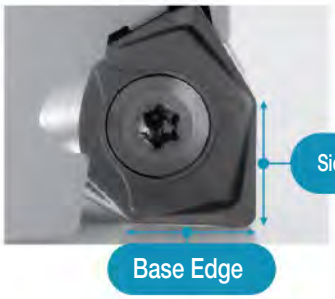


Advantage 4

Neutral Inserts

Available for Shouldering and Facing

Neutral Insert are applicable to left-hand cutters (custom order).



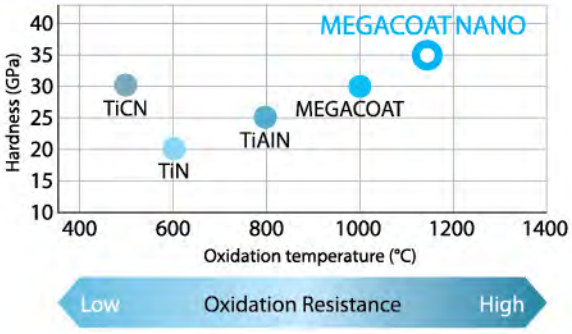
Wide Application Range

Advantage 5

Extended Tool Life by New MEGACOAT NANO Technology

PR1525 for steel and stainless steel
PR1510 for cast iron

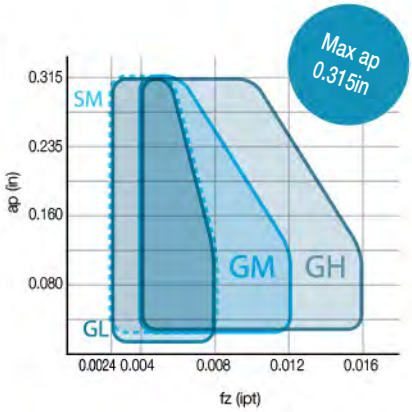
Prevents wear and fracture with high hardness (35GPa) and superior oxidation resistance (oxidation temperature: (1,150°C)



Advantage 6

4 Chipbreakers for Various Applications

Chipbreaker	Applications	Shape
GM	General Purpose	
SM	Low Cutting Force	
GH	Heavy Cutting	
GL	Surface Finish Oriented	



Smooth Chip Evacuation

Properly curled chips
(The photo was taken by a high speed camera.)

MFWN90 Face Mill (inch-size)

Rake Angle (°)	A.R.	R.R.	
	(MAX) +13°	øD=63 -10° øD=80 -9° øD=100 -8°	øD=125 -7.5° øD=160-250 -7°

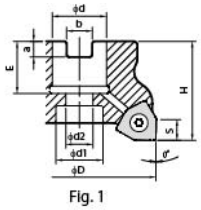


Fig. 1

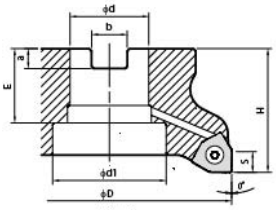


Fig.2

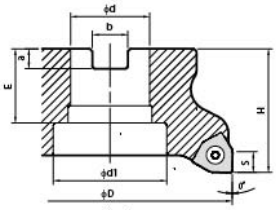


Fig.3

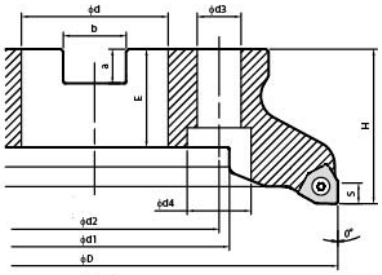


Fig.4

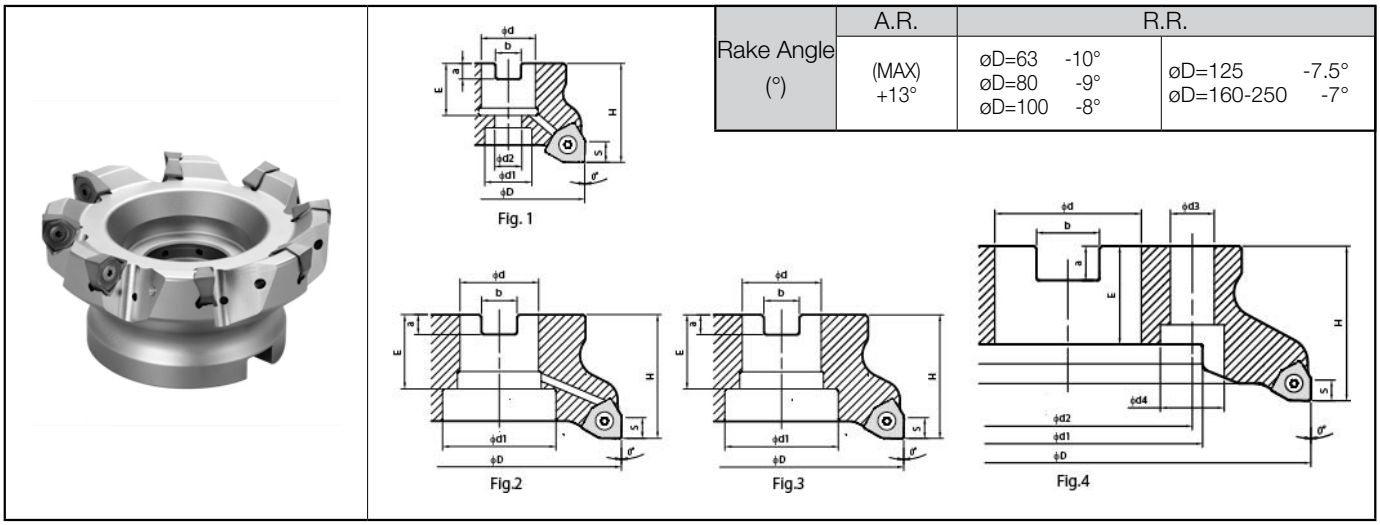
Toolholder Dimensions

Description			Stock	No. of Inserts	Dimension (in)											Drawing	Weight (kg)	Shim	Coolant Hole	Applicable Inserts
					øD	ød	ød1	ød2	H	E	a	b	S	ød3	ød4					
Inch	Coarse pitch	MFWN 902500R-3T	●	3	2.50	0.75	0.669	0.433	1.575	0.750	0.187	0.312	0.315	-	-	Fig.1	0.4	Yes	Yes	WN○U 080608EN-□□ Page B16
		903000R-4T	●	4	3.00	1.00	0.875	0.551	1.968	1.063	0.236	0.381					0.8			
		904000R-5T	●	5	4.00	1.50	2.047		1.968	1.142	0.393	0.625				Fig.2	1.1			
		905000R-6T	●	6	5.00	1.50	2.175	-	2.480	1.496	0.393	0.625				Fig.2	2.5			
		906000R-8T	●	8	6.00	2.00	2.835		2.480	1.496	0.433	0.752				Fig.3	3.4		-	
		908000R-10T	●	10	8.00	2.50	3.937	4.000	2.480	1.575	0.551	1.008		0.709	1.024	Fig.4	6.0			
		9010000R-12T	●	12	10.00	2.50	3.937	4.000	2.480	1.575	0.551	1.008					8.2			
	Fine pitch	MFWN 902500R-4T	●	4	2.50	0.75	0.669	0.433	1.575	0.750	0.187	0.312	0.315	-	-	Fig.1	0.5	-	Yes	
		903000R-5T	●	5	3.00	1.00	0.875	0.551	1.968	1.063	0.236	0.381					0.8			
		904000R-7T	●	7	4.00	1.50	2.047		1.968	1.142	0.393	0.625				Fig.2	1.0			
		905000R-8T	●	8	5.00	1.50	2.175	-	2.480	1.496	0.393	0.625				Fig.2	2.5			
		906000R-10T	●	10	6.00	2.00	2.835		2.480	1.496	0.433	0.752				Fig.3	3.5		-	
		908000R-12T	●	12	8.00	2.50	3.937	4.000	2.480	1.575	0.551	1.008		0.709	1.024	Fig.4	6.2			
		9010000R-14T	●	14	10.00	2.50	3.937	4.000	2.480	1.575	0.551	1.008					8.4			
	Extra fine pitch	MFWN 902500R-5T	●	5	2.50	0.75	0.669	0.433	1.575	0.750	0.187	0.312	0.315	-	-	Fig.1	0.4	-	Yes	
		903000R-7T	●	7	3.00	1.00	0.875	0.551	1.968	1.063	0.236	0.381					0.8			
		904000R-9T	●	9	4.00	1.50	2.047		1.968	1.142	0.393	0.625				Fig.2	1.0			
		905000R-12T	●	12	5.00	1.50	2.175	-	2.480	1.496	0.393	0.625				Fig.2	2.4			
		906000R-14T	●	14	6.00	2.00	2.835		2.480	1.496	0.433	0.752				Fig.3	3.4		-	
		908000R-16T	●	16	8.00	2.50	3.937	4.000	2.480	1.575	0.551	1.008		0.709	1.024	Fig.4	6.1			
		9010000R-18T	●	18	10.00	2.50	3.937	4.000	2.480	1.575	0.551	1.008					8.4			

Spare Parts E14
Recommended Cutting Conditions E16

● : Stock Std. ○ : World Express

MFWN90 Face Mill (metric-size)



Rake Angle (°)	A.R.	R.R.	
	(MAX) +13°	øD=63 -10° øD=80 -9° øD=100 -8°	øD=125 -7.5° øD=160-250 -7°

Fig. 1

Fig.2

Fig.3

Fig.4

●Toolholder Dimensions

		Description	Stock	No. of Inserts	Dimension (mm)											Drawing	Weight (kg)	Shim	Coolant Hole	Applicable Inserts
					øD	ød	ød1	ød2	H	E	a	b	S	ød3	ød4					
Metric	Coarse pitch	MFWN 90063R-3T-M	○	3	63	22	19	11	40	21	6.3	10.4	8	-	-	Fig. 1	0.5	Yes	Yes	WN○U 080608EN-□□ Page B16
		90080R-4T-M	○	4	80	27	20	13	50	24	7	12.4					1.0			
		90100R-5T-M	○	5	100	32	46	-		30	8	14.4				Fig.2	1.3			
		90125R-6T-M	○	6	125	40	55		63	33	9	16.4					2.5			
		90160R-8T-M	○	8	160		68	75.7		32				14	20		3.8			
		90200R-10T-M	○	10	200	60	110	101.6		40	14	25.7		18	26	Fig.4	6.0		-	
		90250R-12T-M	○	12	250												8.4			
	Fine pitch	MFWN 90063R-4T-M	○	4	63	22	19	11	40	21	6.3	10.4	8	-	-	Fig. 1	0.5	-	Yes	
		90080R-5T-M	○	5	80	27	20	13	50	24	7	12.4					1.0			
		90100R-7T-M	○	7	100	32	46	-		30	8	14.4				Fig.2	1.3			
		90125R-8T-M	○	8	125	40	55		63	33	9	16.4					2.6			
		90160R-10T-M	○	10	160		68	75.7		32				14	20		3.9			
		90200R-12T-M	○	12	200	60	110	101.6		40	14	25.7		18	26	Fig.4	6.3		-	
		90250R-14T-M	○	14	250												8.7			
	Extra fine pitch	MFWN 90063R-5T-M	○	5	63	22	19	11	40	21	6.3	10.4	8	-	-	Fig. 1	0.5	-	Yes	
		90080R-7T-M	○	7	80	27	20	13	50	24	7	12.4					1.1			
		90100R-9T-M	○	9	100	32	46	-		30	8	14.4				Fig.2	1.3			
		90125R-12T-M	○	12	125	40	55		63	33	9	16.4					2.6			
		90160R-14T-M	○	14	160		68	75.7		32				14	20		3.9			
		90200R-16T-M	○	16	200	60	110	101.6		40	14	25.7		18	26	Fig.4	6.4		-	
		90250R-18T-M	○	18	250												8.8			
Bore Dia. Inch spec	Coarse pitch	MFWN 90080R-4T	○	4	80	25.4	20	13	50	27	6	9.5	8	-	-	Fig. 1	1.0	Yes	Yes	
		90100R-5T	○	5	100	31.75	46	-		34	8	12.7				Fig.2	1.3			
		90125R-6T	○	6	125	38.1	55		63	38	10	15.9					2.6			
		90160R-8T	○	8	160	50.8	72				11	19.1				Fig.3	3.9			
		90200R-10T	○	10	200	47.625	110	101.6		40	14	25.4		18	26	Fig.4	6.3		-	
		90250R-12T	○	12	250												8.7			
	Fine pitch	MFWN 90080R-5T	○	5	80	25.4	20	13	50	27	6	9.5	8	-	-	Fig. 1	1.0	-	Yes	
		90100R-7T	○	7	100	31.75	46	-		34	8	12.7				Fig.2	1.4			
		90125R-8T	○	8	125	38.1	55		63	38	10	15.9					2.7			
		90160R-10T	○	10	160	50.8	72				11	19.1				Fig.3	4.0			
		90200R-12T	○	12	200	47.625	110	101.6		40	14	25.4		18	26	Fig.4	6.6		-	
		90250R-14T	○	14	250												8.9			
	Extra fine pitch	MFWN 90080R-7T	○	7	80	25.4	20	13	50	27	6	9.5	8	-	-	Fig. 1	1.1	-	Yes	
		90100R-9T	○	9	100	31.75	46	-		34	8	12.7				Fig.2	1.3			
		90125R-12T	○	12	125	38.1	55		63	38	10	15.9					2.7			
		90160R-14T	○	14	160	50.8	72				11	19.1				Fig.3	4.1			
		90200R-16T	○	16	200	47.625	110	101.6		40	14	25.4		18	26	Fig.4	6.7		-	
		90250R-18T	○	18	250												9.1			

Spare Parts E14
Recommended Cutting Conditions E16

● : Stock Std. ○ : World Express

M-Six (MFWN) NEW

◆Spare Parts (inch-size)

Description		Spare Parts							
		Insert Screw	Wrench		Shim	Shim Screw	Wrench	Anti-seize Compound	Arbor bolt
			TT	DTM					
									
Coarse pitch	MFWN 902500R-3T	SB-50140TR	TT-15	-	MFWN-90	SPW-7050	LW-5	MP-1	HH3/8-1.25 (HH3/8-1.25H)
	MFWN 903000R-4T	for Insert Screw Recommended torque 4.2N·m			for Shim Screw Recommended torque 6.0N·m				HH1/2-1.25 (HH1/2-1.25H)
	MFWN 904000R-5T ~ 9010000R-12T								-
Fine pitch	MFWN 902500R-4T	SB-50140TR	TT-15	-	-	-	-	MP-1	HH3/8-1.25 (HH3/8-1.25H)
	MFWN 903000R-5T	for Insert Screw Recommended torque 4.2N·m							HH1/2-1.25 (HH1/2-1.25H)
	MFWN 904000R-7T ~ 9010000R-14T								-
Extra fine pitch	MFWN 902500R-5T	SB-50140TR	TT-15	-	-	-	-	MP-1	HH3/8-1.25 (HH3/8-1.25H)
	MFWN 903000R-7T	SB-40140TRN	-	DTM-15					HH1/2-1.25 (HH1/2-1.25H)
	MFWN 904000R-9T ~ 9010000R-18T	for Insert Screw Recommended torque 3.5N·m							-

Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

Recommended Cutting Conditions E16

***If through spindle coolant is required please order arbor bolt in ( ) seperately.**

◆Spare Parts (metric-size)

Description		Spare Parts							
		Insert Screw	Wrench		Shim	Shim Screw	Wrench	Anti-seize Compound	Arbor bolt
			TT	DTM					
									
Coarse pitch	MFWN 90063R-3T-M	SB-50140TR	TT-15	-	MFWN-90	SPW-7050	LW-5	MP-1	HH10×30 (HH10×30H)
	MFWN 90080R-4T-(M)	for Insert Screw Recommended torque 4.2N·m			for Shim Screw Recommended torque 6.0N·m				HH12×35 (HH12×35H)
	MFWN 90100R-5T-(M) ~ 90250R-12T-(M)								-
Fine pitch	MFWN 90063R-4T-M	SB-50140TR	TT-15	-	-	-	-	MP-1	HH10×30 (HH10×30H)
	MFWN 90080R-5T-(M)	for Insert Screw Recommended torque 4.2N·m							HH12×35 (HH12×35H)
	MFWN 90100R-7T-(M) ~ 90250R-14T-(M)								-
Extra fine pitch	MFWN 90063R-5T-M	SB-50140TR	TT-15	-	-	-	-	MP-1	HH10×30 (HH10×30H)
	MFWN 90080R-7T-(M)	SB-40140TRN	-	DTM-15					HH12×35 (HH12×35H)
	MFWN 90100R-9T-(M) ~ 90250R-18T-(M)	for Insert Screw Recommended torque 3.5N·m							-

Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

Recommended Cutting Conditions E16

***If through spindle coolant is required please order arbor bolt in ( ) seperately.**

● : Stock Std. ○ : World Express

How to replace the shim (for coarse pitch)

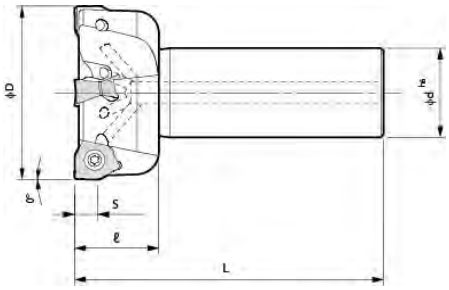
1. Be sure to remove dust and chips from the insert mounting pocket.
2. The shim must be mounted in the proper direction. While aligning the surface of the shim with the mark on it to the corresponding pocket walls (Ref. to Fig. 1) and lightly pressing the shim toward the pocket walls (Ref. to Fig. 2),
   insert the screw into the hole of the shim and tighten (Ref. to Fig. 3). When tightening the screw, make sure that the screw is vertical to the pocket floor (Recommended torque is 6.0Nm).
3. After tightening the screw, make sure that there is no clearance between the shim seat surface and the pocket floor. If there is any clearance, remove the shim and mount it again according to the above steps.

Fig. 1

Fig.2

Fig.3

MFWN Endmill (with coolant hole)



Description		Stock	No. of Inserts	Unit	Dimension øD	Dimension ød	Dimension L	Dimension ℓ	Dimension S	Rake Angle (°) A.R. (MAX)	Rake Angle (°) R.R.	Coolant Hole	Spare Parts: Insert Screw	Spare Parts: Wrench	Spare Parts: Anti-seize Compound
MFWN	902000R-W125-3T	●	3	(in)	2.00	1.25	3.60	1.18	0.315	+13°	-12°	Yes	SB-50140TR	TT-15	MP-1
	902500R-W125-4T	●	4		2.50						-10°		Recommended torque 4.2N·m		
	903000R-W125-5T	●	5		3.00						-8°				
MFWN	90050R-S32-3T	○	3	(mm)	50	32	110	30	8	+13°	-12°	Yes	SB-50140TR	TT-15	MP-1
	90063R-S32-4T	○	4		63						-10°		Recommended torque 4.2N·m		
	90080R-S32-5T	○	5		80						-9°				

Coat Anti-seize Compound (MP-1) thinly on portion of taper and thread when insert is fixed.

Applicable Inserts B16
Recommended Cutting Conditions E16

● : Stock Std. ○ : World Express

Precautions for use (How to mount the insert)

1. Be sure to remove dust and chips from the insert mounting pocket.
2. After applying anti-seize compound on portion of taper and thread, attach the screw to the front end of the wrench. While lightly pressing the insert against the pocket walls, put the screw into the hole of the insert and tighten. (Ref. to Fig. 1)
3. When tightening the screw, make sure that the wrench is parallel to the screw. Remember that the screw hole of the holder for Extra fine pitch is inclined to the pocket floor. (Ref. to Fig. 2 and Fig. 3)
4. Be careful not to tighten the screw with excessive torque. Recommended torque is 4.2N·m for M5 screw (SB-50140TR) and 3.5N·m for M4 screw (SB-40140TRN).
5. After tightening the screw, make sure that there is no clearance between the insert seat surface and the pocket floor of the holder or between the insert side surfaces and the pocket walls of the holder. If there is any clearance, remove the insert and mount it again according to the above steps.
6. To change the cutting edge of the insert, turn the insert counterclockwise. (Ref. to Fig. 4) The insert corner identification number is stamped on the top surface of the insert.


Fig. 1

Fig.2

Fig.3


Fig.4

◆Recommended Cutting Conditions

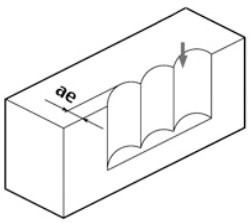
Workpiece Material	Insert Grades	Cutting Speed Vc (sfm)	Chipbreaker	fz (ipt) 0.002	0.004	0.008	0.012	0.016
Carbon Steel	PR1525	400~**600**~800	GM★		0.004	**0.008**	0.012	
			SM ☆	0.002		**0.005**	0.008	
			GH			0.008	**0.012**	0.016
			GL	0.002		**0.005**	0.008	
Alloy Steel	PR1525	320~**520**~720	GM★		0.004	**0.008**	0.012	
			SM ☆	0.002		**0.005**	0.008	
			GH ☆			0.008	**0.012**	0.016
			GL	0.002		**0.005**	0.008	
Mold Steel	PR1525	260~**450**~600	GM★		0.004	**0.006**	0.010	
			SM ☆	0.002	**0.003**			
			GH ☆			0.006	**0.008**	0.012
			GL	0.002	**0.003**	0.006		
Stainless Steel	PR1525	320~**500**~650	GM☆		0.004	**0.006**	0.010	
			SM ★	0.002		**0.005**	0.008	
			GL	0.002		**0.005**	0.008	
Gray Cast Iron	PR1510	390~**600**~820	GM★		0.004	**0.008**	0.012	
			SM	0.002		**0.005**	0.008	
			GH ☆			0.008	**0.012**	0.016
			GL	0.002		**0.005**	0.008	
Nodular Cast Iron	PR1510	325~**500**~650	GM★		0.004	**0.006**	0.010	
			SM	0.002	**0.003**	0.006		
			GH ☆			0.006	**0.008**	0.012
			GL	0.002	**0.003**	0.006		
Titanium Alloys	PR1510	100~**160**~225	SM ★	0.002	**0.003**	0.006		
			GL	0.002	**0.003**	0.006		

Cutter Specification	
	Coarse pitch (with shim)
	Fine pitch (without shim) (For GH Chipbreaker, fz=0.0118ipt is recommended.)
	Extra fine pitch (without shim) (The use of the GH breaker is not recommended.)

* The bold-faced number indicates a center value of recommended condition.

★: 1st Recommendation ☆: 2nd Recommendation

Vertical milling



Cutting Dia.	Max. Width of Cut (ae)
All items	0.315in (8mm)

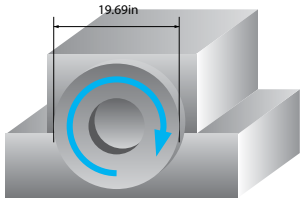
●Cutter Type and Chipbreaker Selection Guide

Milling Purpose	Cutter Type			Chipbreaker			
	Coarse pitch	Fine pitch	Extra fine pitch	GM	SM	GH	GL
General milling of steel and alloy steel		●		●			
Steel and alloy steel (at or to prevent chattering due to low rigidity or weak clamping pressure)	●				●		
Productivity oriented (Reducing Costs) (ap=>0.15"; fz=>0.010 ipt)	●					●	
Focus on quality finish	●	●					●
General milling of stainless steel		●			●		
Stainless steel (to prevent chattering due to low rigidity or weak clamping pressure)	●				●		
Cast iron (for efficiency improvement)			●	●			
Cast iron (ap=>0.15"; fz=>0.010 ipt)	●					●	

■ Case Studies

Gray Cast Iron No.50

- Machine Part
- Vc=558sfm
- ap×ae=0.01×5.12in
- fz=0.007ipt (Vf=19.69in/min)
- Wet
- MFWN90160R-8T(8 flutes)
- WNMU080608ER-GM(PR1510)

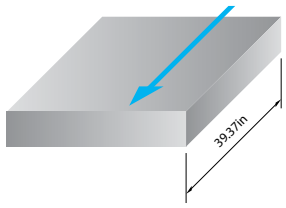


PR1510	Chip Removal=9.95in³/min.
Competitor A (Positive Cutter)	Chip Removal=4.15in³/min.

Competitor A proceeded cutting under low cutting conditions, as the workpiece was slipping because of the unstable chucking.
With MFWN, stable cutting was possible at higher cutting conditions.
(Customer Evaluation)

Gray Cast Iron No.45

- Frame
- Vc=492sfm
- ap×ae=0.16×6.30in
- fz=0.009ipt (Vf=28.15in/min)
- DRY
- MFWN90160R-10T(10 flutes)
- WNMU080608ER-GM(PR1510)

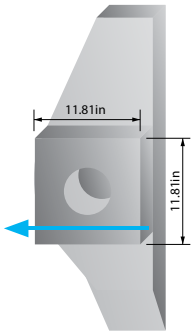


PR1510	Chip Removal=27.95in³/min.
Competitor B (Negative Cutter) (Vertical inserts)	Chip Removal=17.21in³/min.

While Competitor B could not improve the cutting conditions due to chattering, MFWN improved it by 160% with NO chattering.
(Customer Evaluation)

Manganese Steel

- Construction machine part
- Vc=492sfm
- ap×ae=0.04×3.94in
- fz=0.008ipt (Vf=26.30in/min)
- DRY
- MFWN90100R-7T(7 flutes)
- WNMU080608ER-GM(PR1525)

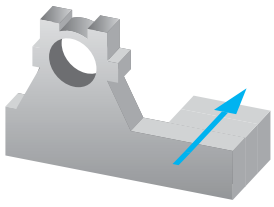


PR1525	Machining efficiency: 2 pcs/edge
Competitor C (Negative Cutter) (Vertical inserts)	1 pc/edge

Despite instability with the long overhang of the workpiece, MFWN doubled tool life, improving the efficiency by 150%.
(Customer Evaluation)

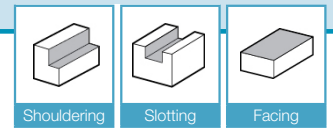
Structural Steel 1018

- Machine parts
- Vc=740sfm
- ap×ae=0.06×3.15in
- fz=0.006ipt (Vf=39.37in/min)
- DRY
- MFWN90080R-7T(7 flutes)
- WNMU080608ER-GM(PR1525)

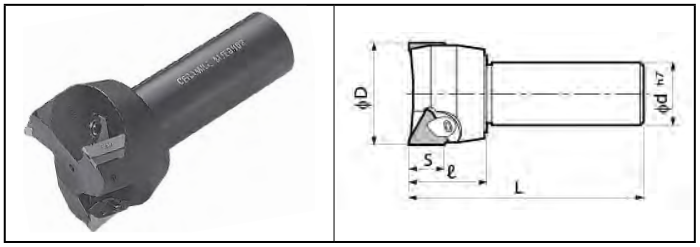


PR1525	Machining efficiency: 3 pcs/edge
Competitor D (Positive Cutter)	1 pc/edge

MFWN tripled tool life under the same cutting conditions as Competitor D.
(Customer Evaluation)



MTE90 Endmill (High Rake)



●Toolholder Dimensions

Description	Stock	No. of Inserts	Dimension (mm)					Rake Angle (°)		Spare Parts				
			øD	ød	L	l	S	A.R.	R.R.	Clamp	Clamp Screw	Wrench	Shim	Shim Screw
MTE 9050	O	3	50	32	120	40	17	+13°	+3°	CP-8TE	W8X18	LW-4	MTE-42	SP3X8
9063	O	3	63						+5°					
9080-32	O	4	80					+16°	+6°					

●Applicable Inserts

Description	Applicable Inserts B15		
MTE 90...	TEKR 43PTER-S	TEKN 43PTTR 43PTFR	TEKN 43PTFR-NE 43PTFR (PCD)

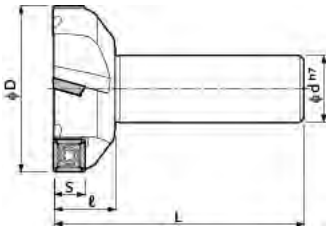
◆Recommended Cutting Conditions

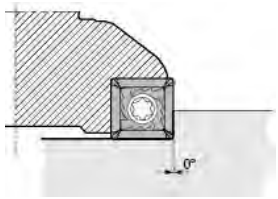
Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)												
		Cermet			MEGACOAT		PVD Coated Carbide						Carbide		PCD
		TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR1025	PR905	PW30	KW10	KPD001 (KPD010)
Stainless Steel	~0.008	-	☆ 400~656	☆ 400~656	★ 400~725	-	☆ 400~656	☆ 400~656	☆ 400~656	☆ 325~656	☆ 325~656	-	☆ 250~400	-	-
Carbon Steel	~0.010	☆ 492~725	★ 400~656	☆ 400~656	★ 400~820	-	☆ 400~656	☆ 400~656	☆ 400~656	☆ 325~600	☆ 325~600	-	☆ 250~492	-	-
Alloy Steel	~0.010	☆ 400~656	★ 325~600	☆ 325~600	★ 325~725	-	☆ 325~600	☆ 325~600	☆ 325~600	☆ 250~492	-	-	☆ 250~492	-	-
Mold Steel	~0.008	☆ 400~656	★ 325~600	☆ 325~600	★ 250~600	-	☆ 250~492	☆ 250~492	☆ 250~492	☆ 197~427	-	-	☆ 250~492	-	-
Cast Iron	~0.010	-	-	-	-	★ 325~725	-	-	-	-	-	☆ 325~656	-	☆ 250~492	-
Non-ferrous Metals	~0.008	-	-	-	-	-	-	-	-	-	-	-	-	★ 325~984	★ 984~2625

★: 1st Recommendation ☆: 2nd Recommendation

● : Stock Std. ○ : World Express

MSO90-S Endmill





●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm) øD	ød	L	ℓ	S		Rake Angle (°) A.R.	R.R.	Spare Parts: Insert Screw	Spare Parts: Wrench	Applicable Inserts B18
MSO	9050-S32-15	O	3	50	32	120	30	13		+15°	-10°	SB-5085TR	DT-20	SEMM 150408PESR
	9063-S32-15	O	4	63							-9°			
	9080-S32-15	O		80							-8°			

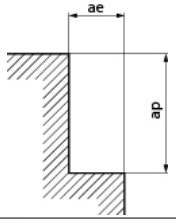
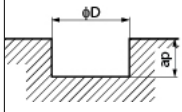
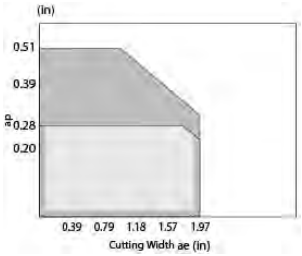
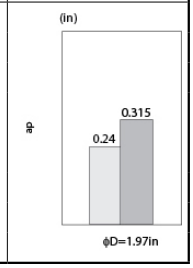
◆Recommended Cutting Conditions

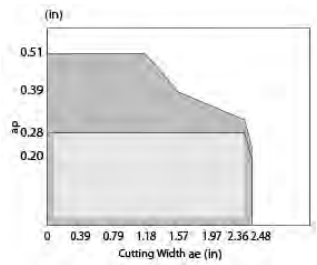
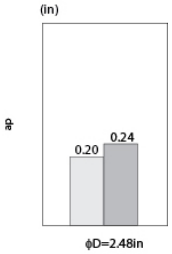
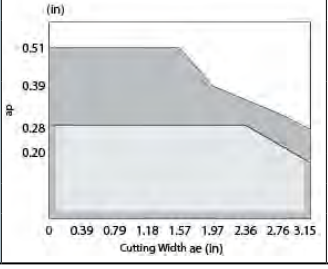
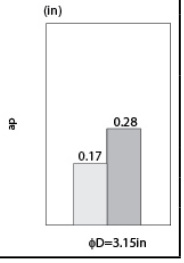
Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm) Cermet TN100M	MEGACOAT PR1225	MEGACOAT PR1210	PVD Coated Carbide PR630	PR730	PR830	PR660	PR1025	PR905	Carbide KW10
Stainless Steel	~0.008	☆ 400~656	★ 400~725	-	☆ 400~656	☆ 400~656	☆ 400~656	☆ 325~656	☆ 325~656	-	-
Carbon Steel	~0.008	★ 400~656	★ 400~820	-	☆ 400~656	☆ 400~656	☆ 400~656	☆ 325~600	☆ 325~600	-	-
Alloy Steel	~0.008	★ 325~600	★ 325~725	-	☆ 325~600	☆ 325~600	☆ 325~600	☆ 250~492	-	-	-
Mold Steel	~0.008	★ 325~600	★ 250~600	-	☆ 250~492	☆ 250~492	☆ 250~492	☆ 197~427	-	-	-
Cast Iron	~0.008	-	-	★ 325~725	-	-	-	-	-	☆ 325~656	☆ 250~492
Non-ferrous Metals	~0.008	-	-	-	-	-	-	-	-	-	★ 325~984

★: 1st Recommendation ☆: 2nd Recommendation

●Cutting Performance

[Cutting Conditions] Vc=328sfm, fz=0.006ipt, Dry

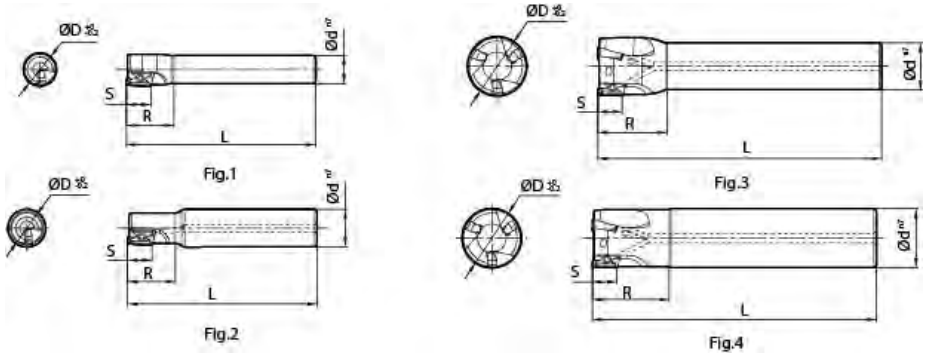
Workpiece Material	Shouldering	Slotting
S50C		
Description		
MSO-9050-S32-OO Insert Size 09 type 15 type		

Description	Shouldering	Slotting
MSO-9063-S32-OO Insert Size 09 type 15 type		
MSO-9080-S32-OO Insert Size 09 type 15 type		

● : Stock Std. ○ : World Express

MEC Endmill (inch-size)

(Cylindrical)



●Toolholder Dimensions (in)

Description			Stock	No. of Inserts	Dimension (in)					Rake Angle (°)		Coolant Hole	Drawing	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
					øD	ød	L	ℓ	S	A.R. (MAX)	R.R.			Insert Screw	Wrench		
Cylindrical	Standard Shank	MEC 0500-S500-11	●	1	0.500	0.500	2.650	0.787	0.400	12°	-21°	No	Fig.1	SB-2545TR	DTM-8	50800	BD□T 1103○○□R-J□ Page➡B20-B21
		MEC 0625-S500-11T	●	2	0.625	0.500	2.750	0.906	0.400	18°	-14°		Fig.3			43750	
		0625-S625-11T	●		0.625	0.625	3.000	1.024	0.400	18°	-14°		Fig.4			43750	
		0750-S625-11T	●	3	0.750	0.625	3.050	1.024	0.400	20°	-10°		Fig.3			41000	
		0750-S750-11T	●		0.750	0.750	3.250	1.142	0.400	20°	-10°		Fig.4			41000	
		1000-S750-11T	●		1.000	0.750	3.250	1.142	0.400	21°	-10°		Fig.3	SB-2555TRG	DTM-8	37500	BD□T 11T3○○□R-J□ Page➡B20-B21
		1000-S100-11T	●		1.000	1.000	3.750	1.260	0.400	21°	-10°		Fig.4			37500	
		1250-S100-11T	●	4	1.250	1.000	3.750	1.260	0.400	23°	-9°		Fig.3			33900	
		1250-S125-11T	●		1.250	1.250	4.000	1.575	0.400	23°	-9°		Fig.4			33900	
		1500-S125-11T	●	5	1.500	1.250	4.350	1.969	0.400	24°	-8°		Fig.3			30000	
		MEC 1000-S750-17	●	2	1.000	0.750	3.500	1.417	0.618	16°	-11°		Fig.3			35000	
		1000-S100-17	●		1.000	1.000	3.750	1.417	0.618	16°	-11°	Yes	Fig.4			35000	BD□T 1704○○□R-J□ Page➡B20-B21
		1250-S100-17	●	3	1.250	1.000	4.000	1.575	0.618	17°	-7°		Fig.3	SB-4070TRN	DTM-15	30000	
		1250-S125-17	●		1.250	1.250	4.000	1.575	0.618	17°	-7°		Fig.4			30000	
		1500-S125-17	●	4	1.500	1.250	4.350	1.969	0.618	19°	-7°		Fig.3			25000	
	Long Shank	MEC 0750-S750-5.2-11T	●	2	0.750	0.750	5.200	2.362	0.400	20°	-10°		Fig.4			41000	
		1000-S100-6.3-11T	●		1.000	1.000	6.300	2.362	0.400	21°	-10°		Fig.4	SB-2555TRG	DTM-8	37500	BD□T 11T3○○□R-J□ Page➡B20-B21
		1250-S125-7.9-11T	●		1.250	1.250	7.870	2.559	0.400	23°	-9°		Fig.4			33900	
		1500-S125-9.5-11T	●		1.500	1.250	9.450	2.559	0.400	23°	-8°		Fig.3			30000	
		MEC 1000-S100-6.3-17	●		1.000	1.000	6.300	2.362	0.618	16°	-11°		Fig.4			35000	BD□T 1704○○□R-J□ Page➡B20-B21
		1250-S125-7.9-17	●		1.250	1.250	7.870	2.559	0.618	17°	-7°		Fig.4	SB-4070TRN	DTM-15	30000	
		1500-S125-9.5-17	●		1.500	1.250	9.450	2.559	0.618	17°	-7°		Fig.3			25000	

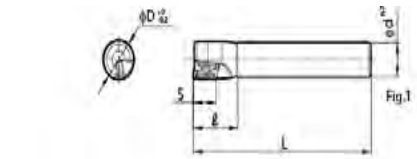
■Max. Revolution

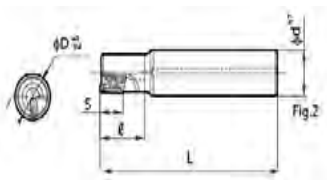
When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" on page E27.

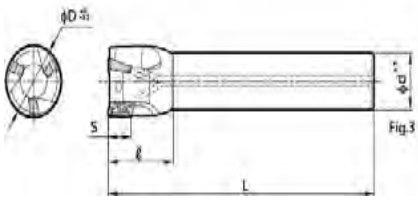
Recommended Cutting Conditions➡E27

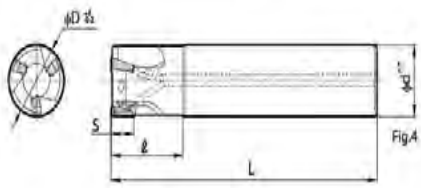
● : Stock Std. ○ : World Express

MEC Endmill (metric-size)









●Toolholder Dimensions (mm)

Description				Stock	No. of Inserts	Dimension (mm)					Rake Angle (°)		Coolant Hole	Drawing	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
						øD	ød	L	ℓ	S	A.R. (MAX)	R.R.			Insert Screw	Wrench		
Cylindrical	Standard Shank	MEC	10-S10-11	○	1	10	10	80	17	10	+10°	-24°	No Code	Fig.1	SB-2545TR	DTM-8	54,800	BD□T 11T3○○□R-J□ Page B20-B21
			10-S16-11	○			16						Yes	Fig.2				
			12-S10-11	○		12	10		20		+12°	-21°	No Code	Fig.1			50,800	
			12-S12-11	○			12											
			12-S16-11	○			16						Yes	Fig.2				
			13-S12-11	○		13	12					-19°	No Code	Fig.1			49,200	
			14-S12-11	○		14											47,700	
			14-S16-11	○			16						Yes	Fig.2				
		MEC	16-S12-11T	○	2	16	12	100	23	10	+18°	-14°	No Code	Fig.1	SB-2555TRG	DTM-8	43,750	
			17-S16-11T	○		17	16					-13°	Yes	Fig.3			43,500	
			18-S16-11T	○		18					+19°						43,000	
			19-S16-11T	○	3	19		110	26		+20°	-10°					42,000	
			20-S16-11T	○		20											41,000	
			21-S20-11T	○		21	20					-9°					40,300	
			22-S20-11T	○		22					+21°	-10°					39,600	
			24-S20-11T	○		24		120	29								38,200	
			25-S20-11T	○		25											37,500	
			28-S25-11T	○		28	25				+22°	-9°					125,800	
			30-S25-11T	○	4	30		130	32		+23°						34,800	
			32-S25-11T	○		32											33,900	
			40-S32-11T	○	5	40	32	150	50			-8°					30,000	
			50-S32-11T	○		50						-7°					22,500	
	Same Shank Size	MEC	16-S16-11T	○	2	16	16	100	30	10	+18°	-14°	Yes	Fig.4	SB-2555TRG	DTM-8	43,750	
			20-S20-11T	○	3	20	20	110			+20°	-10°					41,000	
			25-S25-11T	○		25	25	120	32		+21°						37,500	
			32-S32-11T	○	4	32	32	130	40		+23°	-9°					33,900	

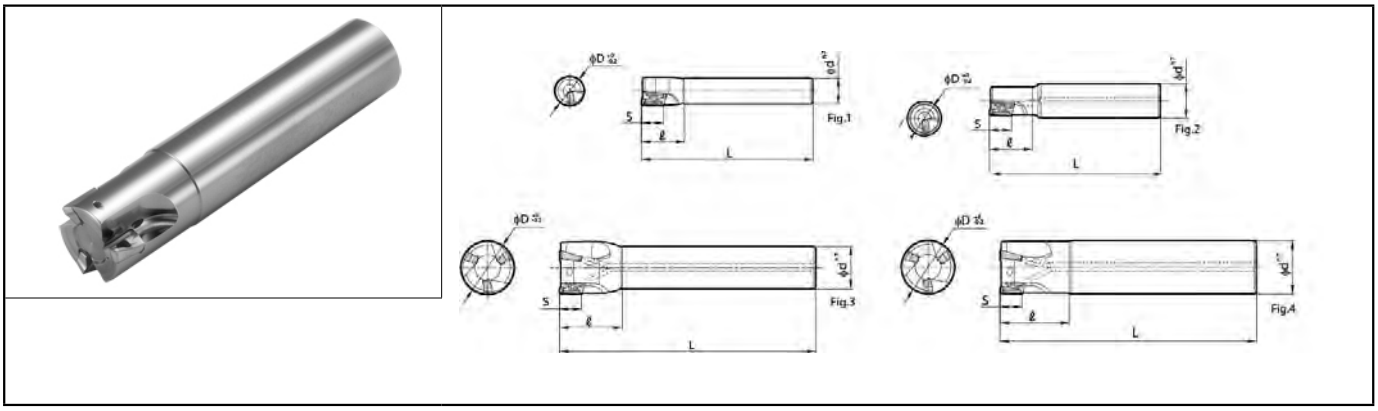
■Max. Revolution

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" on page E27.

Recommended Cutting Conditions E27

● : Stock Std. ○ : World Express

MEC Endmill (metric-size)



●Toolholder Dimensions (mm)

Description				Stock	No. of Inserts	Dimension (mm)					Rake Angle (°)		Coolant Hole	Drawing	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
						øD	ød	L	ℓ	S	A.R. (MAX)	R.R.			Insert Screw	Wrench		
Cylindrical	Long Shank	MEC	20-S18-170-11T	○	2	20	18	170	30	10	+20°	-10°	Yes	Fig.3	SB-2555TRG	DTM-8	41,000	BD□T 11T3○○□R(-J□) Page B20-B21
			20-S20-140-11T	○			20	140	60					Fig.4				
			20-S20-170-11T	○				170										
			22-S20-170-11T	○		22			30		+21°			Fig.3			39,600	
			25-S23-210-11T	○		25	23	210	32								37,500	
			25-S25-160-11T	○			25	160	60					Fig.4				
			25-S25-210-11T	○				210										
			28-S25-210-11T	○		28			32		+22°	-9°		Fig.3			125,800	
			32-S30-250-11T	○		32	30	250	40		+23°						33,900	
			32-S32-200-11T	○			32	200	65					Fig.4				
			32-S32-250-11T	○				250										
			125-S32-250-11T	○		125			40					Fig.3			32,600	
			40-S32-240-11T	○		40		240	65			-8°					30,000	
	Standard	MEC	25-S20-17	○	2	25	20	120	36	15.7	+16°	-11°	Yes	Fig.3	SB-4070TRN	DTM-15	125,000	BD□T 1704○○□R(-J□) Page B20-B21
			32-S25-17	○	3	32	25	130	40		+17°	-7°					30,000	
			40-S32-17	○	4	40	32	150	50		+19°						25,000	
			50-S32-17	○		50											17,000	
	Same Shank Size	MEC	25-S25-17	○	2	25	25	120	36	15.7	+16°	-11°	Yes	Fig.4	SB-4070TRN	DTM-15	125,000	
			32-S32-17	○	3	32	32	130	40		+17°	-7°					30,000	
	Long Shank	MEC	25-S25-160-17	○	2	25	25	160	60	15.7	+16°	-11°	Yes	Fig.4	SB-4070TRN	DTM-15	125,000	
			25-S25-210-17	○				210										
			28-S25-210-17	○		28			36					Fig.3			32,500	
			32-S32-200-17	○		32	32	200	65		+17°	-7°		Fig.4			30,000	
			32-S32-250-17	○				250										
			125-S32-250-17	○		125			40					Fig.3			27,700	
			40-S32-240-17	○		40		240	65		+19°						25,000	

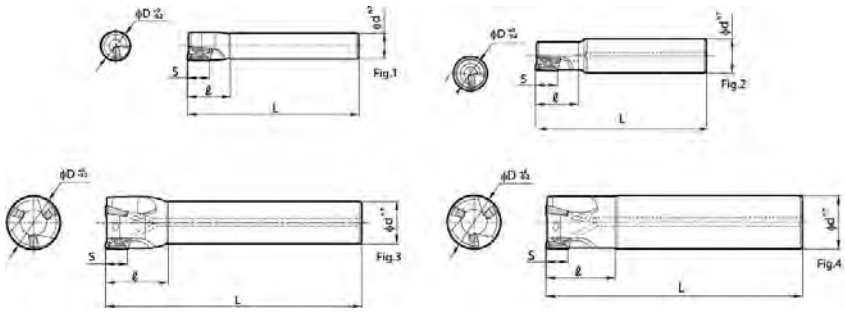
■Max. Revolution

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" on page E27.

Recommended Cutting Conditions E27

● : Stock Std. ○ : World Express

MEC Endmill (metric-size)



●Toolholder Dimensions (mm)

Description			Stock	No. of Inserts	Dimension (mm)					Rake Angle (°)		Coolant Hole	Drawing	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
					øD	ød	L	ℓ	S	A.R. (MAX)	R.R.			Insert Screw	Wrench		
Weldon	Long Shank	MEC 10-W10-1103	△	1	10	10	60	17	10	+10°	-24°	-	Fig.2	SB-2545TR	DTM-8	54,800	BDMT 1103○○ER-J□ Page B20-B21
		10-W16-1103-H	△			16	68					Yes	Fig.4				
		12-W10-1103	△		12	10	60	20		+12°	-21°	-	Fig.2			50,800	
		12-W16-1103-H	△			16	68					Yes	Fig.4				
		14-W12-1103	△		14	12				+12°	-19°	-	Fig.2			47,700	
		14-W16-1103-H	△			16						Yes	Fig.4				
		MEC 16-W12-11T3	△	2	16	12	68	23	10	+18°	-14°	-	Fig.2	SB-2555TRG	DTM-8	43,750	BD□T 11T3○○□R(-J□) Page B20-B21
		18-W16-11T3-H	△		18	16				+19°	-13°	Yes	Fig.6			43,000	
		20-W16-11T3-H	△	3	20			25		+20°	-10°					41,000	
		22-W20-11T3-H	△		22	20	81	26		+21°						39,600	
		25-W20-11T3-H	△		25			29								37,500	
		28-W25-11T3-H	△		28		88			+22°	-9°		Fig.7			35,800	
		30-W25-11T3-H	△	4	30	25		32		+23°						34,800	
		32-W25-11T3-H	△		32											33,900	
		40-W32-11T3-H	△	5	40	32	110	50			-8°					30,000	
	Standard	MEC 16-W16-11T3-H	△	2	16	16	68	25	10	+18°	-14°	Yes	Fig.9	SB-2555TRG	DTM-8	43,750	
		20-W20-11T3-H	△	3	20	20	81	30		+20°	-10°					41,000	
		25-W25-11T3-H	△		25	25	88	32		+21°			Fig.10			37,500	
		32-W32-11T3-H	△	4	32	32	100	40		+23°	-9°					33,900	
		MEC 25-W20-1704-H	△	2	25	20	86	36	15.7	+16°	-11°	Yes	Fig.6	SB-4070TRN	DTM-15	35,000	BD□T 1704○○□R(-J□) Page B20-B21
		32-W25-1704-H	△	3	32	25	92			+17°	-7°		Fig.7			30,000	
		40-W32-1704-H	△	4	40	32	110	50		+19°						25,000	
		MEC 25-W25-1704-H	△	2	25	25	92	36	15.7	+16°	-11°	Yes	Fig.10	SB-4070TRN	DTM-15	35,000	
		32-W32-1704-H	△	3	32	32	100	40		+17°	-7°					30,000	

●MEC Applicable Inserts

Description	Applicable Inserts B20-B21			Applicable Inserts B27
				
MEC·····11 MEC·····1103	BDMT 1103OOER-JT	BDMT 1103OOER-JS	-	-
MEC·····11T MEC·····11T03	BDMT 11T3OOER-JT	BDMT 11T3OOER-JS	BDGT 11T3OOFR-JA	BDMT 11T3OOFR (PCD)
MEC·····17 MEC·····1704	BDMT 1704OOER-JT	BDMT 1704OOER-JS	BDGT 1704OOFR-JA	BDMT 1704OOFR (PCD)

Recommended Cutting Conditions E27

△ : Made to Order

Shouldering | Slotting | Facing

MEC Face Mill (inch-size)

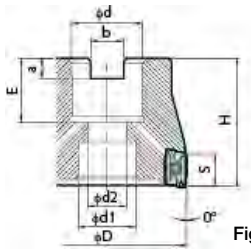


Fig.1

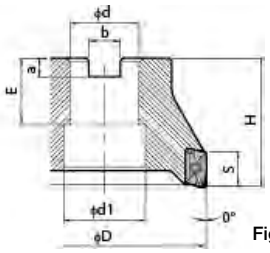


Fig.2

Rake Angle (°)
11Type A.R.(MAX): +23° R.R. : -7°
17Type A.R.(MAX): +17° R.R. : -7°

●Dimensions

		Stock	No. of Inserts	Dimension (in)									Coolant Hole	Drawing	Weight (kg)	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
				øD	ød	ød1	ød2	H	E	a	b	S				Insert Screw	Wrench		
MEC	1500R-11T-5T	●	5	1.500		0.63			0.807						0.2			30,700	
	2000R-11T-5T	●	5	2.000	0.750	0.646	0.417	1.575	0.819	0.188	0.312				0.3			22,300	BD□T
	2500R-11T-6T	●	6	2.500		0.63			0.819			0.400	Yes	1	0.7	SB-2555TRG	DTM-8	20,400	11T3○○□R-J□
	3000R-11T-7T	●	7	3.000	1.000	0.827	0.555	1.969	0.878	0.223	0.375				1.0			18,500	Page B20-B21
	4000R-11-9TN	●	9	4.000	1.500	1.969	-	2.48	1.654	0.375	0.625				1.6			16,800	
MEC	2000R-17-4T	●	4	2.000	0.750	0.646	0.417	1.575	0.819	0.188	0.312				0.4			16,800	BD□T
	2500R-17-5T	●	5	2.500		0.646			0.819			0.618	Yes	1	0.8	SB-4070TRN	DTM-15	14,400	1704○○□R-J□
	3000R-17-6T	●	6	3.000	1.000	0.827	0.555	1.969	0.878	0.223	0.375				1.0			12,250	Page B20-B21
	4000R-17-7TN	●	7	4.000	1.500	1.969	-	2.48	1.654	0.375	0.625			2	1.8			10,400	

■**Max. Revolution**

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" on page E27.

Recommended Cutting Conditions E27

E

0° Lead Angle

● : Stock Std. ○ : World Express

MEC Face Mill (metric-size)

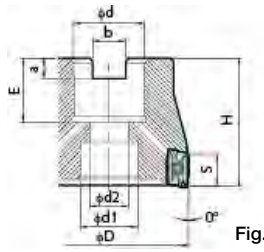


Fig.1

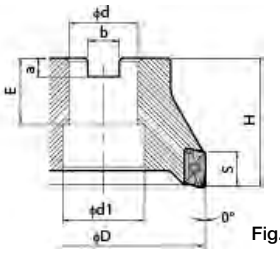


Fig.2

Rake Angle (°)
11Type A.R.(MAX): +23° R.R. : -7°
17Type A.R.(MAX): +19° R.R. : -7°

●Dimensions

Description			Stock	No. of Inserts	Dimension (mm)									Coolant Hole	Drawing	Weight (kg)	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
					øD	ød	ød1	ød2	H	E	a	b	S				Insert Screw	Wrench		
Bore Dia. Metric spec	Standard	MEC 040R-11-5T-M	○	5	40	16	14	8.5	40	20	5.5	8.5	10	Yes	Fig.1	0.2	SB-2555TRG	DTM-8	30,000	BD□T 11T3○○□R-J□ Page B20-B21
		050R-11-5T-M	○	5	50	22	18	12		22	6.3	10.4				0.3			22,500	
		063R-11-6T-M	○	6	63											0.7			20,500	
		080R-11-7T-M	○	7	80	27	20	14	50	26	7	12.4				1.0			18,500	
		100R-11-9TN	○	9	100	32	26	17.6	55		8	14.4				1.6			17,000	
		125R-11-11T-M	○	11	125	40	45	32	63	33	9.5	16.4				3.1			15,000	
		160R-11-14T-M	○	14	160		68	-						No	Fig.2	4.5			13,900	
	Standard	MEC 040R-17-4T-M	○	4	40	16	14	8.5	40	20	5.5	8.5	15.7	Yes	Fig.1	0.3	SB-4070TRN	DTM-15	25,000	BD□T 1704○○□R-J□ Page B20-B21
		050R-17-4T-M	○	4	50	22	18	12		22	6.3	10.4				0.4			17,000	
		063R-17-5T-M	○	5	63											0.6			14,500	
		080R-17-6T-M	○	6	80	27	20	14	50	26	7	12.4				1.0			12,000	
		100R-17-7TN	○	7	100	32	26	17.6	55		8	14.4				1.8			10,500	
		125R-17-9T-M	○	9	125	40	45	32	63	33	9.5	16.4				3.1			8,900	
		160R-17-12T-M	○	12	160		68	-						No	Fig.2	4.5			7,400	
Bore Dia. Inch spec	Coarse pitch	MEC 063R-11-6T	○	6	63	25.4	20	14	50	26	6	9.5	10	Yes	Fig.1	0.8	SB-2555TRG	DTM-8	20,500	BD□T 11T3○○□R-J□ Page B20-B21
		080R-11-7T	○	7	80											1.0			18,500	
		100R-11-9TN	○	9	100	31.75	26	17.6	63	32	8	12.7				1.8			17,000	
		125R-11-11T	○	11	125	38.1	45	32		38	10	15.9				3.4			15,000	
		160R-11-14T	○	14	160	50.8	70	-		47	10	19.1			Fig.2	4.4			13,900	
	Fine pitch	MEC 063R-11-8T	○	8	63	25.4	20	14	50	26	6	9.5	10	Yes		0.8	SB-2555TRG	DTM-8	20,500	
		080R-11-10T	○	10	80											1.0			18,500	
	Coarse pitch	MEC 063R-17-5T	○	5	63	25.4	20	14	50	26	6	9.5	15.7	Yes	Fig.1	0.8	SB-4070TRN	DTM-15	14,500	BD□T 1704○○□R-J□ Page B20-B21
		080R-17-6T	○	6	80											1.0			12,000	
		100R-17-7TN	○	7	100	31.75	26	17.6	63	32	8	12.7				1.8			10,500	
		125R-17-9T	○	9	125	38.1	45	32		38	10	15.9				3.4			8,900	
		160R-17-12T	○	12	160	50.8	70	-		47	10	19.1			Fig.2	4.5			7,400	
	Fine pitch	MEC 063R-17-6T	○	6	63	25.4	20	14	50	26	6	9.5	15.7	Yes	Fig.1	0.8	SB-4070TRN	DTM-15	14,500	
		080R-17-8T	○	8	80											1.0			12,000	
		100R-17-9TN	○	9	100	31.75	26	17.6	63	32	8	12.7				1.8			10,500	

■**Max. Revolution**

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" on page E27.

Recommended Cutting Conditions E27

● : Stock Std. ○ : World Express

●When using Center-through Air / Coolant / Mist

If Center Through air (Coolant, Mist) is used, please use appropriate arbor and clamp with arbor bolt. (Table1)

●MEC's surface finish when shouldering with multiple passes

In order to obtain smoothly finished shoulder wall by multiple passes of MEC Milling Cutter, please keep ap less than 0.217" (5.5mm) for 11T3 type insert and also keep ap less than 0.354" (9mm) for 1704 type insert.

Table1

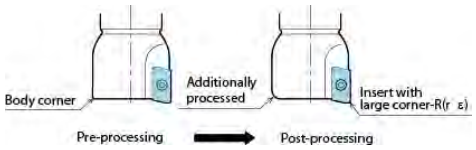
Toolholder	Arbor clamp bolt (Attachment)	Wrench
MEC040R·····M	HH8×25H	LW-5 (Double width 5mm)
MEC050R·····M **MEC063R·····M**	HH10×30H	LW-6 (Double width 6mm)
MEC063R···· **MEC080R····**	HH12×35H	LW-8 (Double width 8mm)
MEC100R·····(M) N	HH16×52H	LW-12 (Double width 12mm)
MEC125R·····(M) **MEC160R·····M**	HF20×53H	LW-14 (Double width 14mm)
MEC160R····	HF24×60H	LW-17 (Double width 17mm)
MEC1500···· ~ **MEC2500····**	HH3/8-1.25H	
MEC3000····	HH1/2-1.25H	
MEC4000····	HH3/4-2.30H	

Wrench is not included. Please purchase separately.

■ When using inserts with corner-R(rε)1.6 or larger, additional modifications of the cutter body will be necessary. Ref. to the chart below for the recommended modifications.

Insert Corner-R(rε)	Additional modifications of the cutter body corner
1.6	R1.0
2.0	
2.4	R1.2
3.1	R1.6
4.0	R2.5

* R shape is recommended for additional processing to the body corner.
When applying chamfer shaped additional processing, do not cut away too much.



E

0° Lead Angle

●MEC Applicable Inserts

Description	Applicable Inserts ➡B20-B21			Applicable Inserts ➡B27
				
MEC·····-11 **MEC·····-1103**	BDMT 1103OOER-JT	BDMT 1103OOER-JS	-	-
MEC·····-11T **MEC·····-11T03**	BDMT 11T3OOER-JT	BDMT 11T3OOER-JS	BDGT 11T3OOFR-JA	BDMT 11T3OOFR
MEC·····-17 **MEC·····-1704**	BDMT 1704OOER-JT	BDMT 1704OOER-JS	BDGT 1704OOFR-JA	BDMT 1704OOFR

Recommended Cutting Conditions ➡E27

Recommended Cutting Conditions (MEC Endmill / Face Mill)

·JT Chipbreaker

Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed: sfm)				
	Holder		Cermet	MEGACOAT		PVD Coated Carbide	
	MEC0500~MEC0750 MEC10~MEC19	MEC1000~MEC1500 MEC20~MEC40 MEC1500R~MEC4000R MEC040R~MEC160R	TN100M	PR1225	PR1210	PR830	PR905
Stainless Steel	0.002~0.003~0.004	0.003~0.005~0.006	-	☆ 325~525~656	-	☆ 325~560~600	-
Carbon Steel	0.002~0.004~0.006	0.003~0.006~0.010	☆ 400~525~656	★ 400~600~820	-	☆ 400~525~656	-
Alloy Steel	0.002~0.004~0.005	0.003~0.006~0.008	☆ 325~560~600	★ 325~525~725	-	☆ 325~560~600	-
Mold Steel	0.002~0.003~0.004	0.003~0.005~0.008	☆ 250~400~492	★ 250~560~600	-	☆ 250~400~492	-
Gray Cast Iron	0.002~0.004~0.006	0.003~0.007~0.010	-	-	★ 400~600~820	-	☆ 325~560~600
Nodular Cast Iron	0.002~0.003~0.004	0.003~0.006~0.008	-	-	★ 325~492~656	-	☆ 250~400~525
Titanium Alloys	0.002~0.003~0.004	0.003~0.006~0.008	-	-	★ 98~164~225	-	☆ 75~115~164

* Cutting with coolant is recommended for Titanium Alloy.

★: 1st Recommendation ☆: 2nd Recommendation

·JS Chipbreaker

Workpiece Material	fz (ipt)		Insert Grades (Cutting Speed: sfm)		
	Holder		MEGACOAT	PVD Coated Carbide	
	MEC0500~MEC0750 MEC10~MEC19	MEC1000~MEC1500 MEC20~MEC40 MEC1500R~MEC4000R MEC040R~MEC160R	PR1225	PR830	PR1025
Stainless Steel	0.002~0.003~0.004	0.003~0.004~0.005	★ 400~600~820	☆ 325~450~600	☆ 325~450~600
Carbon Steel	0.002~0.004~0.005	0.003~0.006~0.007	★ 400~600~820	☆ 400~525~656	☆ 325~400~500
Alloy Steel	0.002~0.003~0.004	0.003~0.005~0.006	★ 325~525~725	☆ 325~450~600	-
Mold Steel	0.002~0.003~0.004	0.003~0.004~0.005	★ 250~450~600	☆ 250~400~500	-

★: 1st Recommendation ☆: 2nd Recommendation

· JA Chipbreaker

Workpiece Material	fz (ipt)	Insert Grades (Cutting Speed: sfm)
		Carbide
		GW25
Aluminium Alloys (Si 13% or below)	0.002~0.012	656~2625
Aluminium Alloys (Si 13% or above)	0.002~0.008	656~984

· PCD

Workpiece Material	fz (ipt)	Insert Grades (Cutting Speed: sfm)
		PCD
		KPD230 (KPD001)
Aluminium Alloys (Si 13% or bellow)	0.002~0.012	1640~4921
Aluminium Alloys (Si 13% or above)	0.002~0.006	984~3280

Warning Please observe below precautions fully. Failure to observe the precautions may cause serious damage to human body.

Warning about Max. Revolution indicated on main body

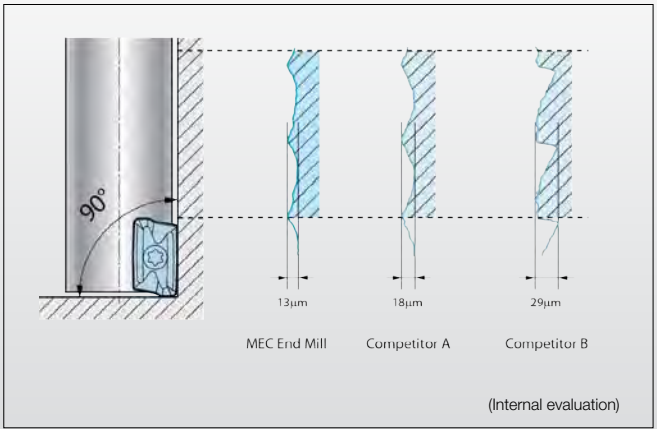
1. When running the endmill and the face mill at revolutions exceeding the maximum revolution limit, the inserts or toolholder may be damaged due to the centrifugal force.
2. For actual practical revolution, please set within recommended cutting condition.
3. When using at a higher revolution (over 10,000min^{-1}), refer to the table to adjust the balance of MEC and suitable arbor.

Max. Revolution (min^{-1})	Balance quality grade G ISO 1940-1 / 8821 (JIS B0905)
~20,000	G16
~30,000	G6.3
30,000~	G2.5

●Features of MEC

●Perfect 90° Shoulders

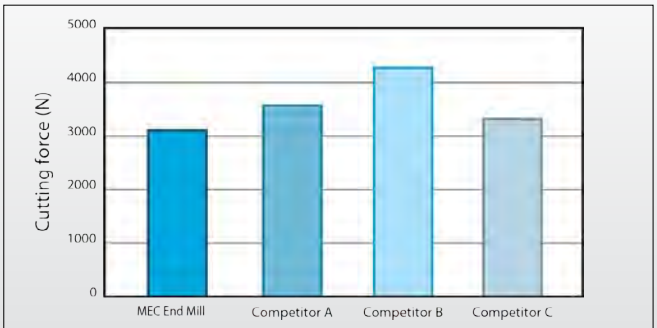
<Cutting Surface Comparison>



(Internal evaluation)

●Low cutting force

<Cutting Force Comparison>

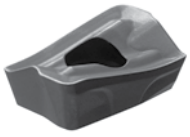


Tool diameter ø0.787in 1049
Vc=328sfm Shouldering ap×ae=0.354×0.3936in
fz=0.008ipt Dry (In house evaluation)

(Internal evaluation)

■Chipbreaker

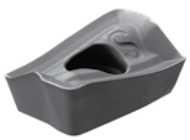
●JT Chipbreaker (General Purpose)



●JA Chipbreaker (For Aluminum)

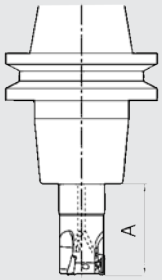
●Low cutting force JS chipbreaker

Cutting force 20% lower

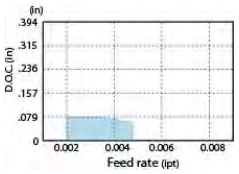
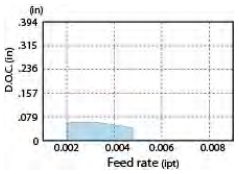
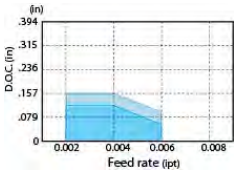
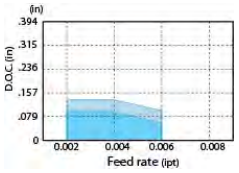
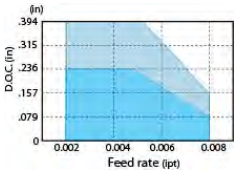
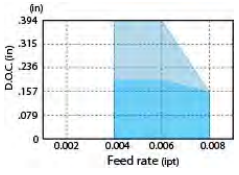
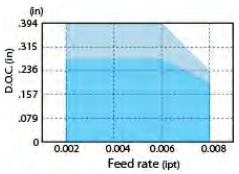
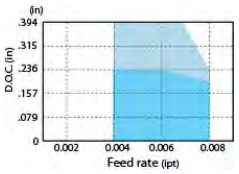
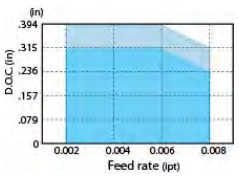
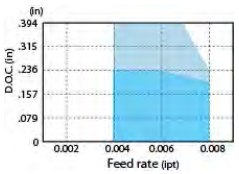
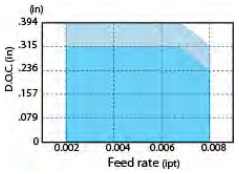
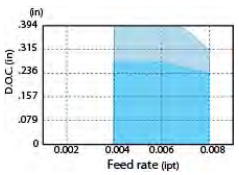


■ Cutting Performance of MEC Endmill

(1) Overhang Length When Using BDMT 11mm-type Insert
(Standard / Straight Shank)

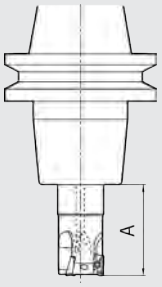
Cutting Dia.	Description (mm / in)	Overhang Length A (in)		Shape
ø8mm	MEC10-S10-11	0.670	-	
ø12mm	MEC0500... MEC12-S16-11	0.787	1.180	
ø16mm ø0.625in	MEC0625-S625-11T MEC16-S16-11T	1.180	1.790	
ø0.750in ø20mm	MEC0750-S750-11T MEC20-S20-11T	1.180	1.790	
ø1.000in ø25mm	MEC1000-S100-11T MEC25-S25-11T	1.260	1.890	
ø1.250in ø32mm	MEC1250-S125-11T MEC32-S32-11T	1.580	2.360	

(JT chipbreaker Vc=400 SFM Workpiece :1049)

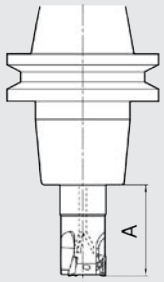
Description	■ Shouldering (Cutting width ae = øD/2)	■ Slotting ■ Ramping and Helical Milling
MEC10-S10-11		
MEC0500... MEC12-S16-11		
MEC0625-S625-11T MEC16-S16-11T		
MEC0750-S750-11T MEC20-S20-11T		
MEC1000-S100-11T MEC25-S25-11T		
MEC1250-S125-11T MEC32-S32-11T		

(2) Overhang Length When Using BDMT 11mm-type Insert

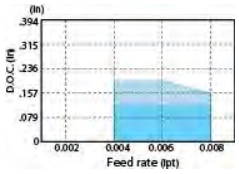
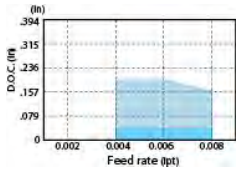
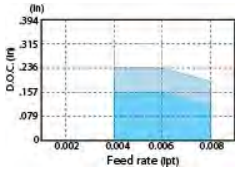
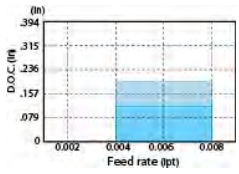
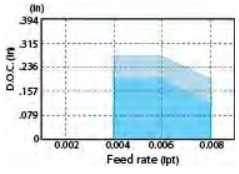
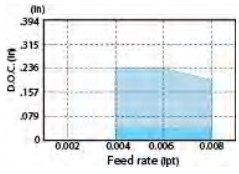
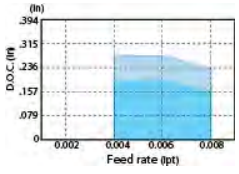
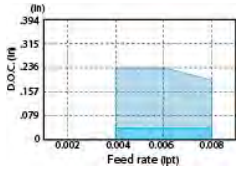
(Long Shank)

Cutting Dia.	Description	Overhang Length A (in)		Shape
ø0.750in ø20mm Long Shank	MEC20-S20-140-11T MEC0750-S750-5.2-11T	2.362	3.543	
ø1.000in ø25mm Long Shank	MEC25-S25-160-11T MEC1000-S100-6.3-11T	2.362	3.957	
ø1.250in ø32mm Long Shank	MEC32-S32-200-11T MEC1250-S125-7.9-11T	3.957	5.118	
ø1.500in ø40mm Long Shank	MEC40-S32-240-11T MEC1500-S125-9.5-11T	3.957	5.119	

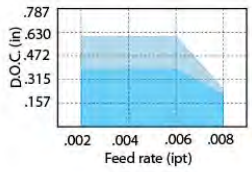
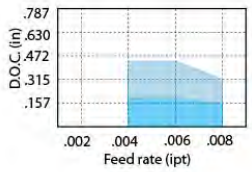
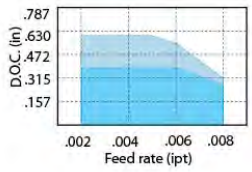
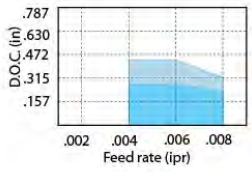
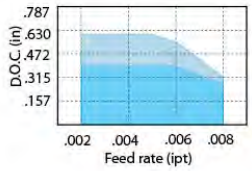
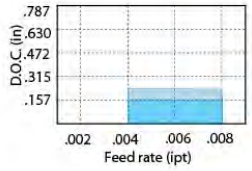
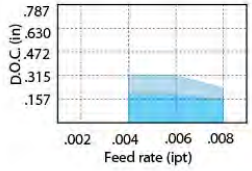
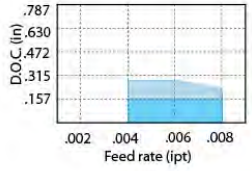
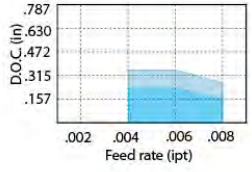
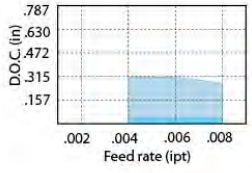
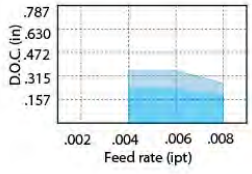
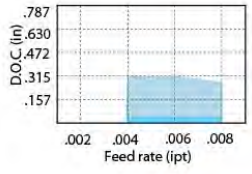
(3) Overhang Length When Using BDMT 17mm-type Insert

Cutting Dia.	Description	Overhang Length A (in)		Shape
ø1.000in ø25mm	MEC1000-S100-17 MEC25-S25-17	1.417	2.126	
ø1.250in ø32mm	MEC1250-S125-17 MEC32-S32-17	1.575	2.362	
ø1.500in ø40mm	MEC1500-S125-17 MEC40-S32-17	1.969	2.953	
ø1.000in ø25mm Long Shank	MEC1000-S100-6.3-17 MEC25-S25-160-17	2.362	3.937	
ø1.250in ø32mm Long Shank	MEC1250-S125-7.9-17 MEC32-S32-200-17	3.937	5.118	
ø1.500in ø40mm Long Shank	MEC1500-S125-9.5-17 MEC40-S32-240-17	3.937	5.118	

(JT chipbreaker Vc=400 SFM Workpiece :1049)

Description	■ Shouldering (Cutting width ae = øD/2)	■ Slotting ■ Ramping and Helical Milling
MEC0750-S750-5.2-11T MEC20-S20-140-11T Long Shank		
MEC1000-S100-6.3-11T MEC25-S25-160-11T Long Shank		
MEC1250-S125-7.9-11T MEC32-S32-200-11T Long Shank		
MEC1500-S125-9.5-11T MEC40-S32-240-11T Long Shank		

(JT chipbreaker Vc=400 SFM Workpiece :1049)

Description	■ Shouldering (Cutting width ae = øD/2)	■ Slotting ■ Ramping and Helical Milling
MEC1000-S100-17 MEC250S25-17		
MEC1250-S125-17 MEC32-S32-17		
MEC1500-S125-17 MEC40-S32-17		
MEC1000-S100-6.3-17 MEC25-S25-160-17		
MEC1250-S125-7.9-17 MEC32-S32-200-17		
MEC1500-S125-9.5-17 MEC40-S32-240-17		

E

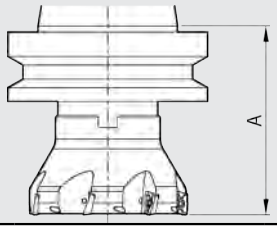
0° Lead Angle

Cutting Performance of MEC Milling Cutter

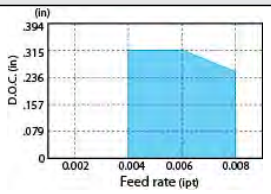
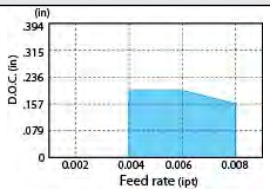
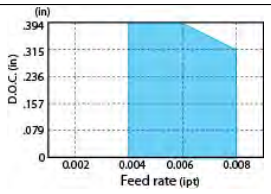
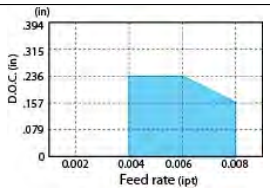
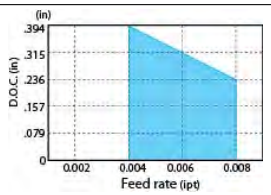
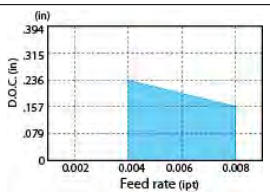
Overhang Length When Using BDMT 11mm-type Insert

Cutting Dia.	Description	Overhang Length A (in)
ø40mm ø1.500in	MEC1500R-11T-5T MEC040R-11-5T-M	4.528
ø50mm ø2.000in	MEC2000R-11T-5T MEC050R-11-OT-M	3.937
ø63mm ø2.500in	MEC2500R-11T-6T MEC063R-11-OT(-M)	3.740
	MEC063R-11-OT-M	
ø80mm ø3.000in	MEC3000R-11T-7T MEC080R-11-OT(-M)	3.740
ø100mm ø4.000in	MEC4000R-11-9TN MEC100R-11-9TN	4.252
ø125	MEC125R-11-11T(-M)	
ø160	MEC160R-11-14T(-M)	

Shape



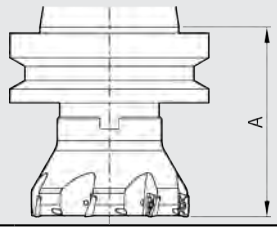
(JT chipbreaker Vc=400 SFM Workpiece :1049)

Description	■ Shouldering (Cutting width ae = øD/2)	■ Slotting
MEC1500R-11T-5T MEC040R-11-5T-M		
MEC2000R-○T-○T ~ MEC4000R-○T-○T MEC050R-11-○T-M ~ MEC100R-11-9TN MEC100R-11-9T-MN		
MEC125R-11-11T(-M) MEC160R-11-14T(-M)		

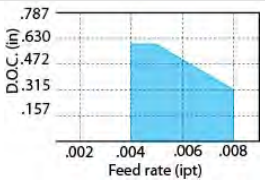
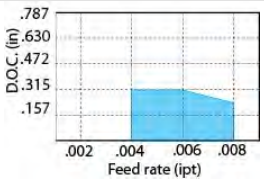
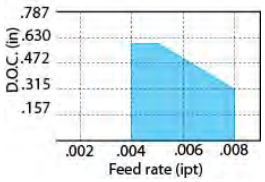
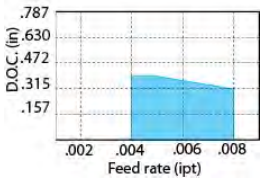
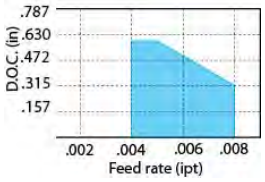
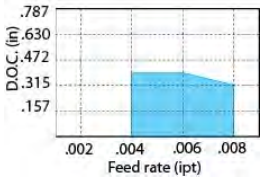
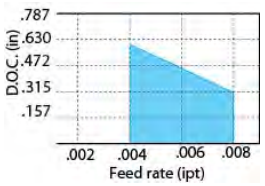
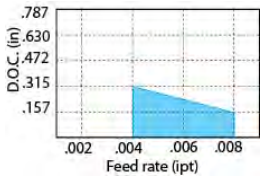
Overhang Length When Using BDMT 17mm-type Insert

Cutting Dia.	Description	Overhang Length A (mm)
ø40mm	MEC040R-17-4T-M	4.528
ø50mm ø2.000in	MEC2000R-17-4T MEC050R-17-OT-M	3.937
ø63mm ø2.500in	MEC2500R-17-4T MEC063R-17-OT	3.740
	MEC3000R-17-6T MEC063R-17-OT-M	
ø80mm ø3.000in	MEC4000R-17-7T MEC080R-17-OT	3.740
ø100mm ø4.000in	MEC100R-17-OTN	4.252
ø125mm	MEC125R-17-9T(-M)	
ø160mm	MEC160R-17-12T(-M)	

Shape



(JT chipbreaker Vc=400 SFM Workpiece :1049)

Description	■ Shouldering (Cutting width ae = øD/2)	■ Slotting
MEC040R-17-4T-M		
MEC2000R-17-4T MEC050R-17-○T-M		
MEC2500R-17-○T ~ MEC4000R-17-○TN MEC063R-17-○T(-M) ~ MEC100R-17-○TN MEC100R-17-7T-MN		
MEC125R-17-9T(-M) MEC160R-17-12T(-M)		

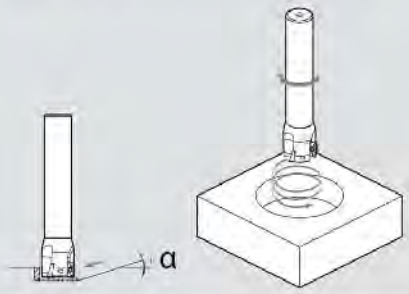
E

0° Lead Angle

Ramping, Helical milling and Vertical milling

Ramping, Helical Milling

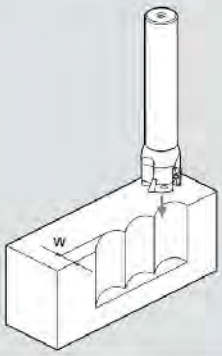
• Ramping angle should be under α °



Cutting diameter	Applicable Insert	Max. ramping angle (α°)
.625	BDMT 11T3	3°
.750		5°
1.00		2.5°
1.25		1.5°
1.50		.7°
1.00	BDMT 1704	8°
1.25		5°
1.50		2.5°

BDMT 1103 insert not recommended for slant or helical milling

Vertical Milling



Cutting diameter	Applicable Insert	Max. D.O.C. (W)
.625"	BDMT 11T3	.060
.750 / 4.00"	BDMT 11T3	.197
.250 / 4.00"	BDMT 1704	.315

BDMT 1103 insert not recommended for vertical milling

Shouldering | Slotting | Facing

MECX Endmill

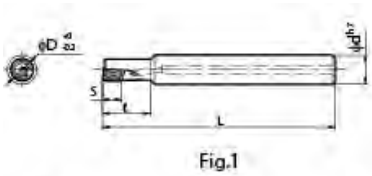


Fig.1

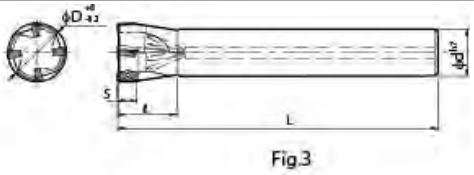


Fig.3

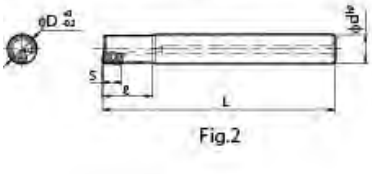


Fig.2

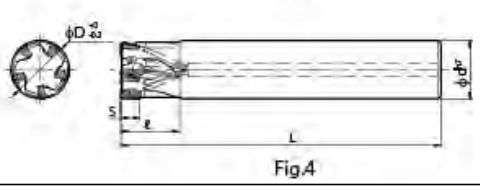


Fig.4

●Toolholder Dimensions (inch-size)

Description			Stock	No. of Inserts	Dimension (in)					Rake Angle (°)		Coolant Hole	Drawing	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
					øD	ød	L	ℓ	S	A.R. (MAX)	R.R.			Insert Screw	Wrench		
Standard Shank	MECX	0375-S375-07-1T	●	1	0.375	0.375	3.00	0.669	0.236	12.8°	-19.7°	Yes	Fig.1	SB-2035TRG	DTM-6	47,150	BDMT 0703○○ER-J□ Page B20
		0500-S500-07-2T	●	2	0.500	0.500	3.27	0.709		14.3°	-12.9°					45,800	
		0625-S625-07-3T	●	3	0.625	0.625	3.50	0.787		16.3°	-11.3°		Fig. 2	SB-2042TRG		43,300	
		0750-S625-07-4T	●	4	0.750		4.00				-10.9°		Fig. 3			40,900	
		0750-S625-07-5T	●	5	0.750		4.00									40,900	
		0750-S750-07-4T	●	4	0.750	0.750	4.00						Fig. 2			40,900	
		0750-S750-07-5T	●	5	0.750	0.750	4.00									40,900	
		1000-S100-07-5T	●		1.000	1.000	4.50	0.984			-9.5°		Fig. 2			36,900	
		1000-S100-07-7T	●	7	1.000	1.000	4.50									36,900	
		1000-S750-07-5T	●	5	1.000	0.750	4.50						Fig.3	SB-2042TRG	DTM-6	36,900	
		1000-S750-07-7T	●	7	1.000	0.750	4.50									36,900	
		1250-S125-07-6T	●	6	1.250	1.250	5.00	1.181			-8.9°		Fig.2	SB-2035TRG	DTM-6	33,700	
		1250-S125-07-8T	●	8	1.250	1.250	5.00	1.181			-8.9°		Fig.4			33,700	
Long Shank	MECXL	0625-S625-07-3T	●	3	0.625	0.625	5.10	2.175	0.236	16.3°	-11.3°	Yes	Fig.4	SB-2042TRG	DTM-6	43,300	
		0750-S750-07-4T	●	4	0.750	0.750	5.50	2.362			-10.9°					40,900	
		1000-S100-07-5T	●	5	1.000	1.000	6.30	2.362			-9.5°					36,900	
		1250-S125-07-6T	●	6	1.250	1.250	7.90	2.559			-8.9°					33,700	

●Toolholder Dimensions (metric-size)

Description			Stock	No. of Inserts	Dimension (mm)					Rake Angle (°)		Coolant Hole	Drawing	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
					øD	ød	L	ℓ	S	A.R. (MAX)	R.R.			Insert Screw	Wrench		
Standard Shank	Standard	MECX 08-S10-07-1T	○	1	8	10	80	16	6	11.7°	-24.0°	Yes	Fig.1	SB-2035TRG	DTM-6	48,100	BDMT 0703○○ER-J□ Page B20
		14-S12-07-2T	○	2	14	12		18		16.3°	-12.1°		Fig.3			44,800	
		17-S16-07-3T	○	3	17	16	100	20			-11.0°			SB-2042TRG		42,400	
		18-S16-07-3T	○		18						-10.9°					41,600	
		20-S16-07-4T	○	4	20		110				-10.4°					40,200	
		21-S20-07-4T	○		21	20					-10.1°					39,500	
		25-S20-07-5T	○	5	25		120	25			-9.7°					37,000	
		26-S25-07-5T	○		26	25					-9.5°					36,500	
		33-S32-07-6T	○	6	33	32	130	30			-8.8°					33,100	
	Fine pitch	MECX 20-S16-07-5T	○	5	20	16	110	20	6	16.3°	-10.4°	Yes	Fig.3	SB-2042TRG	DTM-6	40,200	
		25-S20-07-7T	○	7	25	20	120	25			-9.7°					37,000	
Same Shank	Standard	MECX 10-S10-07-1T	○	1	10	10	80	17	6	12.8°	-18.7°	Yes	Fig.2	SB-2035TRG	DTM-6	47,100	
		12-S12-07-2T	○	2	12	12		18		14.3°	-13.7°		Fig.4			46,200	
		16-S16-07-3T	○	3	16	16	100	20		16.3°	-11.3°			SB-2042TRG		43,200	
		20-S20-07-4T	○	4	20	20	110				-10.4°					40,200	
		25-S25-07-5T	○	5	25	25	120	25			-9.7°					37,000	
		32-S32-07-6T	○	6	32	32	130	30			-8.9°					33,600	
	Fine pitch	MECX 16-S16-07-4T	○	4	16	16	100	20	6	16.3°	-11.3°	Yes	Fig.4	SB-2042TRG	DTM-6	43,200	
		20-S20-07-5T	○	5	20	20	110				-10.4°					40,200	
		25-S25-07-7T	○	7	25	25	120	25			-9.7°					37,000	
		32-S32-07-8T	○	8	32	32	130	30			-8.9°					33,600	
Long Shank	Standard	MECX 17-S16-130-07-3T	○	3	17	16	130	20	6	16.3°	-11.0°	Yes	Fig.3	SB-2042TRG	DTM-6	42,400	
		21-S20-140-07-4T	○	4	21	20	140				-10.1°					39,500	
		26-S25-160-07-5T	○	5	26	25	160	25			-9.5°					36,500	
		33-S32-200-07-6T	○	6	33	32	200	30			-8.8°					33,100	

■Max. Revolution

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" in the next page.

Recommended Cutting Conditions E34

■For good shoulder finishes by MECX multistage ap.

In order to obtain smooth cutting wall surface by MECX multistage ap set ap within 0.197in for each cut.

● : Stock Std. ○ : World Express

MECX Face Mill

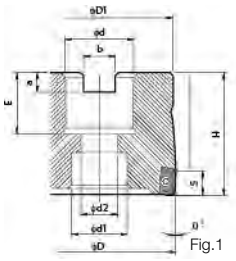


Fig.1

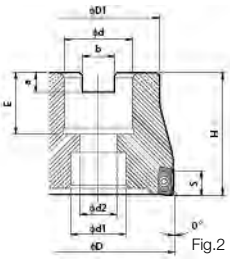


Fig.2

●Toolholder Dimensions (inch-size)

Description		Stock	No. of Inserts	Dimension (mm)									Rake Angle (°)		Coolant Hole	Drawing	Weight (kg)	Spare Parts			Max. Revolution (min⁻¹)	Applicable Inserts
				øD	ød	ød1	ød2	H	E	a	b	S	A.R. (MAX)	R.R.				Insert Screw	Wrench	Arbor Bolt		
MECX	1250R-07-8T	●	8	1.25	0.75	0.630	0.417	1.575	0.807	0.187	0.313	0.236	+7°	-8.9°	Yes	Fig.5	0.15	SB-2042TRG	DTM-6	HH 3/8-1.25H	33,600	BDMT 0703○○ER-J□ Page B20
	1500R-07-10T	●	10	1.50	0.75	0.630	0.417	1.575	0.807	0.187	0.313			-8.4°			0.25				30,500	
	2000R-07-12T	●	12	2.00	0.75	0.646	0.417	1.575	0.819	0.187	0.313			-8.3°		Fig.6	0.125				27,700	
	2500R-07-14T	●	14	2.50	0.75	0.630	0.417	1.575	0.819	0.187	0.313			-7.9°			0.50				24,900	

●Toolholder Dimensions (metric-size)

Description		Stock	No. of Inserts	Dimension (mm)									Rake Angle (°)		Coolant Hole	Drawing	Weight (kg)	Spare Parts		Max. Revolution (min⁻¹)	Applicable Inserts
				øD	øD1	ød	ød1	ød2	H	E	a	b	S	A.R. (MAX)	R.R.				Insert Screw	Wrench		
MECX	032R-07-8T-M	○	8	32	30	16	14	8.5	40	20	5.5	8.5	6	+16.3°	-8.9°	Yes	Fig.1	0.15	SB-2042TRG	DTM-6	33,600	BDMT 0703○○ER-J□ Page B20
	040R-07-10T-M	○	10	40	38	22	18	12		22	6.3	10.4			-8.4°			0.25			30,500	
	050R-07-12T-M	○	12	50	40										-8.3°		Fig.2	0.125			27,700	
	063R-07-14T-M	○	14	63											-7.9°			0.50			24,900	

Recommended Cutting Conditions E34

■ **Max. Revolution**

When running the endmill and cutter at the maximum revolution, the insert or toolholder may be damaged by centrifugal force. For more details, see "Warning" below

■ **For good shoulder finishes by MECX multistage ap.**

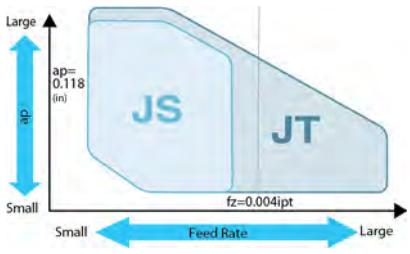
In order to obtain smooth cutting wall surface by MECX multistage ap set ap within 5mm for each cut.

■ **MECX032R comes with arbor screw (HH8X25H) and MECX040R/050R/063R comes with arbor bolt (HH10X30H).**

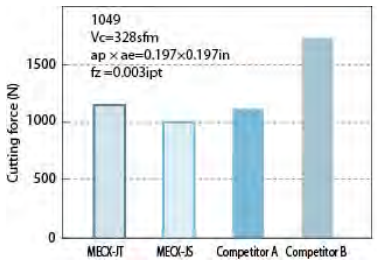
●Applicable Inserts

Description	Applicable Inserts B20	
		
MECX····07..	BDMT 0703○○ER-JT	BDMT 0703○○ER-JS

Selecting Chipbreaker



Cutting Force Comparison



Warning Please observe below precautions fully. Failure to observe the precautions may cause serious damage to human body.

Warning about Max. Revolution indicated on main body

1. When running the endmill and the face mill at revolutions exceeding the maximum revolution limit, the inserts or toolholder may be damaged due to the centrifugal force.
2. For actual practical revolution, please set within recommended cutting condition.
3. When using at a higher revolution (over 10,000min⁻¹), refer to the table to adjust the balance of MECX and suitable arbor.

Max. Revolution (min⁻¹)	Balance quality grade G ISO 1940-1 / 8821 (JIS B0905)
~20,000	G16
~30,000	G6.3
30,000~	G2.5

● : Stock Std. ○ : World Express

◆Recommended Cutting Conditions

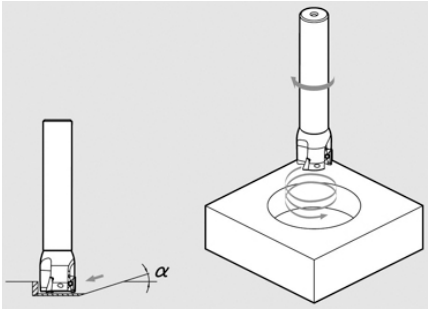
Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed Vc: sfm)				
	JS Chipbreaker	JT Chipbreaker	MEGACOAT		PVD Coated Carbide		
			PR1225	PR1210	PR830	PR1025	PR905
Stainless Steel	0.0012~0.0016~0.0020	0.0020~0.0024~0.0028	★ 400~600~820	-	-	☆ 325~525~656	-
Carbon Steel	0.0016~0.0031~0.0039	0.0024~0.0039~0.0047	★ 400~600~820	-	☆ 400~500~600	-	-
Alloy Steel	0.0016~0.0024~0.0031	0.0024~0.0031~0.0039	★ 325~525~725	-	☆ 325~450~600	-	-
Mold Steel	0.0016~0.0024~0.0031	0.0024~0.0031~0.0039	★ 250~450~600	-	☆ 250~400~500	-	-
Gray Cast Iron	0.0016~0.0031~0.0039	0.0031~0.0039~0.0059	-	★ 400~600~820	-	-	☆ 325~450~600
Nodular Cast Iron	0.0016~0.0024~0.0031	0.0031~0.0039~0.0047	-	★ 325~500~656	-	-	☆ 250~400~525
Titanium Alloys	0.0016~0.0024~0.0031	0.0031~0.0039~0.0047	-	★ 98~164~225	-	-	☆ 75~115~164

* Cutting with coolant is recommended for titanium alloys.

★: 1st Recommendation ☆: 2nd Recommendation

Slant Milling / Helical Milling

For the plunge depth per revolution when helical milling, refer to the cutting performance data for each tool. Use compressed air during machining.

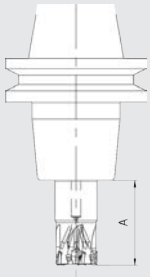


Cutting Dia. (in)	Applicable Insert	Max.Ramping Angle (α°)
ø.315	BDMT0703	Not Recommended
ø.400		1.5°
ø.472,ø.551		2°
ø.630		3°
ø.669,ø.709		1.5°
ø.787		2°
ø.827		1.8°
ø1.00		1.3°
ø1.02		1.2°
ø1.26		0.8°
ø1.30		0.5°

Cutting Performance of MECX Endmill

Cutting Dia.	Description	Overhang Length A (in)	
ø8mm	**MECX08-S10-07-1T**	0.630	-
ø0.375in ø10mm	**MECX0375-S375-07-1T MECX10-S10-07-1T**	0.670	-
ø0.500in ø12mm	**MECX0500-S500-07-2T MECX12-S12-07-2T**	0.709	1.18
ø0.625in ø16mm	**MECX0625-S625-07-4T MECX16-S16-07-3T**	0.787	1.57
ø0.750in ø20mm	**MECX0750-S750-07-4T MECX20-S20-07-4T**	0.787	1.57
ø1.000in ø25mm	**MECX1000-S100-07-5T MECX25-S25-07-5T**	1.000	1.97
ø1.250in ø32mm	**MECX1250-S125-07-6T MECX32-S32-07-6T**	1.180	1.97

Shape



* Machining with extended overhang length is not recommended for ø0.315in and ø0.394in.

* The cutting performance list shows applicable range of JT Chipbreaker (PR830) with Standard flute-number type.

For Multi-Edge type, use with 70% or less of ap.

*** Cutting conditions of JS Chipbreaker**

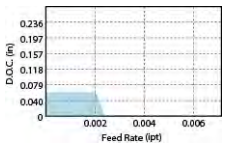
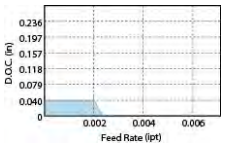
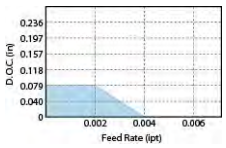
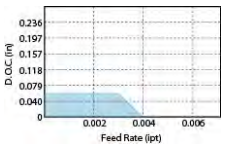
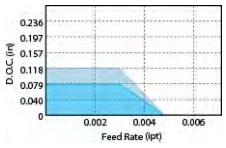
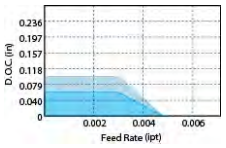
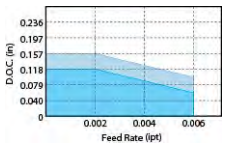
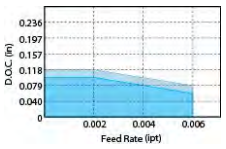
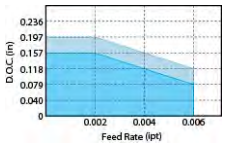
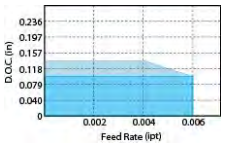
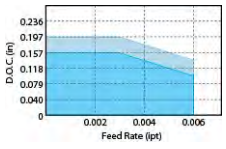
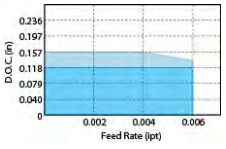
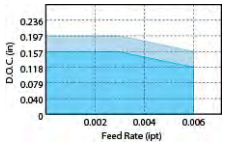
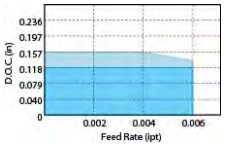
(1) For MECX0375~MECX0500 / MECX08~MECX12

Decrease the feed rate by 25% according to cutting capability list.

(2) For MECX 0625 / MECX16 and over

Decrease the feed rate and ap by 30% according to cutting capability list.

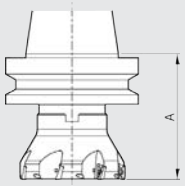
(JT chipbreaker Vc=400 SFM Workpiece :1049)

Description	■ Shouldering (Cutting width ae = øD/2)	■ Slotting ■ Ramping and Helical Milling
MECX08-S10-07-1T		
MECX0375-S375-07-1T MECX10-S10-07-1T		
MECX0500-S500-07-2T MECX12-S12-07-2T		
MECX0625-S625-07-4T MECX16-S16-07-3T		
MECX0750-S750-07-4T MECX20-S20-07-4T		
MECX1000-S100-07-5T MECX25-S25-07-5T		
MECX1250-S125-07-6T MECX32-S32-07-6T		

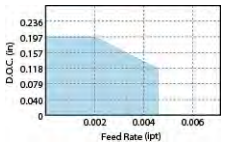
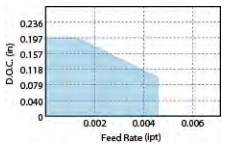
Cutting Performance of MECX Face Mill

Cutting Dia.	Description	Overhang Length A (in)
ø1.250in ø32mm	**MECX1250R-07-8T MECX032R-07-8T-M**	3.937
ø1.500in ø40mm	**MECX1500R-07-10T MECX040R-07-10T-M**	
ø2.000in ø50mm	**MECX2000R-07-12T MECX050R-07-12T-M**	
ø2.500in ø63mm	**MECX2500R-07-14T MECX063R-07-14T-M**	

Shape



(JT chipbreaker Vc=400 SFM Workpiece :1049)

Description	■ Shouldering (Cutting width ae = øD/2)
MECX032R-07-8T-M MECX040R-07-10T-M	
MECX050R-07-12T-M MECX063R-07-14T-M	

* Not Recommended for Slotting.

MECH Helical Endmill

Lineup

Replaceable Head MECH

MECH

Enhanced chip evacuation

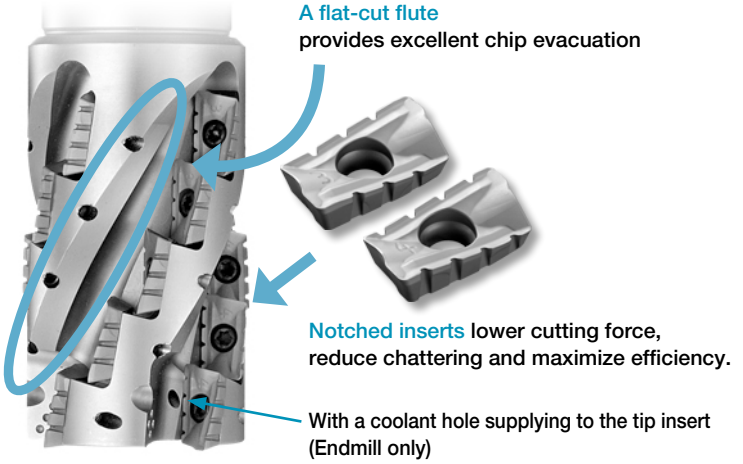
●Good Chip Evacuation

Notched insert breaks chips into small pieces

MECH

Competitor A

Workpiece Material: SS400
Vc=400sfm
ap×ae=1.575×0.394in
fz=0.005ipt
MECH032-S32-11-5-4T



A flat-cut flute
provides excellent chip evacuation

Notched inserts lower cutting force, reduce chattering and maximize efficiency.

With a coolant hole supplying to the tip insert (Endmill only)

High Efficiency Milling

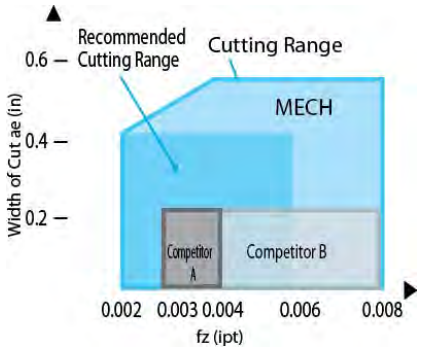
●High efficiency cutting with Multi-Edge design

Workpiece Material : S50C
Vc=400sfm(n=1200min^{-1}), ap=1.575,
ae=0.197~0.512in, fz=0.006ipt

MECH ⌀32 (4flute lines)	Competitor A (3 flute lines)	Competitor B (3 flute lines)
Improved productivity		
22.82in^3/min (Vf=28.35ipm, ae=0.512in) (Tripled chip evacuation)	6.59in^3/min (Vf=21.25ipm, ae=0.197in)	6.59in^3/min (Vf=25.25ipm, ae=0.197in)

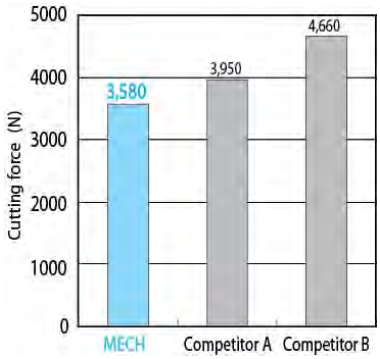
Low Cutting Force

●Low Cutting Force due to Notched Inserts



Workpiece Material: S50C
Vc=400sfm
ap×ae=1.575in×0.197~0.512in
fz=0.002 ~ 0.008ipt
MECH032-S32-11-5-4T

Cutting force (principal force)



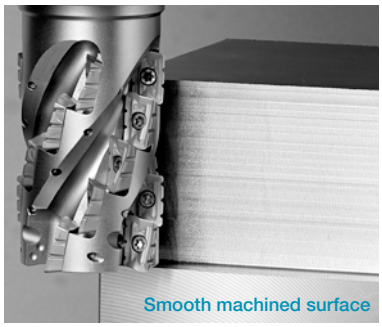
Workpiece Material: S50C
Vc=400sfm
ap×ae=1.575in×0.394in
fz=0.004ipt
MECH032-S32-11-5-4T

(Internal evaluation)

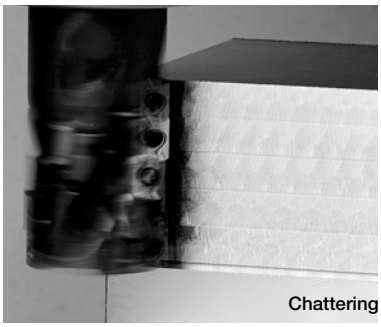
Reduced chattering

●Comparison of surface wall (Lateral surface)

Notched insert lowers and disperses cutting force, and enables high feed rates by reducing chattering.



MECH



Competitor A

Workpiece Material: S50C
Vc=400sfm
fz=0.005ipt
ap×ae=1.575×0.276in

(Internal evaluation)

■ PR1225, PR1230 and PR1210 (MEGACOAT) are now available.

●MEGACOAT (PVD Coated carbide)

Long tool life and high-speed milling due to superior toughness and high oxidation resistance

■ Replaceable Head MECH

●Minimizing cost on toolholder

1) The toolholder front piece (the first and second stage) can be separated from the body.
2) If the tip of head is damaged, you only need to replace the front piece.

Separate structure

The base unit is highly rigid in combination with BT50

Clamp Bolt

The front piece composed of the first and second stage can be separated

When assembled

The base unit and front piece are connected by the clamp bolt (HH...)

Shouldering | Slotting | Facing

MECH Endmill with Weldon Shank (with coolant hole for bottom insert)

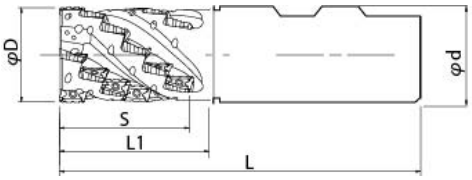


Fig.1

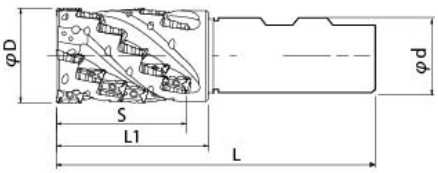


Fig.2

●Dimensions (inch-size)

Description	Stock	No. of Flutes	No. of Stages	No. of Inserts	Dimension (inch) øD	Dimension (inch) ød	Dimension (inch) L	Dimension (inch) L1	Dimension (inch) S	Rake Angle (°) A.R. (MAX)	Rake Angle (°) R.R.	Insert	Spare Parts: Insert Screw	Spare Parts: Wrench	Spare Parts: Anti-seize Compound	Applicable Inserts
MECH 1000-W1000-11-4-2T	●	2	4	8	1.00	1.00	4.17	1.81	1.46	+21°	-10°	Fig.1	SB-2555TRG	DTM-8	MP-1	BDMT11T308ER-N2 BDMT11T308ER-N3 Page B21
1250-W1250-11-5-2T	●		5	10	1.25	1.25	4.52	2.17	1.81		-9°					
1250-W1250-11-5-4T	●	4		20												
1500-W1250-11-6-4T	●		6	24	1.50		4.90	2.52	2.16	+23°	-8°	Fig.2				
1500-W1500-11-6-4T	●					1.50	5.28					Fig.1				
2000-W1500-11-7-4T	●		7	28	2.00		5.73	2.95	2.52		-7°	Fig.2				
2000-W1500-11-7-6T	●	6		42												
MECH 1500-W1250-17-4-2T	●	2	4	8	1.50	1.25	5.26	2.87	2.32	+19°	-7°	Fig.2	SB-4070TRN	DTM-15	MP-1	BDMT170408ER-N3 BDMT170408ER-N4
1500-W1500-17-4-2T	●					1.50	5.64					Fig.1				Page B21
2000-W1500-17-5-4T	●	4	5	20	2.00		6.26	3.46	2.91			Fig.2				

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Recommended Cutting Conditions E45

● : Stock Std. ○ : World Express

MECH Endmill with Cylindrical Shank (with coolant hole for bottom insert)

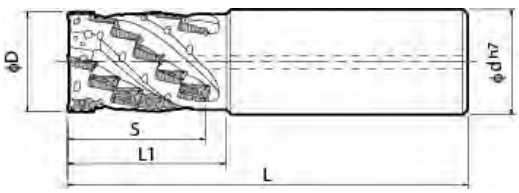


Fig.1

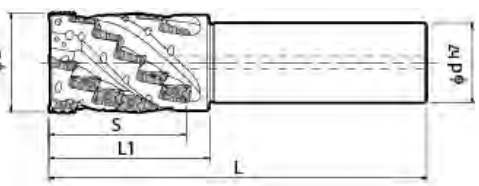


Fig.2

●Dimensions (metric-size)

Description	Stock	No. of Flutes	No. of Stages	No. of Inserts	Dimension (mm)					Rake Angle (°)		Insert	Spare Parts			Applicable Inserts
					øD	ød	L	L1	S	A.R. (MAX)	R.R.		Insert Screw	Wrench	Anti-seize Compound	
MECH 025-S25-11-4-2T	○	2	4	8	25	25	120	46	37	+21°	-10°	Fig.1	SB-2555TRG	DTM-8	MP-1	BDMT11T308ER-N2 BDMT11T308ER-N3 Page B21
032-S32-11-5-2T	○		5	10	32	32	140	55	46	+23°	-9°					
032-S32-11-5-4T	○	4		20												
040-S32-11-6-4T	○		6	24	40		150	64	55		-8°	Fig.2				
040-S42-11-6-4T	○					42	160					Fig.1				
050-S42-11-7-4T	○		7	28	50		172	75	64		-7°	Fig.2				
050-S42-11-7-6T	○	6		42												
MECH 040-S32-17-4-2T	○	2	4	8	40	32	160	73	59	+19°	-7°	Fig.2	SB-4070TRN	DTM-15	MP-1	BDMT170408ER-N3 BDMT170408ER-N4 Page B21
040-S42-17-4-2T	○					42	170					Fig.1				
050-S42-17-5-4T	○	4	5	20	50		185	88	74		-6°	Fig.2				

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Recommended Cutting Conditions E45

● : Stock Std. ○ : World Express

MECH Shell Mill (without coolant hole)

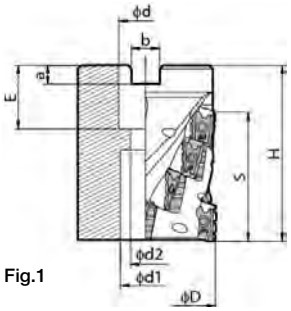


Fig.1

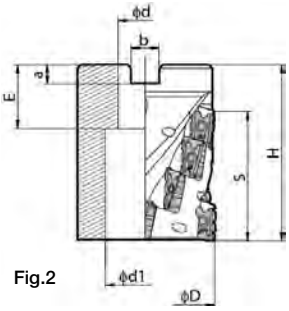


Fig.2

Rake Angle (°)		
Description	A.R. (MAX)	R.R.
MECH•••-11-	+23°	-8°
MECH•••-17-	+19°	-7°

●Dimensions

Description	Stock	No. of Flutes	No. of Stages	No. of Inserts	Unit	Dimension øD	ød	ød1	ød2	H	E	a	b	S	Drawing	Spare Parts: Insert Screw	Wrench	Anti-seize Compound	Arbor Bolt	Applicable Inserts Page B21
MECH 2000R-11-5-6T	●	6	5	30	in	2.00	0.75	0.63	0.417	2.480	0.750	0.197	0.313	1.811	Fig.1	SB-2555TRG	DTM-8	MP-1	HH3/8-1.5	BDMT11T308ER-N2 BDMT11T308ER-N3
2000R-17-2-4T	●	4	2	8						2.047				1.181		SB-4070TRN	DTM-15		HH3/8-1.25	BDMT170408ER-N3 BDMT170408ER-N4
2000R-17-4-4T	●	4	4	16						3.070				2.322						
MECH 040R-11-4-4T-M	○	4	4	16	mm	40	16	15	9	50	19	5.6	8.4	37	Fig.1	SB-2555TRG	DTM-8		HH8X25	BDMT11T308ER-N2 BDMT11T308ER-N3
050R-11-5-6T-M	○	6	5	30		50	22	18	11	63	21	6.3	10.4	46					HH10X30	
MECH 050R-17-2-4T-M	○	4	2	8		50	22	18	11	52	21	6.3	10.4	30		SB-4070TRN	DTM-15		HH10X30	BDMT170408ER-N3 BDMT170408ER-N4
050R-17-4-4T-M	○		4	16						78				59					HH10X40	
063R-17-3-4T-M	○	4	3	12		63	27	20	14	70	24	7	12	45					HH12X35	
080R-17-4-6T-M	○	6	4	24		80	32	26	18	85	28	8	14	59					HH16X45	
100R-17-4-6T-M	○	6	4	24		100	40	56	-	85	30	9	16	59	Fig.2				-	
MECH 063R-17-3-4T	○	4	3	12		63	25.4	20	14	70	26	6	9.5	45	Fig.1	SB-4070TRN	DTM-15		HH12X35	BDMT170408ER-N3 BDMT170408ER-N4
080R-17-4-6T	○	6	4	24		80	31.75	26	18	85	32	8	13	59					HH16X45	
100R-17-4-6T	○	6	4	24		100	38.1	56	-	85	38	10	16	59	Fig.2				-	

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Recommended Cutting Conditions E45

● : Stock Std. ○ : World Express

MECH-BT50 / MECH-SK (Integral Arbor type, without coolant hole)

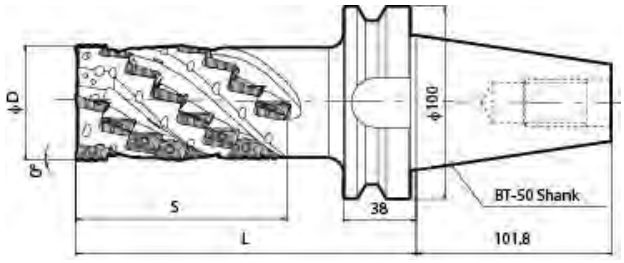


Fig.1

Rake Angle (°)		
Description	A.R. (MAX)	R.R.
MECH•••-11-	+23°	-7°
MECH•••-17-	+19°	-7°

●Dimensions

Description	Stock	No. of Flutes	No. of Stages	No. of Inserts	Dimension (mm)			Drawing	Weight (kg)	Spare Parts			Applicable Inserts ➡B21
					øD	L	S			Insert Screw	Wrench	Anti-seize Compound	
MECH 050R11-8-4T-BT50	○	4	8	32	50	143	73	Fig.1	4.8	SB-2555TRG	DTM-8	MP-1	BDMT11T308ER-N2 BDMT11T308ER-N3
MECH 050R17-7-4T-BT50	○	4	7	28	50	173	104		4.9	SB-4070TRN	DTM-15	MP-1	BDMT170408ER-N3 BDMT170408ER-N4
063R17-7-4T-BT50	○				63				5.9				
080R17-7-4T-BT50	○				80				7.8				
100R17-7-6T-BT50	○	6		42	100				10.2				

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

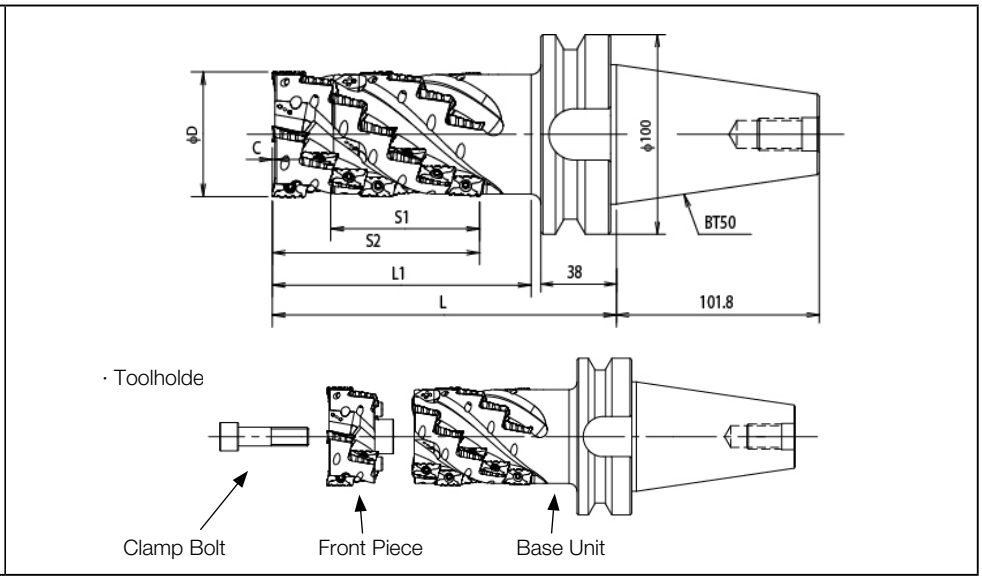
●Applicable Inserts

Description	Applicable Inserts ➡B21			
	2-Notched	3-Notched	3-Notched	4-Notched
MECH•••-11-	BDMT 11T308ER-N2	BDMT 11T308ER-N3	–	–
MECH•••-17-	–	–	BDMT 170408ER-N3	BDMT 170408ER-N4

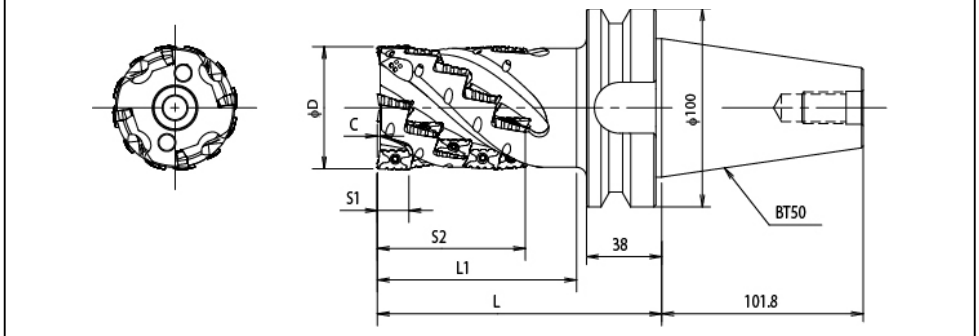
Recommended Cutting Conditions ➡E45

● : Stock Std. ○ : World Express

MECH-BT50SA (Without a coolant hole) Arbor Integral Type (Base Unit+1 Front Piece+Clamp Bolt)



MECH-BT50-A (Without a coolant hole) Base Unit



●Toolholder Dimensions

Description			Stock	No. of Flutes	No. of Stages	No. of Inserts	Dimension (mm)						Rake Angle (°)		Weight (kg)	Applicable Inserts Page B21
							øD	L	L1	C	S1	S2	A.R.	R.R.		
Arbor Integral Type	MECH	050R11-4T-BT50SA	△	4	8	32	50	143	99	0.7	55	73	+23°	-7°	4.8	BDMT11T308ER-N2 BDMT11T308ER-N3
		063R17-4T-BT50SA	△		7	28	63	173	130	1.3	75	104	+19°	-7°	5.8	BDMT170408ER-N3 BDMT170408ER-N4
		080R17-4T-BT50SA	△				80								7.6	
		100R17-6T-BT50SA	△	6	7	42	100								9.8	
Base Unit	MECH	050R11-4T-BT50-A	△	4	6	24	50	125	81	0.7	10	55	+23°	-7°	4.6	BDMT11T308ER-N2 BDMT11T308ER-N3
		063R17-4T-BT50-A	△		5	20	63	143	100	1.3	16	75	+19°	-7°	5.4	BDMT170408ER-N3 BDMT170408ER-N4
		080R17-4T-BT50-A	△				80								6.8	
		100R17-6T-BT50-A	△	6	5	30	100								8.5	

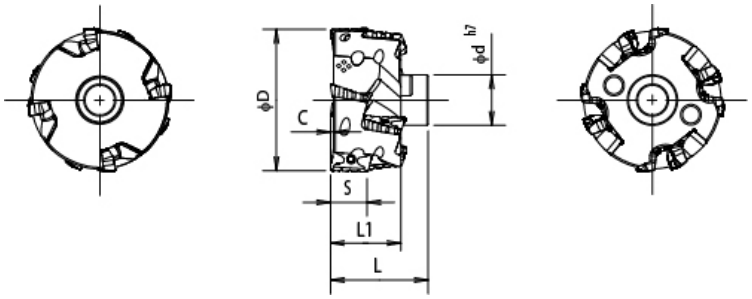
Recommended Cutting Conditions E45

●Toolholder structure

Endmill			Base Unit E42		Front Piece (1pcs) E43		Arbor Bolt
MECH	050R11-4T-BT50SA	=	MECH050R11-4T-BT50-A	+	MECH050R11-4T-F	+	HH12X35
	063R17-4T-BT50SA		MECH063R17-4T-BT50-A		MECH063R17-4T-F		HH12X40
	080R17-4T-BT50SA		MECH080R17-4T-BT50-A		MECH080R17-4T-F		HH16X40
	100R17-6T-BT50SA		MECH100R17-6T-BT50-A		MECH100R17-6T-F		HH20X40

△ : Made to Order

MECH-F (Without a coolant hole) Front Piece



●Toolholder Dimensions

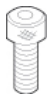
Description		Stock	No. of Flutes	No. of Stages	No. of Inserts	Dimension (mm)						Rake Angle (°)		Weight (kg)	Applicable Inserts Page B21
						øD	ød	L	L1	C	S	A.R.	R.R.		
MECH	050R11-4T-F	○	4	2	8	50	22	32	18	0.7	10	+23°	-7°	0.2	BDMT11T308ER-N2 BDMT11T308ER-N3
	063R17-4T-F	○				63	22	44	30	1.3	16	+19°	-7°	0.4	BDMT170408ER-N3 BDMT170408ER-N4
	080R17-4T-F	○				80	32							0.8	
	100R17-6T-F	○	6	2	12	100	45							1.3	

●Applicable Inserts

Endmill		Base Unit E42	Front Piece E43	Applicable Inserts B21
MECH	050R11-4T-BT50SA	MECH050R11-4T-BT50-A	MECH050R11-4T-F	BDMT11T308ER-N2 BDMT11T308ER-N3
	063R17-4T-BT50SA	MECH063R17-4T-BT50-A	MECH063R17-4T-F	
	080R17-4T-BT50SA	MECH080R17-4T-BT50-A	MECH080R17-4T-F	BDMT170408ER-N3 BDMT170408ER-N4
	100R17-6T-BT50SA	MECH100R17-6T-BT50-A	MECH100R17-6T-F	

· For installation of notched insert, ref. page **125**.

●Spare Parts

Description		Spare Parts				
		Insert Screw	Wrench (for Insert Screw)	Arbor Bolt	Wrench (for Arbor Bolt)	Anti-seize Compound
						
Arbor Integral Type (Set)	MECH 050R11-4T-BT50SA	SB-2555TRG	DTM-8	HH12X35	LW-10	MP-1
	063R17-4T-BT50SA	SB-4070TRN	DTM-15	HH12X40	LW-10	
	080R17-4T-BT50SA			HH16X40	LW-14	
	100R17-6T-BT50SA			HH20X40	LW-17	
Base Unit	MECH 050R11-4T-BT50-A	SB-2555TRG	DTM-8	HH12X35	LW-10	
	063R17-4T-BT50-A	SB-4070TRN	DTM-15	HH12X40	LW-10	
	080R17-4T-BT50-A			HH16X40	LW-14	
	100R17-6T-BT50-A			HH20X40	LW-17	
Front Piece	MECH 050R11-4T-F	SB-2555TRG	-	-	-	
	063R17-4T-F	SB-4070TRN				
	080R17-4T-F					
	100R17-6T-F					

· If you purchased the front piece only, wrench (for insert screw) / arbor bolt and wrench (for arbor bolt) is not included.

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

● : Stock Std. ○ : World Express

Number of Inserts Installed

Description	No. of Flutes	No. of Inserts	No. of Inserts			
			BDMT11T308ER-		BDMT170408ER-	
			N2	N3	N3	N4
MECH 1000-W1000-11-4-2T 025-S25-11-4-2T	2	8	4	4	-	-
1250-W1250-11-5-2T 032-S32-11-5-2T	2	10	5	5	-	-
1250-W1250-11-5-4T 032-S32-11-5-4T	4	20	10	10	-	-
1500-W1250-11-6-2T 040-S32-11-6-4T	4	24	12	12	-	-
1500-W1500-11-6-4T 040-S42-11-6-4T	4	24	12	12	-	-
2000-W1500-11-7-4T 050-S42-11-7-4T	4	28	14	14	-	-
2000-W1500-11-7-6T 050-S42-11-7-6T	6	42	21	21	-	-
MECH 040-S32-17-4-2T	2	8	-	-	4	4
040-S42-17-4-2T	2	8	-	-	4	4
050-S42-17-5-4T	4	20	-	-	10	10
MECH 040R-11-4-4T-M	4	16	8	8	-	-
050R-11-5-6T-M	6	30	15	15	-	-
MECH 050R-17-2-4T-M	4	8	-	-	4	4
050R-17-4-4T-M	4	16	-	-	8	8
063R-17-3-4T-M	4	12	-	-	6	6
080R-17-4-6T-M	6	24	-	-	12	12
100R-17-4-6T-M	6	24	-	-	12	12
MECH 063R-17-3-4T	4	12	-	-	6	6
080R-17-4-6T	6	24	-	-	12	12
100R-17-4-6T	6	24	-	-	12	12
MECH 050R11-8-4T-BT50	4	32	16	16	-	-
050R17-7-4T-BT50	4	28	-	-	14	14
063R17-7-4T-BT50	4	28	-	-	14	14
080R17-7-4T-BT50	4	28	-	-	14	14
100R17-7-6T-BT50	6	42	-	-	21	21

Description	No. of Flutes	No. of Inserts	No. of Inserts			
			BDMT11T308ER-		BDMT170408ER-	
			N2	N3	N3	N4
MECH 050R11-4T-BT50SA	4	32	16	16	-	-
063R17-4T-BT50SA	4	28	-	-	14	14
080R17-4T-BT50SA	4	28	-	-	14	14
100R17-6T-BT50SA	6	42	-	-	21	21
MECH 050R11-4T-BT50-A	4	24	12	12	-	-
063R17-4T-BT50-A	4	20	-	-	10	10
080R17-4T-BT50-A	4	20	-	-	10	10
100R17-6T-BT50-A	6	30	-	-	15	15
MECH 050R11-4T-F	4	8	4	4	-	-
063R17-4T-F	4	8	-	-	4	4
080R17-4T-F	4	8	-	-	4	4
100R17-6T-F	6	12	-	-	6	6

Precautions when installing notched inserts

1. Install notched inserts by matching the insert with the number of marks on the holder body.

<Insert Number and Holder Marks>

Insert Size	11 Type		17 Type	
Insert No.	2	3	3	4
Marks				

* Using the cutter with the inserts installed incorrectly will damage the holder.

2. When installing notched inserts in flute line, ensure that the number on the insert is the same as the insert in first stage.
Ref. to Fig.1, 2 and 3.

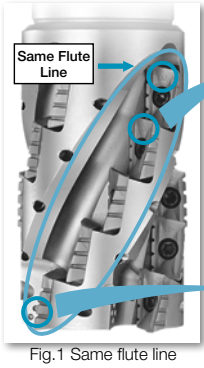


Fig.1 Same flute line

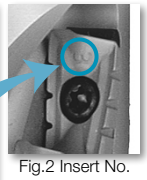


Fig.2 Insert No.

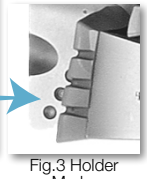


Fig.3 Holder Marks

Recommended Cutting Conditions (When using a notched insert)

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed: sfm)				
		MEGACOAT			PVD Coated Carbide	
		PR1225	PR1230	PR1210	PR830	PR905
Carbon Steel	0.003~0.004~0.006	☆ 400~600~875	★ 400~600~725	-	☆ 325~450~600	-
Alloy Steel	0.003~0.004~0.006	☆ 325~525~725	★ 325~525~650	-	☆ 325~450~600	-
Mold Steel	0.003~0.004~0.006	☆ 250~450~600	★ 250~450~525	-	☆ 325~400~500	-
Gray Cast Iron	0.003~0.006~0.007	-	-	★ 400~600~875	-	☆ 325~450~600
Nodular Cast Iron	0.003~0.006~0.007	-	-	★ 325~500~725	-	☆ 325~400~500
Titanium Alloys	0.003~0.004~0.006	-	-	★ 325~175~225	-	☆ 75~125~175

* Cutting with coolant is recommended for titanium alloy.

★: 1st Recommendation ☆: 2nd Recommendation

1. The recommended cutting conditions above are for notched inserts.
2. If using an insert without notch, the cutting depth (ap) and width (ae) should be less than 60% of those of a notched insert.

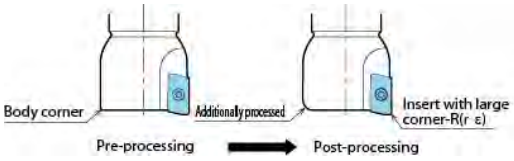
· JA Chipbreaker

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc : sfm)
		Carbide
		GW25
Aluminum Alloy (Si 13% or less)	0.002~0.012	656~2625
Aluminum Alloy (Si 13% or less)	0.002~0.008	656~984

■ When using inserts with corner-R(rε)1.6 or larger, additional modifications of the cutter body will be necessary. Ref. to the table below for the recommended modifications. (Additional grind off is not necessary when corner-R is 1.2mm or less.)

Insert Corner-R(rε)	Additional Processing Dimension to Body Corner
1.6	R1.0
2.0	
2.4	R1.2
3.1	R1.6
4.0	R2.5

* Round-shaped additional processing is recommended.
When applying chamfer shaped additional processing, do not cut away too much.

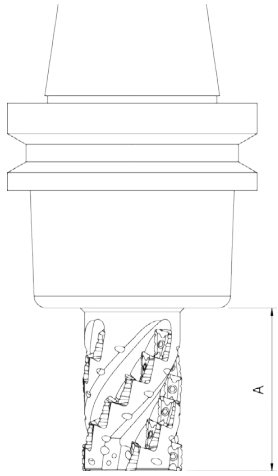


Cutting Performance (Used Machine: Machining center equivalent to AC15 / 18.5kW)

●MECH Endmill Type

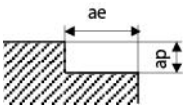
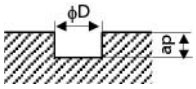
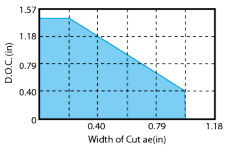
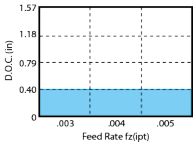
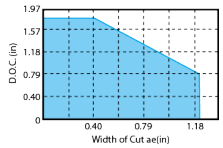
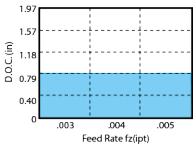
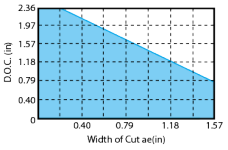
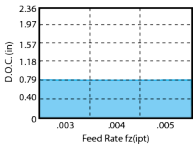
Cutting Dia.	Description	Overhang Length A (in)
ø1.00in ø25mm	MECH1000-W1000-11-4-2T MECH025-S25-11-4-2T	1.89
ø1.25in ø32mm	MECH1250-W1250-11-5-2T MECH032-S32-11-5-2T	2.24
	MECH1250-W1250-11-5-4T MECH032-S32-11-5-4T	
ø1.50in ø40mm	MECH1500-W1250-11-6-4T MECH040-S32-11-6-4T	2.56
	MECH1500-W1500-11-6-4T MECH040-S42-11-6-4T	
ø2.00in ø50mm	MECH2000-W1500-11-7-4T MECH050-S42-11-7-4T	2.99
	MECH2000-W1500-11-7-6T MECH050-S42-11-7-6T	
ø1.50in ø40mm	MECH1500-W1250-17-4-2T MECH040-S32-17-4-2T	2.91
	MECH1500-W1500-17-4-2T MECH040-S42-17-4-2T	
ø2.00in ø50mm	MECH2000-W1500-17-5-4T MECH050-S42-17-5-4T	3.50

Shape

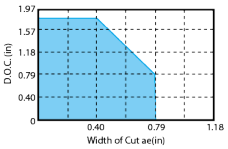
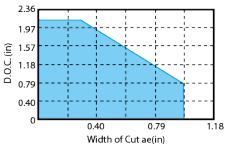
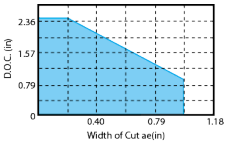
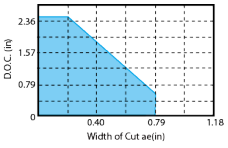
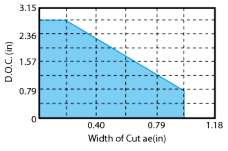


2 Flute Type

(Workpiece Material:1049)

Description	■ Shouldering	■ Slotting
		
	Cutting Speed: Vc=325~590sfm Feed: fz=0.003~0.006 ipt	Cutting speed: Vc=325~400sfm Feed: fz=0.003~0.005 ipt
MECH1000-W1000-11-4-2T MECH025-S25-11-4-2T		
MECH1250-W1250-11-5-2T MECH032-S32-11-5-2T		
MECH1500-W1250-17-4-2T MECH1500-W1500-17-4-2T MECH040-S32-17-4-2T MECH040-S42-17-4-2T		

4 Flute / 6 Flute Type

MECH1250-W1250-11-5-4T MECH032-S32-11-5-4T	
MECH1500-W1250-11-6-4T MECH1500-W1500-11-6-4T MECH040-S32-11-6-4T MECH040-S42-11-6-4T	
MECH1200-W1500-11-7-4T MECH050-S42-11-7-4T	
MECH1200-W1500-11-7-6T MECH050-S42-11-7-6T	
MECH1200-W150017-5-4T MECH050-S42-17-5-4T	

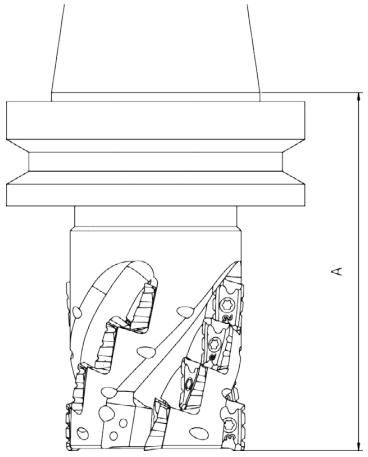
4 Flute / 6 Flute Type are not recommended for Slotting.

●MECH Shell Mill Type

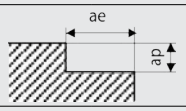
(Workpiece Material: 1049)

Cutting Dia.	Description	Overhang Length A (in)
ø1.58in ø40mm	MECH040R-11-4-4T-M	4.92
ø2.00in ø50mm	MECH2000R-11-5-6T MECH050R-11-5-6T-M	4.84
	MECH2000R-17-2-4T MECH050R-17-2-4T-M	4.41
	MECH2000R-17-4-4T MECH050R-17-4-4T-M	5.43
ø2.48in ø63mm	MECH063R-17-3-4T-O	4.53
ø3.15in ø80mm	MECH080R-17-4-6T-O	5.12
ø3.94in ø100mm	MECH100R-17-4-6T-O	5.12

Shape

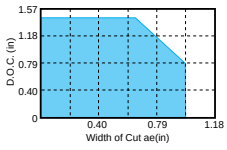


■ Shouldering

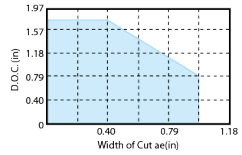


Cutting speed: Vc=325~600sfm
Feed: fz=0.003~0.006ipt

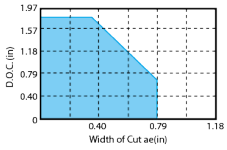
MECH040R -11-4-4T-M



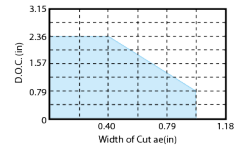
MECH063R -17-3-4T-O



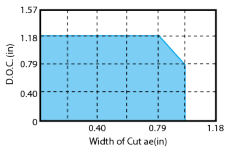
MECH2000R -11-5-6T
MECH050R -11-5-6T-M



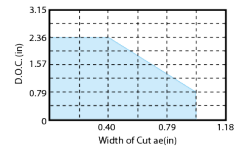
MECH080R -17-4-6T-O



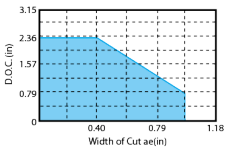
MECH2000R -17-2-4T
MECH050R -17-2-4T-M



MECH100R -17-4-6T-O



MECH2000R -17-4-4T
MECH050R -17-4-4T-M



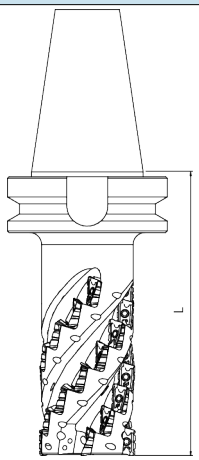
Slotting is not recommended.

●MECH-BT50 (Integral Arbor type)
MECH-BT50SA (Replaceable Head type / Integral Arbor type)

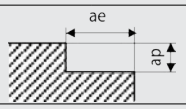
(Workpiece Material: 1049)

Cutting Dia.	Description	Overhang Length L (in)
ø50mm	MECH050R11-8-4T-BT50 MECH050R11-4T-BT50SA	143
	MECH050R17-7-4T-BT50	173
ø63mm	MECH063R17-7-4T-BT50 MECH063R17-4T-BT50SA	
ø80mm	MECH080R17-7-4T-BT50 MECH080R17-4T-BT50SA	
ø100mm	MECH100R17-7-6T-BT50 MECH100R17-6T-BT50SA	

Shape

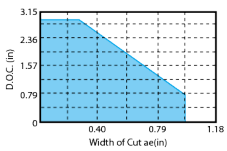


■ Shouldering

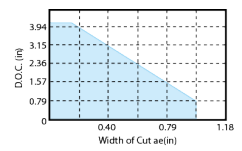


Cutting speed: Vc=325~600sfm
Feed: fz=0.003~0.006ipt

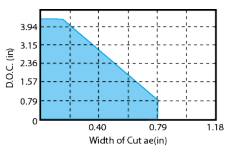
MECH050R11 -8-4T-BT50
MECH050R11 -4T-BT50SA



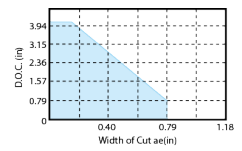
MECH080R17 -7-4T-BT50
MECH080R17 -4T-BT50SA



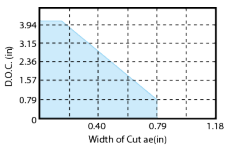
MECH050R17 -7-4T-BT50



MECH100R17 -7-6T-BT50
MECH100R17 -6T-BT50SA



MECH063R17 -7-4T-BT50
MECH063R17 -4T-BT50SA

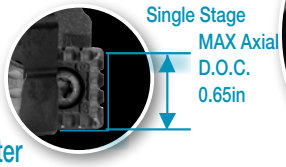


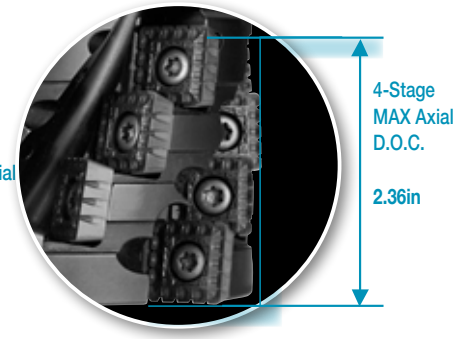
Slotting is not recommended.

MSRS90 Heavy Milling Cutter NEW

●Multiple Cutting Edge Lengths Available

1, 2, and 4-Stage (ø3.00in, ø80mm, ø100mm)



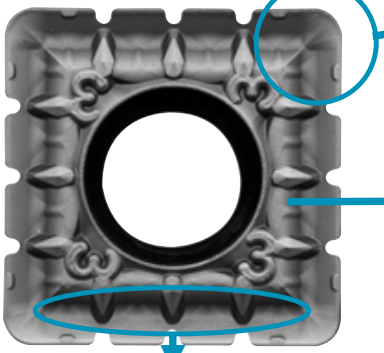


●High efficiency, low cutting force and low vibration milling cutter

●Neutral and corner-R insert

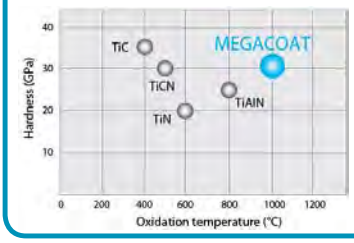
Applicable to shouldering (cutting angle: 90°),
high feed cutting (cutting angle: 30°), plunging, and side cutting.

Custom-ordered milling cutter with high performance notched neutral inserts offer expansive possibilities



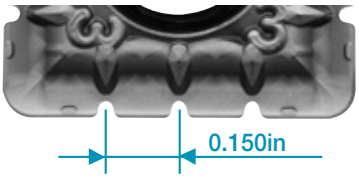
Neutral insert with corner-R is available for a variety of applications

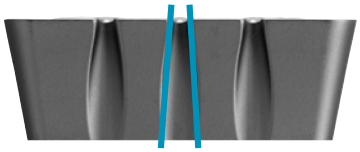
Long tool life: MEGACOAT



High hardness and high oxidation resistance
Long tool life: MEGACOAT

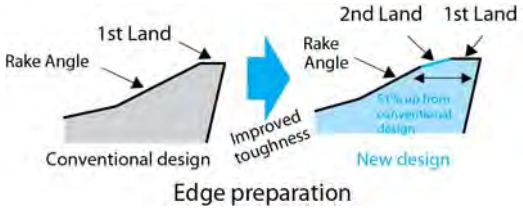
Notched insert SPMT180616EN type





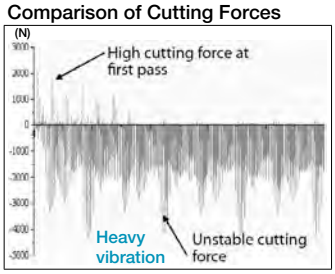
- Notched inserts break chips into smaller pieces and reduce cutting forces.
- Available for high feed cutting due to lower cutting forces at workpiece entry.
- New, double-land edge prep improves the cutting edge strength, while a small notch helps to reduce cutting forces

- Neutral insert
- Available for various cutting angles
- Cutting edge length 0.709in

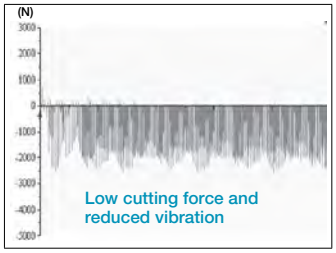


●Low cutting force (effect of notched insert)

Comparison of Cutting Forces



Competitor A

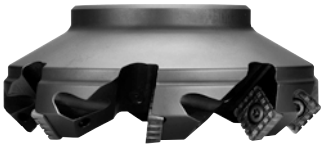


MSRS90

Notched inserts provide lower cutting forces and reduce vibration

Tapered cutter

Plunge cutter



45° Face Mill

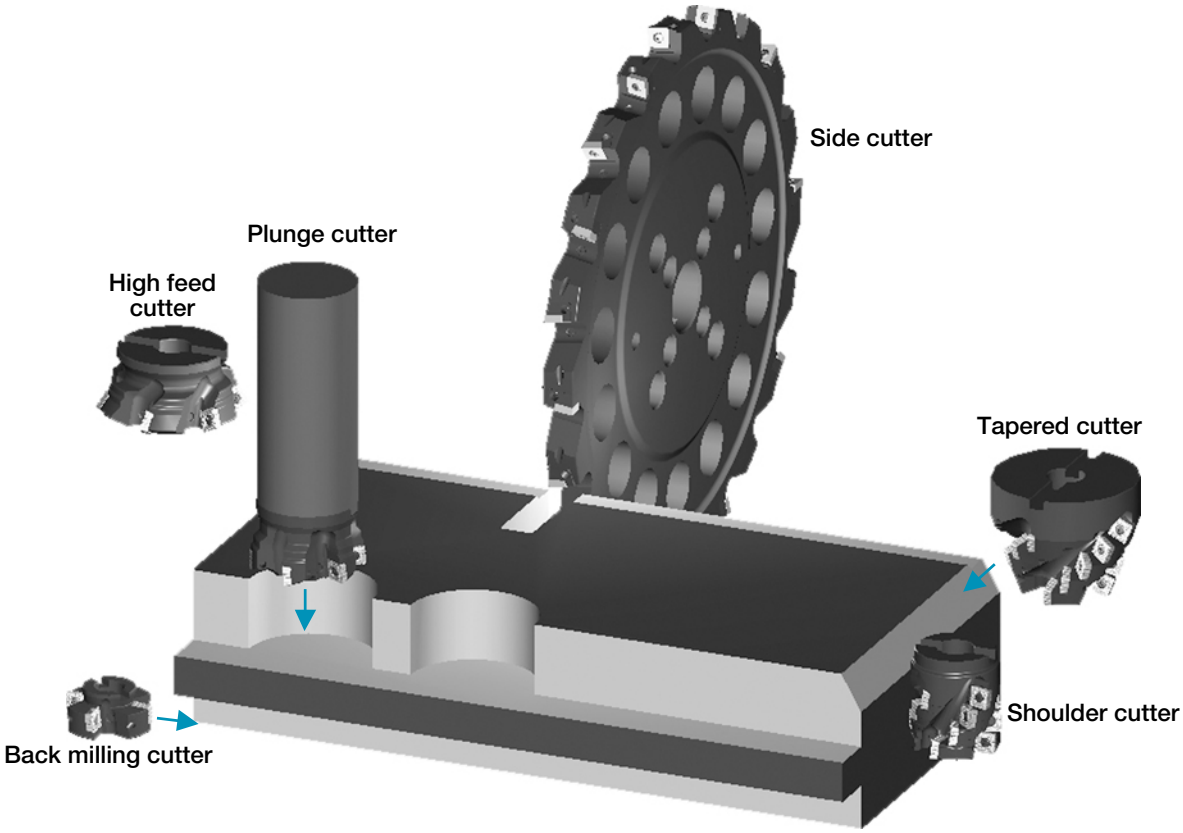
High feed cutter

Shoulder cutter

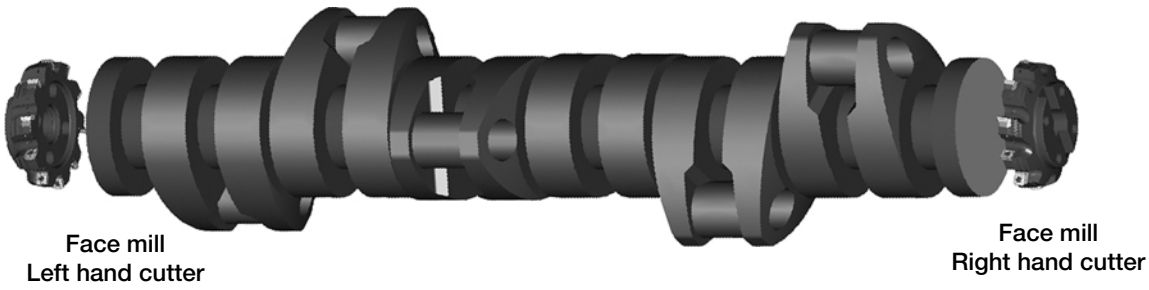
Applicable Inserts: Available for various applications

Applications	Chipbreaker type	3-Notched	4-Notched	Solid Edge
General Purpose (1st Recommendation)	Standard	NB3 +	NB4	
Low Cutting Force	Low Cutting Force	NB3P +	NB4P	
Focusing on edge strength	Without notch (Usable with notched inserts)	(NB3 or	NB4) +	

Various Cutting Possibilities with Custom-Design and Standard Cutters



●Shaft length determination



MSRS90 Heavy Milling Cutter NEW

MSRS90

Rake Angle	
A.R.	R.R.
+7°	-10°

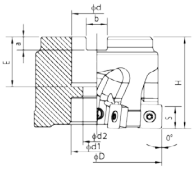


Fig.1

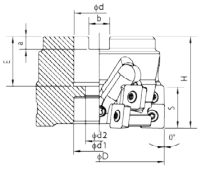


Fig.2

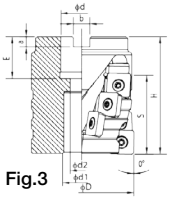


Fig.3

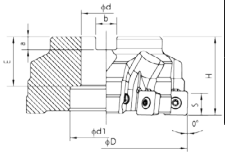


Fig.4

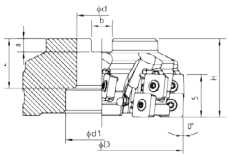


Fig. 5

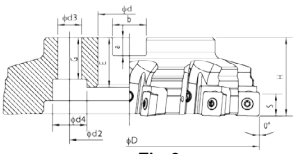


Fig.6

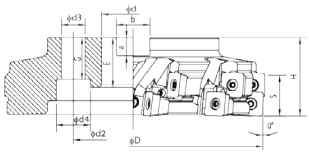


Fig.7

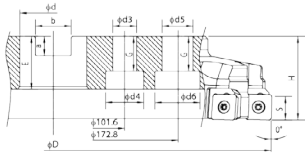


Fig.8

●Toolholder Dimensions (inch-size)

Description		Stock	No. of Inserts	No. of Flutes	No. of Stages	Dimension (in)												Drawing	Weight (lbs)	Applicable Inserts B19
						ØD	Ød	Ød1	Ød2	H	E	a	b	S	Ød3	Ød4	G			
MSRS	903000R-1-4T	●	4	4	1	3.00	1.00	0.87	0.55	2.36	1.06	0.24	0.38	0.65	-	-	-	Fig.1	2.43	SPMT180616EN-NB3 SPMT180616EN-NB4 SPMT180616EN-NB3P SPMT180616EN-NB4P SPMT180616EN-V
	903000R-2-4T	●	8	4	2	3.00								1.22				Fig.2	2.21	
	903000R-4-4T	●	16	4	4	3.00				3.35				2.36				Fig.3	3.50	
	904000R-1-6T	●	6	6	1	4.00	1.50	2.05	-	2.76	1.14	0.39	0.63	0.65				Fig.4	4.41	
	904000R-2-6T	●	12	6	2	4.00								1.22				Fig.5	3.97	
	905000R-1-8T	●	8	8	1	5.00		2.17		2.36	1.42			0.65				Fig.4	5.73	
	906000R-1-8T	●	8	8	1	6.00	2.00	2.76			1.50	0.43	0.75	0.65				Fig.4	7.50	
	908000R-1-10T	●	10	10	1	8.00	2.50	-	4.00		1.58	0.55	1.01	0.65	0.71	1.02	1.26	Fig.6	13.23	
	9010000R-1-12T	●	12	12	1	10.00								0.65				Fig.6	27.49	

● : Stock Std. ○ : World Express

MSRS90

Rake Angle	
A.R.	R.R.
+7°	-10°

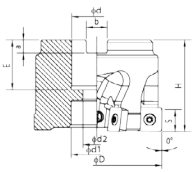


Fig.1

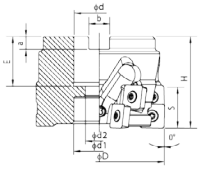


Fig.2

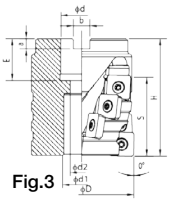


Fig.3

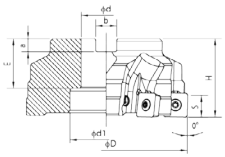


Fig.4

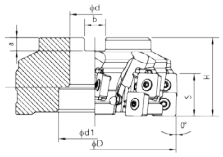


Fig. 5

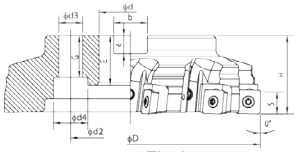


Fig.6

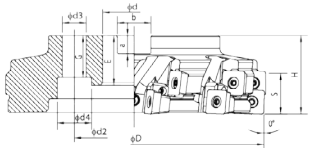


Fig.7

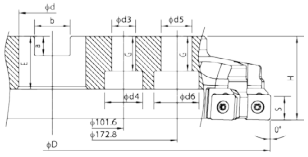


Fig.8

●Toolholder Dimensions (metric-size)

	Description	Stock	No. of Inserts	No. of Flutes	No. of Stages	Dimension (mm) ØD	Ød	Ød1	Ød2	H	E	a	b	S	Ød3	Ød4	Ød5	Ød6	G	Drawing	Weight (kg)	Applicable Inserts ➡B19
Bore Dia. Metric spec	MSRS 90080R-1-4T-M	○	4	4	1	80	27	20	13	60	24	7	12.4	16.5	-	-	-	-	-	Fig.1	1.3	SPMT180616EN-NB3 SPMT180616EN-NB4 SPMT180616EN-NB3P SPMT180616EN-NB4P SPMT180616EN-V
	90080R-2-4T-M	○	8	4	2									31						Fig.2	1.1	
	90080R-4-4T-M	○	16	4	4					85				60						Fig.3	1.4	
	90100R-1-6T-M	○	6	6	1	100	32	45	-	70	30	8	14.4	16.5						Fig.1	2.2	
	90100R-2-6T-M	○	12	6	2									31						Fig.2	2.0	
	90100R-4-6T-M	△	24	6	4					90				60						Fig.3	3.1	
	90125R-1-8T-M	○	8	8	1	125	40	55		60	33	9	16.4	16.5						Fig.4	2.6	
	90125R-2-8T-M	△	16	8	2									31						Fig.5	2.4	
	90160R-1-8T-M	○	8	8	1	160			66.7					16.5	14	20	-	-	28	Fig.6	4.2	
	90160R-2-8T-M	△	16	8	2									31						Fig.7	4.0	
	90200R-1-10T-M	○	10	10	1	200	60	-	101.6		40	14	25.7	16.5	18	26	-	-	32	Fig.6	6.7	
	90200R-2-10T-M	△	20	10	2									31						Fig.7	6.6	
	90250R-1-12T-M	○	12	12	1	250								16.5						Fig.6	12.6	
	90250R-2-12T-M	△	24	12	2									31						Fig.7	12.5	
	90315R-1-14T-M	○	14	14	1	315			-					16.5	17	27	22	32	25	Fig.8	16.1	
	90315R-2-14T-M	△	28	14	2									31						-	16.0	
Bore Dia. Inch spec	MSRS 90080R-1-4T	○	4	4	1	80	1.250"	27	18	60	32	8	0.500"	16.5	-	-	-	-	-	Fig.1	1.4	
	90080R-2-4T	○	8	4	2									31						Fig.2	1.2	
	90080R-4-4T	○	16	4	4					85				60						Fig.3	1.5	
	90100R-1-6T	○	6	6	1	100	1.500"	39	21	70	38	10	0.625"	16.5						Fig.1	2.3	
	90100R-2-6T	○	12	6	2									31						Fig.2	2.1	
	90100R-4-6T	△	24	6	4					85				60						Fig.3	3.2	
	90125R-1-8T	○	8	8	1	125		55	-	60				16.5						Fig.4	2.6	
	90125R-2-8T	△	16	8	2									31						Fig.5	2.4	
	90160R-1-8T	○	8	8	1	160	2.000"	70				11	0.750"	16.5						Fig.4	4.3	
	90160R-2-8T	△	16	8	2									31						Fig.5	4.1	
	90200R-1-10T	○	10	10	1	200	1.875"	-	101.6			14	1.000"	16.5	18	26	-	-	32	Fig.6	6.7	
	90200R-2-10T	△	20	10	2									31						Fig.7	6.6	
	90250R-1-12T	○	12	12	1	250								16.5						Fig.6	12.6	
	90250R-2-12T	△	24	12	2									31						Fig.7	12.5	
	90315R-1-14T	○	14	14	1	315			-					16.5	17	27	22	32	25	Fig.8	16.1	
	90315R-2-14T	△	28	14	2									31						-	16.0	

● : Stock Std. ○ : World Express △ : Made to Order

MSRS90 Heavy Milling Cutter NEW

●Applicable Inserts

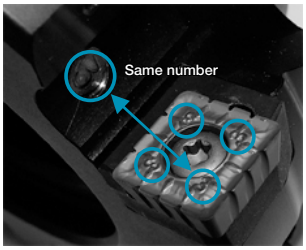
Description	Applicable Inserts B19				
	 3-Notched	 4-Notched	 3-Notched / Low cutting force	 4-Notched / Low cutting force	 Solid Edge
MSRS90...	SPMT 180616EN-NB3	SPMT 180616EN-NB4	SPMT 180616EN-NB3P	SPMT 180616EN-NB4P	SPMT 180616EN-V

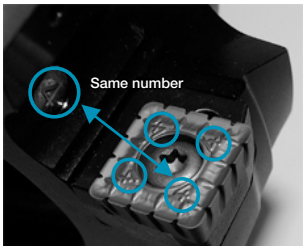
●Caution when installing Notched Inserts

It is important to install the appropriate notched insert into the correct position. Failure to do so may result in damage to the toolholder body. The appropriate insert is marked on the pocket of the cutter body.

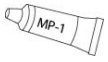
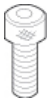
Description		No. of Inserts	No. of Flutes	No. of Stages	No. of Inserts Notched	
					NB3(P)	NB4(P)
MSRS	90100R-1-6T	6	6	1	3	3
	90100R-2-6T	12		2	6	6
	90100R-4-6T	24		4	12	12

When installing the inserts, match the number on the top of insert to the number of the cutter body.



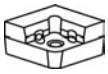
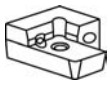
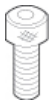


●Spare Parts (Inch-size)

Description		Spare Parts						
		Insert Clamp Screw	Wrench	Cartridge	Cartridge Clamp Screw	Wrench	Anti-seize Compound	Mounting bolt
				MAP-1806M 				
Without cartridge	MSRS 903000R-1-4T	SB-60120TR	TT-25L	-	-	-	MP-1	HH1/2-1.25
	903000R-2-4T							
	903000R-4-4T							
	MSRS 904000R-1-6T							-
	904000R-2-6T							
	MSRS 905000R-1-8T							
With cartridge	MSRS 906000R-1-8T			MAP-1806M	SB-40140TR	DT-15		
	908000R-1-10T							
	9010000R-1-12T							


Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

●Spare Parts (Metric-size)

Description		Spare Parts							
		Clamp Screw	Wrench	Cartridge		Clamp Screw	Wrench	Anti-seize Compound	Mounting bolt
				MAP-1806M 	MAP-1806S  (Bottom edge only)				
Without cartridge	MSRS 90080R-○-4T	SB-60120TR	TT-25L	-	-	-	-	MP-1	HH16×45
	90100R-○-6T								HH20×55
	90125R-○-8T								-
With cartridge	MSRS 90160R-○-8T ~ 90315R-○-14T			MAP-1806M*1	MAP-1806S*2	SB-40140TR	DT-15		
				for Shim Clamp Recommended torque 3.5Nm					
Without cartridge	MSRS 90080R-○-4T-M	for Insert Clamp Recommended torque 7.5Nm		-	-	-	-		HH12×35
	90100R-○-6T-M								
	90125R-○-8T-M								-
With cartridge	MSRS 90160R-○-8T-M ~ 90315R-○-14T-M			MAP-1806M*1	MAP-1806S*2	SB-40140TR	DT-15		
				for Shim Clamp Recommended torque 3.5Nm					

Notes) *1: MAP-1806M is only for applicable R-1 cutters.

*2: MAP-1806S is only for applicable R-2 bottom-edge (1st stage) cartridge... Use it only for the bottom edge (1st stage).

How to attach the cartridge : You need to tighten 2 clamp screws to fix the cartridge. Tighten the slant screw first and then tighten the other screw.

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)		Vc (sfm)	
	Standard NB3+NB4	Low Cutting Force NB3P+NB4P	MEGACOAT	
			PR1230	PR1210
Soft Steel (SS)	0.004~0.008~0.010	0.004~0.008~0.010	★ 400~500~725	☆ 400~500~725
Carbon Steel (SxxC)	0.004~0.008~0.010	0.004~0.008~0.010	★ 325~500~650	☆ 325~500~650
Alloy Steel (SCM)	0.004~0.006~0.008	0.004~0.006~0.008	★ 325~500~650	☆ 325~500~650
Die Steel (SKD/NAK)	0.004~0.006~0.008	0.004~0.005~0.006	★ 325~500~600	☆ 325~500~600
Gray Cast Iron (FC)	0.004~0.008~0.012	0.004~0.008~0.010	☆ 325~600~825	★ 325~600~825
Nodular Cast Iron (FCD)	0.004~0.008~0.010	0.004~0.007~0.008	☆ 325~600~725	★ 325~600~725
Stainless Steel (SUS304)	Not recommended			
Non-Ferrous Metals	Not recommended			

★: 1st Recommendation ☆: 2nd Recommendation

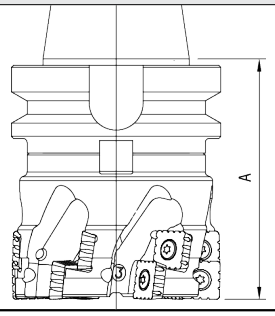
MSRS90 Heavy Milling Cutter NEW

Cutting Conditions (Shouldering)

●MSRS90100R-1-6T

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in³/min)
		Cutting speed	fz		
Cast Iron	Less than 4.72in	Vc=590sfm	fz=0.008ipt	0.59×3.15	50.41
	4.72~7.87in	Vc=590sfm	fz=0.008ipt	0.59×1.57	25.20
	7.91in and over	Vc=425sfm	fz=0.004ipt	0.59×1.57	16.05
Carbon Steel	Less than 4.72in	Vc=490sfm	fz=0.008ipt	0.59×3.15	42.05
	4.72~7.87in	Vc=490sfm	fz=0.008ipt	0.59×1.57	20.99
	7.91in and over	Vc=325sfm	fz=0.004ipt	0.59×1.57	13.97

Overhang Length A (in)



●MSRS90100R-2-6T

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in³/min)
		Cutting speed	fz		
Cast Iron	Less than 4.72in	Vc=590sfm	fz=0.008ipt	1.18×1.97	62.97
	4.72~7.87in	Vc=590sfm	fz=0.008ipt	1.18×1.18	37.77
	7.91in and over	Vc=425sfm	fz=0.004ipt	1.18×0.98	20.08
Carbon Steel	Less than 4.72in	Vc=490sfm	fz=0.008ipt	1.18×1.97	52.54
	4.72~7.87in	Vc=490sfm	fz=0.008ipt	1.18×1.18	31.55
	7.91in and over	Vc=325sfm	fz=0.004ipt	1.18×0.98	17.51

●MSRS90100R-4-6T

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in³/min)
		Cutting speed	fz		
Cast Iron	Less than 5.51in	Vc=590sfm	fz=0.008ipt	2.36×0.79	50.41
	5.51in~7.87in	Vc=590sfm	fz=0.008ipt	2.36×0.39	25.20
	7.91in and over	Vc=425sfm	fz=0.004ipt	2.36×0.39	16.05
Carbon Steel	Less than 5.51in	Vc=490sfm	fz=0.008ipt	2.36×0.79	42.05
	5.51in~7.87in	Vc=490sfm	fz=0.008ipt	2.36×0.39	20.99
	7.91in and over	Vc=325sfm	fz=0.004ipt	2.36×0.39	13.97

Case Studies

Ductile Iron, 60-40-8

Industrial parts
Cutter and inserts
MSRS90100R-1-6T (Ø100 ·6 flutes)
SPMT180616EN-NB3/NB4 (PR1210)
· Vc=490sfm
· ap×ae=0.236×2.559in
· fz=0.006ipt
(Vf=16.93ipm)

MSRS90(PR1210)	Chip Removal=15.7in³/min.
Competitor A	6.5in³/min.

· MSRS90 doubled the cutting efficiency compared to competitor A.
· Competitor A required 2 passes (ap×ae = 0.118×2.56in).
MSRS90 completed the cut in only 1 pass.
· Cutting time reduced. (Customer Evaluation)

Chrome-Moly Steel

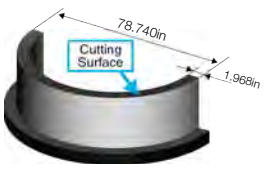
Construction machine part
Cutter and inserts
MSRS90125R-1-8T (Ø125 ·8 flutes)
SPMT180616EN-NB3/NB4 (PR1230)
· Vc=660sfm
· ap×ae=0.394×1.968in
· fz=0.004ipt
(Vf=15.748ipm)

MSRS90(PR1230)	Chip Removal=12.2in³/min.
Competitor B	9.3in³/min.

· MSRS90 improved the cutting efficiency to 1.3 times that of competitor B.
· Competitor C machined with ap×ae=0.20x1.97in
· Tool cost is reduced to 1/3 although competitor C is expensive using 2-corner insert.
MSRS90 reduced machining cost as well as improved cutting efficiency. (Customer Evaluation)

Tool Steel

Shipbuilding parts
Cutter and inserts
MSRS90160R-1-8T (Ø160 ·8 flutes)
SPMT180616EN-NB3/NB4 (PR1230)
· Vc=490sfm
· ap×ae=0.394×0.394~1.968 in
· fz=0.004ipt
(Vf=9.449ipm)

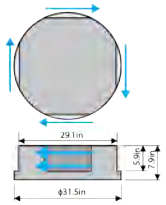


MSRS90(PR1230)	Chip Removal=7.32in³/min.
Competitor C	3.66in³/min.

· MSRS90 doubled the cutting efficiency compared to competitor C.
· Competitor C: ap×ae=0.197×0.394~1.968in
➡MSRS doubled the axial D.O.C. due to lower cutting forces.
· MSRS90 can increase D.O.C. as the cutting speed (Vc=325 increases to 490). This resulted in total cutting efficiency improvement. (time reduction) (Customer Evaluation)

Structural Steel

Power generation parts
Cutter and inserts
MSRS90125R-1-8T (Ø125 ·8 flutes)
SPMT180616EN-NB3/NB4 (PR1230)
· Vc=530sfm
· ap×ae=0.394×0~0.787in
· fz=0.006ipt
(Vf=19.69ipm)



MSRS90(PR1230)	12 faces/edge
Competitor D	8 faces/edge

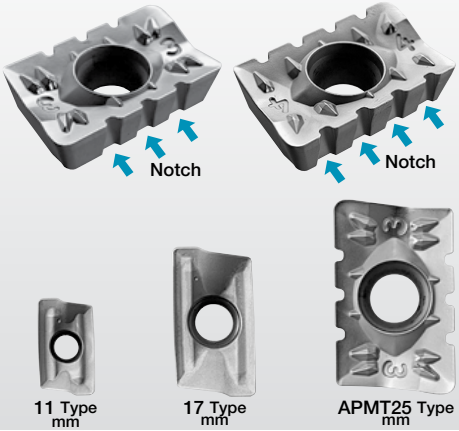
· MSRS90 improved tool life to 1.5 times that of competitor D.
· Competitor D required 2 passes (ap×ae=0.472×0~0.394in) with a low feed rate (Vf=15.748ipm). MSRS90 improved cutting efficiency. (time reduction)
· Competitor D was very noisy due to large cutting forces. MSRS90 reduces the cutting force and noise level as well (Customer Evaluation)

MSR Heavy Milling Cutter

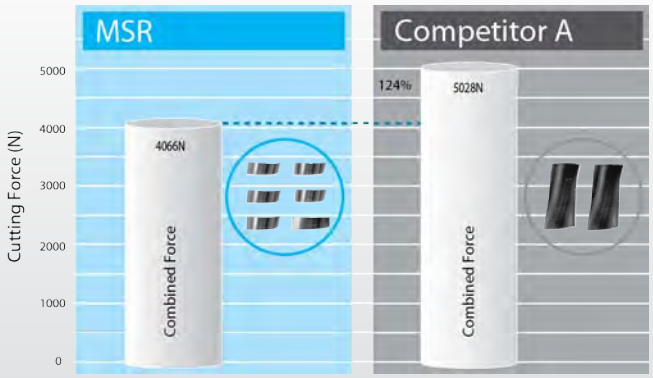
Notched inserts reduce cutting forces, and enable high feed rates by reducing chatter. Improved chip evacuation and low cutting forces due to the special chipbreaker designs.
Enables heavy milling and deep cutting, and also drastically improves cutting efficiency. (Reduction of cycle time)

Notched Insert

Size Comparison (Full-Scale)



Cutting Force Comparison



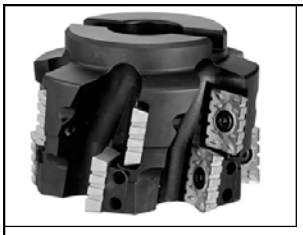
* The exclusive notched chipbreakers provide low cutting resistance and good chip evacuation.

(Customer Evaluation)

MSR Heavy Milling Cutter

Shouldering | Slotting | Facing

MSR (Inch-Size)



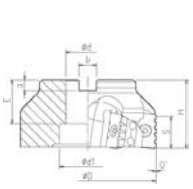


Fig.1

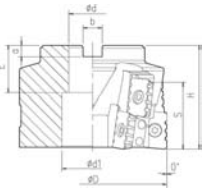


Fig.2

Spare Parts

Description	Spare Parts					
	Clamp Screw	Wrench	Shim	Clamp Screw	Wrench	Anti-seize Compound
						
MSR 3000R-○○	SB-60120TR	TT-25L	MAP-2506	SB-40140TR	DT-15	MP-1
MSR 4000R-○○	for Insert Clamp		for Shim Clamp			

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Toolholder Dimensions (Bore Ød: Inch type)

Description	Stock	No. of Inserts	No. of Flutes	Dimension (inch) ØD	Ød	Ød1	Ød2	H	E	a	b	S	Rake Angle A.R.	R.R.	Drawing	Weight (kg)	Applicable Inserts B20
MSR 3000R-1	●	4	4	3.00	1.00	0.790	-	1.970	1.020	0.240	0.375	0.925	+9°	-5°	Fig.1	1.1	APMT2506○○ER-NB3
3000R-2	●	8	4					2.760				1.770			Fig.2	1.6	APMT2506○○ER-NB4
4000R-1-1.5ID	●	6	6	4.00	1.50	1.610		1.970	1.260	0.310	0.500	0.925			Fig.1	1.6	APMT250616ER-NB3P
4000R-2-1.5ID	●	12	6					2.760				1.770			Fig.2	2.2	APMT250616ER-NB4P

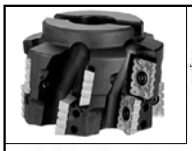
E

0° Lead Angle

● : Stock Std. ○ : World Express

MSR (Metric-Size)

Rake Angle (°)
Ø63~Ø80 A.R.: +9° R.R.: -8°
Ø100~ A.R.: +9° R.R.: -5°



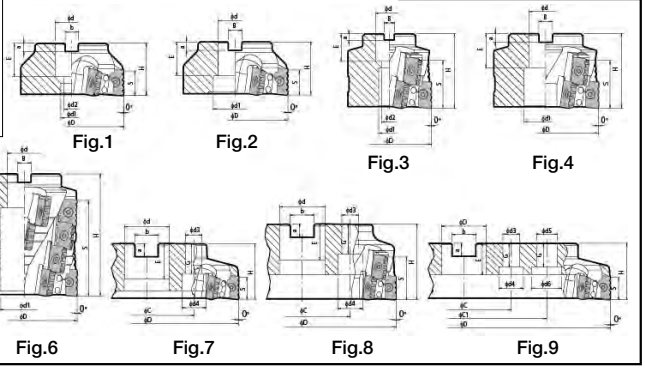


Fig.1 Fig.2 Fig.3 Fig.4

Fig.5 Fig.6 Fig.7 Fig.8 Fig.9

Spare Parts

Description	Spare Parts					
	Clamp Screw	Wrench	Shim	Clamp Screw	Wrench	Anti-seize Compound
MSR 063R-○○	SB-60120TR	TT-25L	-	-	-	MP-1
MSR 080R-○○ ~ 315R-○○			MAP-2506	SB-40140TR	DT-15	
	for Insert Clamp		for Shim Clamp			

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Toolholder Dimensions (Bore Ød: Metric type)

Description	Stock	No. of Inserts	No. of Flutes	No. of Stages	Dimension (mm) ØD	Ød	Ød1	Ød2	H	E	a	b	S	Ød3	Ød4	Ød5	Ød6	ØC	ØC1	G	Drawing	Weight (kg)	Applicable Inserts B20
MSR 063R-1M	○	4	4	1	63	27	20	14	65	22	7.2	12.4	23.5	-	-	-	-	-	-	-	Fig.1	0.7	APMT 2506○○ER-NB3 APMT 2506○○ER-NB4 APMT 250616ER-NB3P APMT 250616ER-NB4P
063R-2M	○	8		2					85				45								Fig.3	0.9	
080R-1M	○	4	4	1	80	27	20	14	50	22	7.2	12.4	23.5	-	-	-	-	-	-	-	Fig.1	1.0	
080R-2M	○	8		2					70				45								Fig.3	1.5	
080R-4M	○	16		4					115				90								Fig.5	2.5	
100R-1M	○	6	6	1	100	32	42	-	50	28	8	14.4	23.5	-	-	-	-	-	-	-	Fig.2	1.5	
100R-2M	○	12		2					70				45								Fig.4	2.0	
100R-4M	○	24		4					115				90								Fig.6	3.2	
125R-1M	○	6	6	1	125	40	58	-	60	30	9	16.4	23.5	-	-	-	-	-	-	-	Fig.2	3.4	
125R-2M	○	12		2					70				45								Fig.4	3.7	
125R-4M	○	24		4					115				90								Fig.6	6.0	
160R-1M	○	8	8	1	160	40	68	-	60	30	10	16.4	23.5	-	-	-	-	-	-	-	Fig.2	6.1	
160R-2M	○	16		2					70				45								Fig.4	6.8	
200R-1M	○	10	10	1	200	60	-	-	60	38	15	25.4	23.5	18	26	-	-	101.6	-	32	Fig.7	7.0	
200R-2M	○	20		2					80				45								Fig.8	9.9	
250R-1M	○	12	12	1	250	60	-	-	60	38	15	25.4	23.5	18	26	-	-	101.6	-	32	Fig.7	10.3	
250R-2M	○	24		2					80				45								Fig.8	14.2	
315R-1M	○	14	14	1	315	60	-	-	60	35	15	25.4	23.5	17	27	22	32	101.6	177.8	25	Fig.9	15.5	

· Shim is not available for MSR063R (Dia. D=63).
· Arbor attachment bolt (HH12x35) is included for MSR063R-1M / MSR080R-1M.
· Arbor attachment bolt (HH12x40) is included for MSR063R-2M and MSR080R-2M/4M.
· It is not recommended using only top edge part (ap=30mm) for 4 stages type. If ap is small, use 1 stage or 2 stages type.
· Deep grooving is not recommended for this cutter.

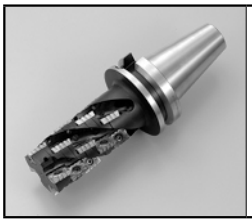
Toolholder Dimensions (Bore Ød: Inch type)

Description	Stock	No. of Inserts	No. of Flutes	No. of Stages	Dimension (mm) ØD	Ød	Ød1	Ød2	H	E	a	b	S	Ød3	Ød4	Ød5	Ød6	ØC	ØC1	G	Drawing	Weight (kg)	Applicable Inserts B20
MSR 063R-1	○	4	4	1	63	1.00"	20	14	65	26	6	9.5	23.5	-	-	-	-	-	-	-	Fig.1	0.8	APMT2506○○ER-NB3 APMT2506○○ER-NB4 APMT250616ER-NB3P APMT250616ER-NB4P
063R-2	○	8		2					85				45								Fig.3	1.0	
080R-1	○	4	4	1	80	1.00"	20	14	50	26	6	9.5	23.5	-	-	-	-	-	-	-	Fig.1	1.1	
080R-2	○	8		2					70				45								Fig.3	1.6	
080R-2-31.75	○					1.25"	27	18		32	8	12.7									Fig.3	1.7	
080R-4	●	16		4		1.00"	20	14	115	26	6	9.5	90								Fig.5	2.6	
080R-4-31.75	○					1.25"	27	18		32	8	12.7									Fig.5	2.7	
100R-1	○	6	6	1	100	1.25"	42	-	50	32	8	12.7	23.5	-	-	-	-	-	-	-	Fig.2	1.6	
100R-2	○	12		2					70				45								Fig.4	2.2	
100R-4	○	24		4					115				90								Fig.6	3.6	
125R-1	●	6	6	1	125	1.50"	54	-	60	38	10	15.9	23.5	-	-	-	-	-	-	-	Fig.2	3.5	
125R-2	○	12		2					70				45								Fig.4	3.8	
125R-4	○	24		4					115				90								Fig.6	6.1	
160R-1	○	8	8	1	160	2.00"	68	-	60	38	11	19.0	23.5	-	-	-	-	-	-	-	Fig.2	5.8	
160R-2	○	16		2					70				45								Fig.4	6.4	
160R-4	○	32		4					115				90								Fig.6	10.7	
200R-1	○	10	10	1	200	1.875"	-	-	60	38	14	25.4	23.5	18	26	-	-	101.6	-	32	Fig.7	7.5	
200R-2	○	20		2					80				45								Fig.8	10.4	
250R-1	○	12	12	1	250	1.875"	-	-	60	38	14	25.4	23.5	18	26	-	-	101.6	-	32	Fig.7	10.9	
250R-2	○	24		2					80				45								Fig.8	14.7	
315R-1	△	14	14	1	315	1.875"	-	-	60	35	14	25.4	23.5	17	27	22	32	101.6	177.8	25	Fig.9	16.0	

· Shim is not available for MSR063R (Dia. D=63).
· Arbor attachment bolt (HH12x40) is included for MSR063R/MSR080R. Arbor attachment bolt (HH16X45) is included for MSR080R-○-31.75.
· It is not recommended using only top edge part (ap=30mm) for 4 stages type. If ap is small, use 1 stage or 2 stages type.
· Deep grooving is not recommended for this cutter.

● : Stock Std. ○ : World Express △ : Made to Order

MSR-BT50



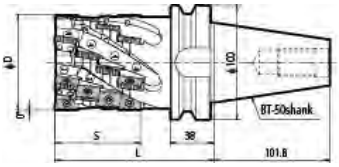


Fig.1

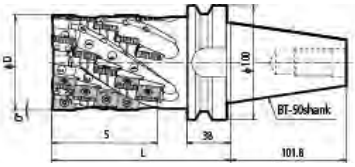


Fig.2

●Toolholder Dimensions (BT50 Integral Arbor type)

Description	Stock	No. of Inserts	No. of Flutes	No. of Stages	Dimension (mm) ØD	L	S	Rake Angle (°) A.R.	R.R.	Insert	Weight (kg)	Spare Parts: Clamp Screw	Wrench	Shim	Clamp Screw	Wrench	Anti-seize Compound	Applicable Inserts ➡B20
MSR 063R-BT50-4	○	16	4	4	63	160	90	+9°	-8°	Fig.1	5.7	SB-60120TR for Insert Clamp	TT-25L	-	-	-	MP-1	APMT2506○○ER-NB3 APMT2506○○ER-NB4 APMT250616ER-NB3P APMT250616ER-NB4P
063R-BT50-5	○	20		5		180	111			Fig.2	6.2							
080R-BT50-4	○	16	4	4	80	160	90			Fig.1	6.9			MAP-2506 for Shim Clamp	SB-40140TR for Shim Clamp	DT-15		
080R-BT50-5	○	20		5		180	111			Fig.2	7.4							
100R-BT50-4	○	24	6	4	100	160	90	+9°	-5°	Fig.1	9.6							
100R-BT50-5	○	30		5		180	111			Fig.2	10.5							

· Shim is not available for MSR063R (Dia. D=63).
· Using only top edge part (ap=30mm) for 4 stages / 5 stages type is not recommended. If ap is small, use previous pages 1 stage type or 2 stages type.
· Deep slotting is not recommended for this cutter.

● : Stock Std. ○ : World Express

●Applicable Inserts

Description	Applicable Inserts (B20) Handed Insert shows R-hand			
	 3-Notched	 4-Notched	 Low Cutting Force / 3-Notched	 Low Cutting Force / 4-Notched
MSR... MSR...M	APMT 2506○○ER-NB3	APMT 2506○○ER-NB4	APMT 250616ER-NB3P	APMT 250616ER-NB4P
For Custom-Ordered Left-Hand Cutters	APMT 250616EL-NB3	APMT 250616EL-NB4	–	–

Recommended Cutting Conditions (E60-E61)

●Caution of installing Notched Inserts

See Page (E52)

It is important to install the appropriate notched insert into the correct position. Failure to do so may result in damage to the toolholder body. The appropriate insert is marked on the pocket of the cutter body.

1) (3) is for APMT2506○○ER-NB3
2) (4) is for APMT2506○○ER-NB4

(No. of Inserts - Example)

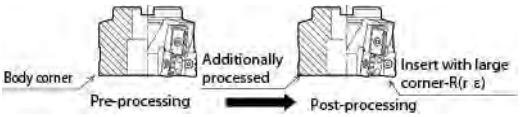
Description		No. of Inserts	No. of Flutes	No. of Inserts Notched	
				NB3	NB4
MSR	100R-1	6	6	3	3
	100R-2	12		6	6
	100R-4	24		12	12

■ Caution when installing the Insert with Corner-R(rε) 4.0

●When installing the insert with corner-radius 4.0mm, additional modifications for the body will be necessary. Ref. to the table below for the recommended modifications.

Insert Corner-R(rε)	Additional Processing Dimension to Body Corner
4.0	R2.0

* Round- chamfer additional processing is recommended. When applying chamfer, do not cut away too much.



◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed: sfm)				
	Low Cutting Force	General Purpose	MEGACOAT		PVD Coated Carbide		
	NB3P+NB4P	NB3+NB4	PR1230	PR1210	PR660	PR830	PR905
Cast Iron	0.006	0.008	-	★ 325~500~650	-	-	☆ 325~450~600
Carbon Steel	0.006	0.008	★ 325~500~650	-	☆ 325~450~600	☆ 325~500~600	-
Stainless Steel	Not recommended						
Aluminum / Copper	Not recommended						

* For MSR, cutting speed should be carefully adjusted depending on the length of toolholder protruding from the end of machine spindle.

★: 1st Recommendation
☆: 2nd Recommendation

- When the protruding length of toolholder is small, ➡ set the cutting speed to slightly higher than the recommended cutting conditions.
- When the protruding length of toolholder is large, ➡ set the cutting speed to slightly lower than the recommended cutting conditions.

■ Cutting Conditions

1) Shouldering

●When using MSR100R-1

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in3/min)
		Cutting speed	fz		
Cast Iron	Less than 3.94in	Vc=590sfm	fz=0.008ipt	0.79×3.15	67.13
	3.94~7.87in	Vc=590sfm	fz=0.008ipt	0.79×1.57	33.56
	7.91in and over	Vc=400sfm	fz=0.008ipt	0.79×1.18	16.84
Carbon Steel	Less than 3.94in	Vc=500sfm	fz=0.008ipt	0.79×3.15	56.14
	3.94~7.87in	Vc=500sfm	fz=0.008ipt	0.79×1.57	28.07
	7.91in and over	Vc=325sfm	fz=0.008ipt	0.79×1.18	13.91

●When using MSR100R-2

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in3/min)
		Cutting speed	fz		
Cast Iron	Less than 5.12in	Vc=590sfm	fz=0.008ipt	1.57×1.57	67.13
	5.12~9.06in	Vc=590sfm	fz=0.008ipt	1.57×0.79	33.56
	9.09in and over	Vc=400sfm	fz=0.008ipt	1.57×0.79	22.46
Carbon Steel	Less than 5.12in	Vc=500sfm	fz=0.008ipt	1.57×1.57	56.14
	5.12~9.06in	Vc=500sfm	fz=0.008ipt	1.57×0.79	28.07
	9.09in and over	Vc=325sfm	fz=0.008ipt	1.57×0.79	18.55

●When using MSR100R-4

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in3/min)
		Cutting speed	fz		
Cast Iron	Less than 7.09 in	Vc=590sfm	fz=0.008ipt	2.95×0.79	63.16
	7.09~11.02in	Vc=590sfm	fz=0.008ipt	2.95×0.39	31.61
	11.06in and over	Vc=400sfm	fz=0.008ipt	2.95×0.39	21.05
Carbon Steel	Less than 7.09 in	Vc=500sfm	fz=0.008ipt	2.95×0.79	52.66
	7.09~11.02in	Vc=500sfm	fz=0.008ipt	2.95×0.39	26.30
	11.06in and over	Vc=325sfm	fz=0.008ipt	2.95×0.39	17.39

2) Slotting

●When using MSR100R-1

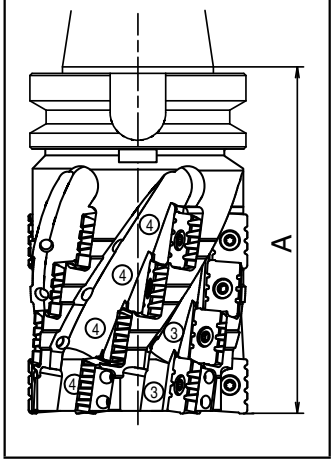
Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in3/min)
		Cutting speed	fz		
Cast Iron	Less than 3.94in	Vc=590sfm	fz=0.008ipt	0.55×3.94	58.95
	3.94~7.87in	Vc=500sfm	fz=0.008ipt	0.28×3.94	24.59
	7.91in and over	Vc=400sfm	fz=0.008ipt	0.16×3.94	11.23
Carbon Steel	Less than 3.94in	Vc=500sfm	fz=0.008ipt	0.28×3.94	24.59
	3.94~7.87in	Vc=400sfm	fz=0.008ipt	0.16×3.94	11.23
	7.91in and over	Vc=325sfm	fz=0.008ipt	0.12×3.94	6.96

●When using MSR100R-2

Workpiece Material	Overhang Length A (in)	Cutting Conditions		ap×ae (in)	Chip Removal Rate (in3/min)
		Cutting speed	fz		
Cast Iron	Less than 5.12in	Vc=590sfm	fz=0.008ipt	0.55×3.94	58.95
	5.12~9.06in	Vc=500sfm	fz=0.008ipt	0.28×3.94	24.59
	9.09in and over	Vc=400sfm	fz=0.008ipt	0.16×3.94	11.23
Carbon Steel	Less than 5.12in	Vc=500sfm	fz=0.008ipt	0.28×3.94	24.59
	5.12~9.06in	Vc=400sfm	fz=0.008ipt	0.16×3.94	11.23
	9.09in and over	Vc=325sfm	fz=0.008ipt	0.12×3.94	6.96

*Slotting is not recommended for 4 stage cutters

Overhang Length A (in)



2) Slotting

●When using MSR160R-1

Workpiece Material	Overhang Length A (in)	Cutting Conditions		apxae (in)	Chip Removal Rate (in³/min)
		Cutting speed	fz		
Cast Iron	Less than 3.94in	Vc=600sfm	fz=0.008ipt	0.39x6.30	56.63
	3.94~7.87in	Vc=500sfm	fz=0.008ipt	0.20x6.30	28.32
	7.91in and over	Vc=400sfm	fz=0.008ipt	0.16x6.30	14.83
Carbon Steel	Less than 3.94in	Vc=500sfm	fz=0.008ipt	0.20x6.30	23.43
	3.94in~7.87in	Vc=400sfm	fz=0.008ipt	0.12x6.30	14.04
	7.91in and over	Vc=325sfm	fz=0.008ipt	0.08x6.30	6.22

●When using MSR160R-2

Workpiece Material	Overhang Length A (in)	Cutting Conditions		apxae (in)	Chip Removal Rate (in³/min)
		Cutting speed	fz		
Cast Iron	Less than 5.12in	Vc=600sfm	fz=0.008ipt	0.39x6.30	56.63
	5.12~9.06in	Vc=500sfm	fz=0.008ipt	0.20x6.30	23.43
	9.09in and over	Vc=400sfm	fz=0.008ipt	0.16x6.30	14.83
Carbon Steel	Less than 5.12in	Vc=500sfm	fz=0.008ipt	0.20x6.30	23.43
	5.12~9.06in	Vc=400sfm	fz=0.008ipt	0.12x6.30	11.11
	9.09in and over	Vc=325sfm	fz=0.008ipt	0.08x6.30	6.22

*Slotting is not recommended for 4 stage cutters

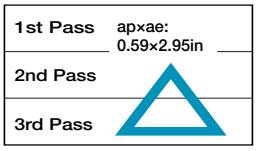
Q&A

Q-1 What cutting conditions are recommended in most cases for MSR?

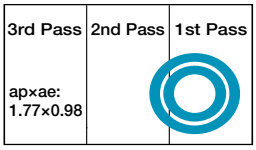
A-1 Vc=500sfm, fz=0.008ipt, larger cutting depth and smaller cutting width

In case of MSR100R-2

e.g.) Load meter 120%



e.g.) Load meter 90%



Q-2 What is the required equipment for MSR?

A-2 Maximum spindle revolution should be lower than 4000RPM. BT50 or larger.
* The reason it is not recommended for high RPM spindle machines is due to their lower torque value.
* Although MSR works with BT40 shank, maximum available fz is about 0.004ipt.

Q-3 What are the points to remember when using a lower horsepower machine?

A-3 Do not use large size cutters. ➡Ø2.5" or Ø3.0" are recommended
Please increase cutting speed and decrease feed rate.
Set up conditions to get the largest available torque by checking torque curve of the machine.
In conditions of Vc=500sfm, insufficient torque was amiable due to being in high gear.
In this case, use Vc which can exert enough torque, such as Vc=400sfm.
* Machine torque curve is a priority.

Q-4 How do I deal with an unstable workpiece?

A-4 Decrease feed rate during the initial cut.

* Vibration and workpiece movement are most likely to occur upon the cutters initial entry entry into the cut.

• Effective combinations for maintaining cycle time while reducing the feedrate.
Vc=500sfm, fz=0.008ipt
↓
Vc=650sfm, fz=0.006ipt

Q-5 What tool life can I expect?

A-5 Example:
Chip weight: 700kg/Corner (Result by PR660)
Cutting time: 90min. (calculated value)
Cutting distance: 65m (calculated value)
Metal Removal Rate? ➡ About 7.8kg chips removed per minute
Tool life time = 700kg (Chip weight)÷7.8kg (Chip evacuation amount per 1min)=90min
Cutting distance= 90min (Time by the end of tool life) x 717mm/min (Table feed ratio per 1min)=65m
* Cutting Vc=150m/min, apxae: 20x70mm, Vf=717mm/min.
* Tool: MSR100R-2 (6 Flutes)

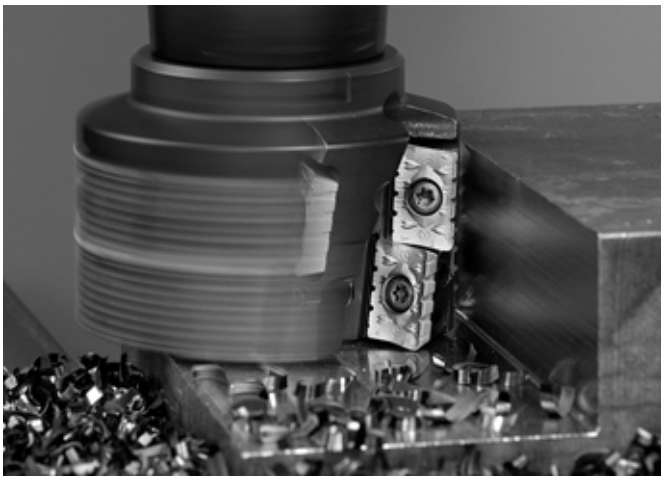
Q-6 How do I reduce chattering?

A-6 If chattering occurs, then the following conditions are recommended.
➡Reduce cutting speed and increase feed rate.

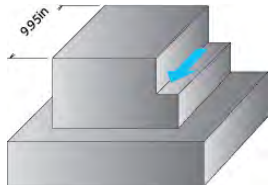
In case of Steel
· Vc=250sfm
· fz=0.010ipt

In case of Cast Iron
· Vc=250sfm
· fz=0.014ipt

Case Studies



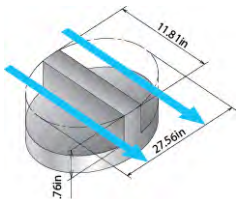
Structural Steel

· Base · Vc=500sfm (n=478RPM) · apxae=1.574×0.591in · fz=0.006ipt (Vf=16.93ipm) · Dry (Air blow) · MSR100R-2 · 6 flutes · APMT250616ER-NB3 · APMT250616ER-NB4 (PR660)	
MSR	Chip Removal Rate=15.7in³/min.
Competitor A	Chip Removal Rate=2.6in³/min.

Since MSR is able to machine a greater ap than competitor. Cutter A [dia 100 (6 edges) Vc=500sfm fz=0.005ipt (Vf=13.54ipm) apxae=0.197x0.984in] Chip Removal rate=2.6in³/min, the cutting time is drastically improved.

(Customer Evaluation)

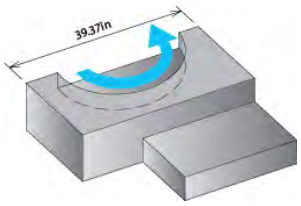
S45C

· Plate · Vc=450sfm(n=446RPM) · apxae=1.69×0.591in · fz=0.008ipt (Vf=21.06ipm) · Dry · MSR100R-2 · 6 flutes · APMT250616ER-NB3 · APMT250616ER-NB4 (PR660)	
MSR	Chip Removal Rate = 21.1in³/min.
Competitor B	Chip Removal Rate = 2.0in³/min.

Since MSR is able to evacuate more than 10 times as many chips as competitor B [dia 125 (6 Edges) Vc=400sfm fz=0.004ipt (Vf=7.24ipm) apxae=0.236x1.181in] Chip Removal rate= 2.0in³/min, the cutting time is improved.

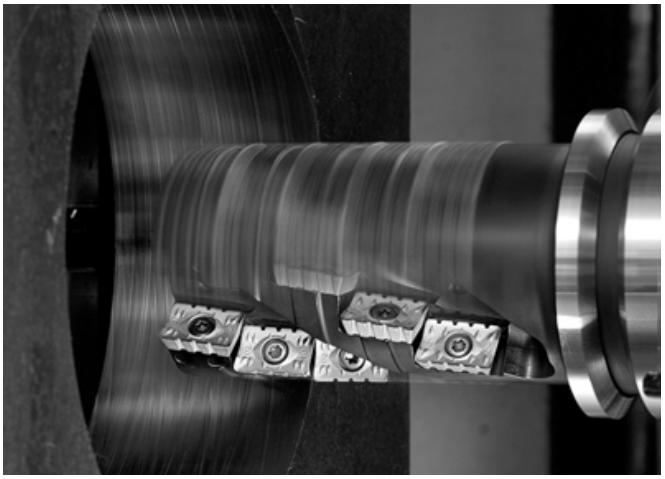
(Customer Evaluation)

1035

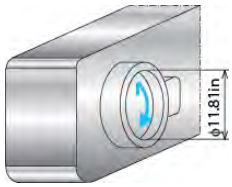
· Bracket · Vc=500sfm (n=478RPM) · apxae=0.787×2.756in · fz=0.010ipt (Vf=28.27ipm) · Dry (Mist) · MSR100R-2 · 6 flutes · APMT250616ER-NB3 · APMT250616ER-NB4 (PR660)	
MSR	Chip Removal Rate=61.3in³/min.
Competitor C	Chip Removal Rate=25.5in³/min.

Since MSR is able to cut stably even by increasing feed rate 2.4 times compared competitor C [dia 100] (6 edge lines) Vc=425sfm fz=0.006ipt (Vf=11.73ipm) apxae=0.787x2.756in], cutting efficiency is improved.

(Customer Evaluation)



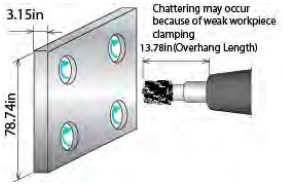
Cast Steel

· Construction Machine Part · Vc=400sfm (n=400RPM) · apxae=0.590×1.772in · fz=0.006ipt (Vf=14.17ipm) · Dry · MSR100R-2 · 6 flutes · APMT250616ER-NB3 · APMT250616ER-NB4 (PR660)	
MSR	Chip Removal Rate=14.9in³/min.
Competitor D	Chip Removal Rate=7.4in³/min.

Even with double the feed rate, stable cutting was possible. and cutting efficiency was improved compared with Competitor D [Dia. 100(4 edges) Vc=400sfm fz=0.003ipt (Vf=7.09) apxae=0.590x1.772in]

(Customer Evaluation)

Structural Steel

· Plate · Vc=650sfm(n=640RPM) · apxae=3.15×0.394in · fz=0.002ipt (Vf=9.06ipm) · Dry · MSR100R-4 (4Stage type) · 6 flutes · APMT250616ER-NB3 · APMT250616ER-NB4 (PR660)	
MSR	Chip Removal Rate=11.2in³/min.
Competitor E	Chip Removal Rate=4.8in³/min.

Compared to Competitor E's [Ø100 (4 Edges) Vc=825sfm fz=0.002ipt (Vf=7.87ipm) apxae=1.535×0.394in] Chip Removal Amount=4.8in³/min., MSR had Chip Removal Amount= 11.2in³/min due to its large cut (ap) and improved cutting efficiency by 2.3 times with quiet cutting sound.

(Customer Evaluation)

Ductile Iron

· Construction Machine Part · Vc=575sfm(n=550RPM) · apxae=0.197×1.969in · fz=0.008 (Vf=25.98ipm) · Dry · MSR100R-2 · 6 flutes · APMT250616ER-NB3 · APMT250616ER-NB4 (PR905)	
MSR	Chip Removal Rate=10.1in³/min.
Competitor F	Chip Removal Rate=3.1in³/min.

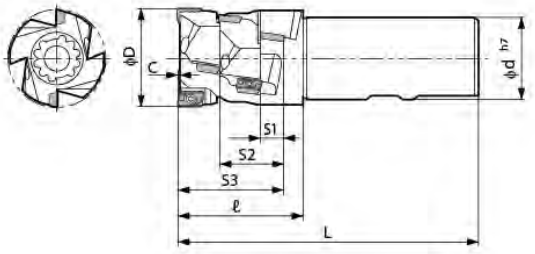
Comparing to Competitor F's [Ø100 (6 Edges) Vc=300sfm fz=0.008ipt (Vf=13.50ipm) apxae=0.118×1.969in] Chip Removal Amount=3.1in³/min., MSR had Chip Removal Amount=10.1in³/min. and improved cutting efficiency by 3.2 times.

(Customer Evaluation)

MHD Helical Endmill (Plus Mill)

Shouldering | Deep Slotting | Facing

MHD-SA Separate type (Base Unit A + 2 Front Pieces)

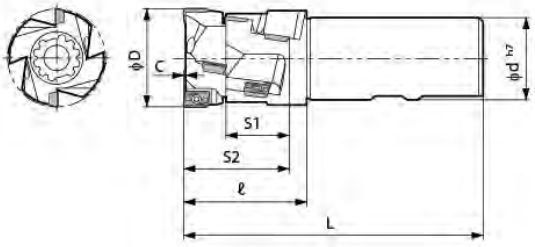


●Toolholder Dimensions

Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm)								Rake Angle (°)	
					ØD	Ød	L	ℓ	C	S1	S2	S3	A.R.	R.R.
MHD	32-S32-SA	○	10	2	32	32	132	50	0.7	8.3	24.7	41.8	+9°	-7°
	40-S32-SA	○			40	32	147	64	0.9	10.9	31.9	53.8		-3°
	40-S42-SA	○				42	154							-3°
	50-S42-SA	○			50									-1°

· When using "-T" Insert, the finished diameter (ØD) will be approx. 0.2mm smaller.

MHD-SB Separate type (Base Unit B+1 Front Piece)



●Toolholder Dimensions

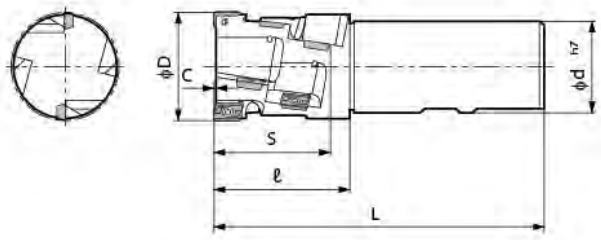
Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm)							Rake Angle (°)	
					ØD	Ød	L	ℓ	C	S1	S2	A.R.	R.R.
MHD	40-S42-SB	○	10	2	40	42	154	64	0.9	31.9	53.8	+9°	-3°
	50-S42-SB	○			50								-1°

· When using "-T" Insert, the finished diameter (ØD) will be approx. 0.2mm smaller.

●Applicable Inserts and Composition of Toolholder

Description		Applicable Inserts ➡B22-B23	Base Unit ➡E64	Front Piece (Middle) ➡E65	Front Piece (End) ➡E65
MHD	32-S32-SA	NDKW090304ER, NDKT090304ER-V/N1/N2	MHD32-S32-A	MHD32-F	MHD32-F
	40-S32-SA	NDMM12T308ER-T/N2/N3	MHD40-S32-A	MHD40-F	MHD40-F
	40-S42-SA		MHD40-S42-A		
	50-S42-SA		MHD50-S42-A	MHD50-F	MHD50-F
MHD	40-S42-SB	NDMM12T308ER-T/N2/N3	MHD40-S42-B	-	MHD40-F
	50-S42-SB		MHD50-S42-B	-	MHD50-F

MHD-C Integral Type



●Toolholder Dimensions

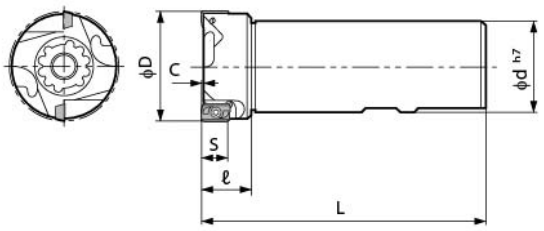
Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm)						Rake Angle (°)		Applicable Inserts ➡B22-B23
					ØD	Ød	L	ℓ	C	S	A.R.	R.R.	
MHD	20S-S20-C	○	3	1	20	20	96	24.5	0.5	17.5	+9°	-7°	NDKW090304ER NDKT090304ER-V
	25-S25-C	○	8	2	25	25	116	41.5	0.5	34.5		-3°	NDKT090304ER-N1/N2
	32-S32-C	○	10		32	32	132	50	0.7	41.8		-7°	
	40-S42-C	○			40	42	154	64	0.9	53.8		-3°	NDMM12T308ER-T/N2/N3
	50-S42-C	○			50							-1°	

· When using "-T" Insert, the finished diameter (ØD) will be approx. 0.2mm smaller.

● : Stock Std. ○ : World Express

MHD Helical Endmill (Plus Mill)

MHD-A Base Unit A



●Toolholder Dimensions

Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm)								Rake Angle (°)	
					ØD	Ød	L	ℓ	C	S			A.R.	R.R.
MHD	32-S32-A	○	2	2	32	32	100	18.7	0.7	9.0			+9°	-7°
	40-S32-A	○			40		106	23	0.9	11.8				-3°
	40-S42-A	○			40	42	113							-3°
	50-S42-A	○			50									-1°
MHD	32-S32-A-130	○	2	2	32	32	130	32.8	0.7	9.0			+9°	-7°
	40-S32-A-150	○			40		150	42	0.9	11.8				-3°
	50-S42-A-150	○			50	42								-1°

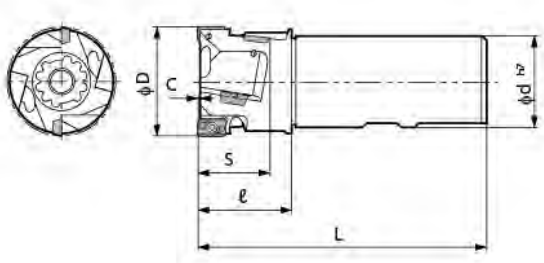
· When using "-T" Insert, the finished diameter (ØD) will be approx. 0.2mm smaller.

●Applicable Inserts and Front Piece

Description		Applicable Inserts ⇨B22-B23	Applicable Front Piece (Middle) ⇨E65	Applicable Front Piece (End) ⇨E65, J10
MHD	32-S32-A	NDKW090304ER, NDKT090304ER-V/N1/N2	MHD32-F	MHD32-F, (MHD32-4RF)
	40-S32-A	NDMM12T308ER-T/N2/N3	MHD40-F	MHD40-F, (MHD40-5RF)
	40-S42-A			
	50-S42-A		MHD50-F	MHD50-F, (MHD50-6RF)
MHD	32-S32-A-130	NDKW090304ER, NDKT090304ER-V/N1/N2	MHD32-F	MHD32-F, (MHD32-4RF)
	40-S32-A-150	NDMM12T308ER-T/N2/N3	MHD40-F	MHD40-F, (MHD40-5RF)
	50-S42-A-150		MHD50-F	MHD50-F, (MHD50-6RF)

· Component in ( ) is for Radius Plus Mill Series ⇨J10

MHD-B Base Unit B



●Toolholder Dimensions

Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm)								Rake Angle (°)	
					ØD	Ød	L	ℓ	C	S			A.R.	R.R.
MHD	40-S42-B	○	6	2	40	42	133	42	0.9	32.8			+9°	-3°
	50-S42-B	○			50									-1°

· When using "-T" Insert, the finished diameter (ØD) will be approx. 0.2mm smaller.

●Applicable Inserts and Front Piece

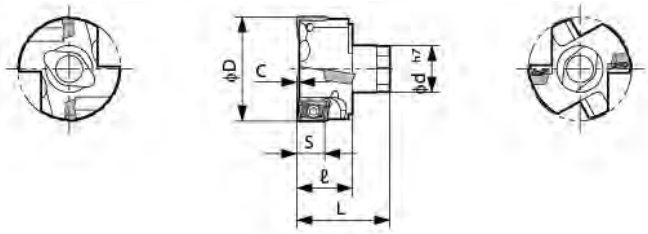
Description		Applicable Inserts ⇨ B23	Applicable Front Piece (End) ⇨E65, J10
MHD	40-S42-B	NDMM12T308ER-T/N2/N3	MHD40-F, (MHD40-5RF)
	50-S42-B		MHD50-F, (MHD50-6RF)

· Component in ( ) is for Radius Plus Mill Series ⇨ J10

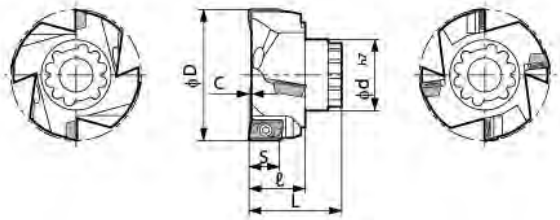
● : Stock Std. ○ : World Express

MHD-F Front Piece

MHD32-F



MHD40/50-F

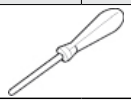


●Toolholder Dimensions

Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm)						Rake Angle (°)		Applicable Inserts B22-B23
					∅D	∅d	L	ℓ	C	S	A.R.	R.R.	
MHD	32-F	○	4	2	32	14.4	28.6	17.1	0.7	9.0	+9°	-7°	NDKW090304ER NDKT090304ER-V/N1/N2
	40-F	○			40	19	35	21.9	0.9	11.8		-3°	NDMM12T308ER-T/N2/N3
	50-F	○			50	27	36					-1°	

· When using "-T" Insert, the finished diameter (∅D) will be approx. 0.2mm smaller.

●Spare Parts

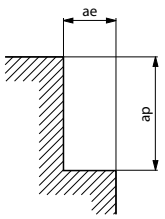
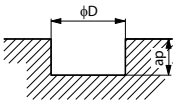
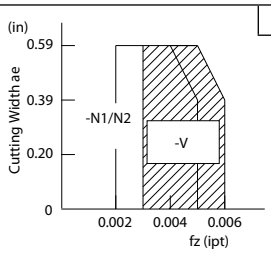
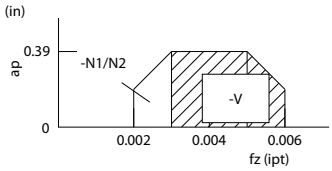
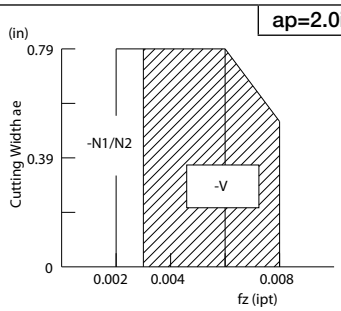
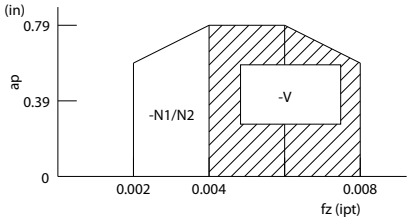
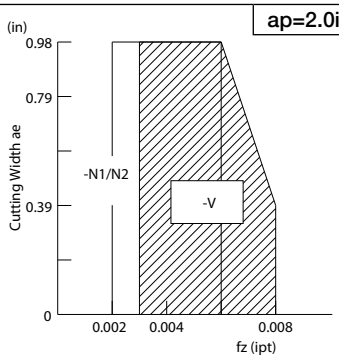
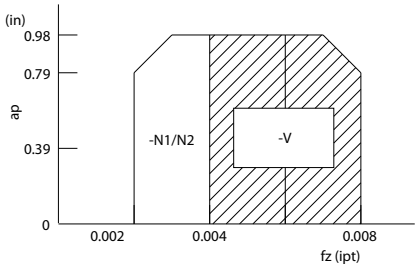
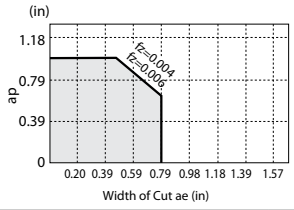
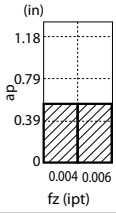
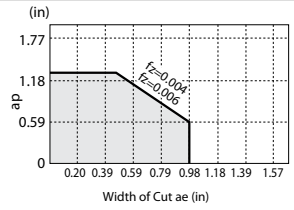
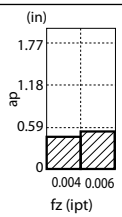
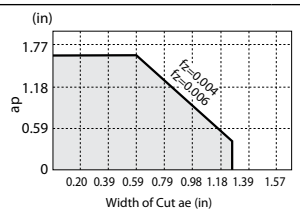
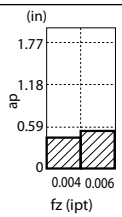
Description			Spare Parts					
			Clamp Screw		Wrench		Clamp Bolt		Wrench	Anti-seize Compound
			For Bottom Insert	For Middle Insert	For Bottom Insert	For Middle Insert	For 1 Front Piece	For 2 Front Pieces		
										
Separate Type	MHD	32-S32-SA	SB-2560TR		DT-8		-	HH8X50	LW-6	MP-1
		40-S32-SA	SB-3080TR		DT-10			HH8X65		
		40-S42-SA								
		50-S42-SA						HH12X65	LW-10	
	MHD	40-S42-SB					HH8X40	-	LW-6	
		50-S42-SB					HH12X40		LW-10	
Integral Type	MHD	20S-S20-C	SB-2560TR		DT-8		-	-	-	
		25-S25-C								
		32-S32-C								
		40-S42-C	SB-3080TR		DT-10					
		50-S42-C								
Base Unit	MHD	32-S32-A	SB-2560TR		DT-8		HH8X35	HH8X50	LW-6	
		40-S32-A	SB-3080TR		DT-10		HH8X40	HH8X65		
		40-S42-A								
		50-S42-A					HH12X40	HH12X65	LW-10	
	MHD	32-S32-A-130	SB-2560TR		DT-8		HH8X35	HH8X50	LW-6	
		40-S32-A-150	SB-3080TR		DT-10		HH8X40	HH8X65		
		50-S42-A-150					HH12X40	HH12X65	LW-10	
	MHD	40-S42-B	SB-3080TR		DT-10		HH8X40	-	LW-6	
		50-S42-B					HH12X40	-	LW-10	
Front Piece	MHD	32-F	SB-2560TR		DT-8		-	-	-	-
		40-F	SB-3080TR		DT-10					
		50-F								

· When purchasing the front piece separately, the wrench (DT-8 or DT-10 or DT-15) is not included.
· When purchasing the base unit and front pieces separately for assembly, the clamp bolt and wrench(for bolt) are not included. Please purchase them separately.
· Various clamp bolts for front pieces are available. E71
· For Separate type (MHD…-SA/-SB type) and Base Unit (MHD…-A/-B type), the clamp bolts for regular type front piece (MHD…-F) installation are attached.
If replacing the end with the radius-type front piece (MHD…-RF), a different type of clamp bolt may be required. E71

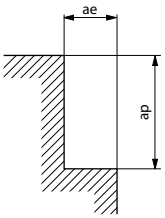
Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

● : Stock Std. ○ : World Express

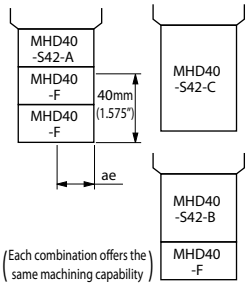
Cutting Performance of the Plus Mill

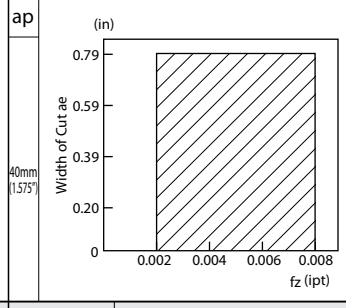
Workpiece Material	Shouldering	Slotting
1050 Steel		
Description		
MHD32-S32-SA	ap=1.5in 	
MHD40-S32-SA MHD40-S42-SA MHD40-S42-SB MHD40-S42-C	ap=2.0in 	
MHD50-S42-SA MHD50-S42-SB MHD50-S42-C	ap=2.0in 	
MHD20S-S20-C		
MHD25-S25-C		
MHD32-S32-C		

◆Cutting Performance in Shouldering (Extending front piece of ∅40mm / ∅50mm)

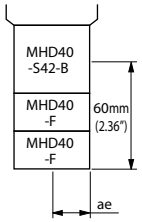
Cutting Conditions	
Cutting Dia.: ϕ40mm Workpiece Material: 1050 Insert: With notch NDMM12T308ER-N2/N3 (PR660)	

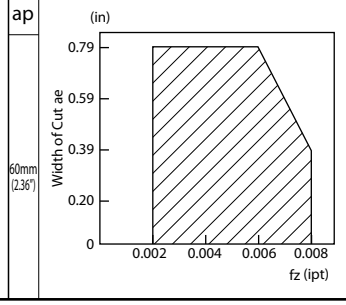
Combination	Cutting speed	Vc=225~400sfm

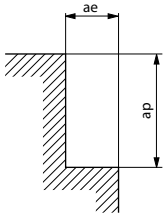




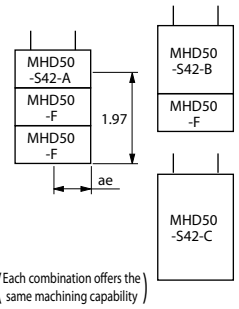
Combination	Cutting speed	Vc=225~400sfm

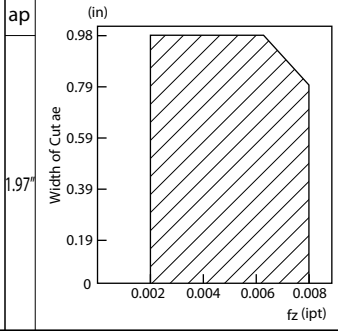




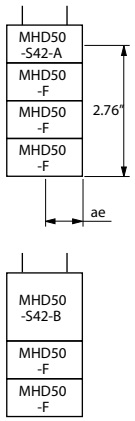
Cutting Conditions	
Cutting Dia.: ϕ50mm Workpiece Material: 1050 Insert: With notch NDMM12T308ER-N2/N3 (PR660)	

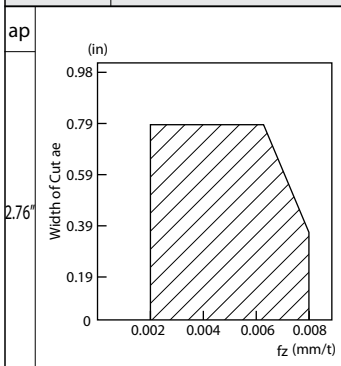
Combination	Cutting speed	Vc=225~400sfm



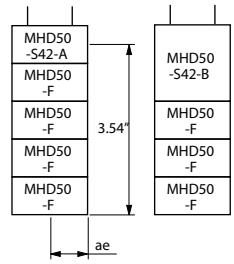


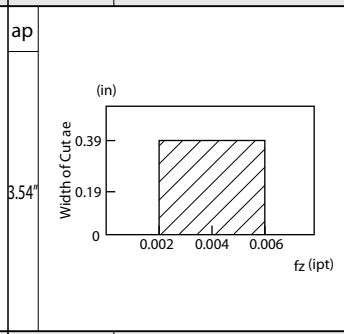
Combination	Cutting speed	Vc=225~400sfm (ae=~0.59in) Vc=200~300sfm (In case of ae=0.59~0.79in)



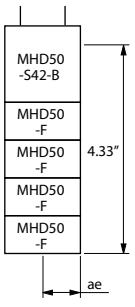


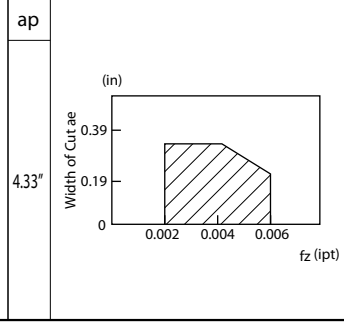
Combination	Cutting speed	Vc=225~400sfm



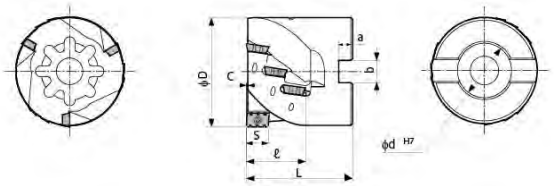


Combination	Cutting speed	Vc=225~400sfm





MHD-FMA-A Base Unit (FMA Arbor-Free type)



Use notched inserts (-N2, -N3).

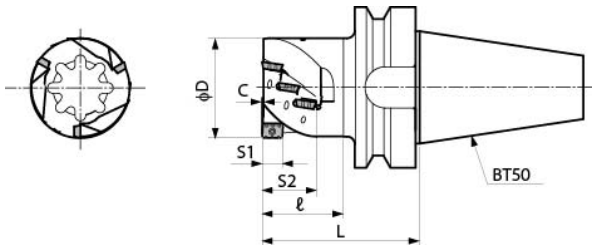
●Toolholder Dimensions

Description	Stock	No. of Inserts	No. of Flutes	Dimension (mm)							Rake Angle (°)		Weight (kg)
				ØD	Ød	L	ℓ	C	a	b	A.R.	R.R.	
MHD 63-FMA-A	○	9	3	63	1.25"	60.9	32.7	0.9	8	0.500"	+9°	0°	0.8
80-FMA-A	○			80	1.50"				10	0.625"			1.4
100-FMA-A	○	16	4	100	2.00"	66.9	43.2		11	0.750"			2.3

●Applicable Inserts, Front Piece and Arbor

Endmill	Applicable Inserts (B23)	Applicable Front Piece (E68)	Applicable Arbor
MHD 63-FMA-A	NDMM12T308ER-N2/N3	MHD63-F	BT50-FMA31.75-○○
80-FMA-A		MHD80-F	BT50-FMA38.1-○○
100-FMA-A		MHD100-F	BT50-FMA50.8-○○

MHD-BT50-A Base Unit (BT50 Integral Arbor type)



Use notched inserts (-N2, -N3).

● Toolholder Dimensions

Description	Stock	No. of Inserts	No. of Flutes	Dimension (mm)							Rake Angle (°)		Weight (kg)
				ØD	L	ℓ	C	S1	S2		A.R.	R.R.	
MHD 63-BT50-A	○	9	3	63	94.1	46.1	0.9	11.8	31.8		+9°	+0°	4.5
80-BT50-A	○			80									5.5
100-BT50-A	○	16	4	100	104	66.0			42.3				6.8

● Applicable Inserts and Front Piece

Endmill	Applicable Inserts (B23)	Applicable Front Piece (E68)
MHD 63-BT50-A	NDMM12T308ER-N2/N3	MHD63-F
80-BT50-A		MHD80-F
100-BT50-A		MHD100-F

MHD-F (Front Piece)

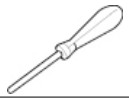
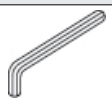
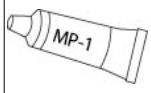
Use notched inserts (-N2, -N3).

●Toolholder Dimensions

Description	Stock	No. of Inserts	No. of Flutes	Dimension (mm)						Rake Angle (°)		Weight (kg)	Applicable Inserts (B23)
				ØD	Ød	L	ℓ	C	S	A.R.	R.R.		
MHD 63-F	○	6	3	63	32.5	37.9	21.9	0.9	11.8	+9°	0°	0.3	NDMM12T308ER-N2/N3
80-F	○	9		80	42	51.9	32.4					0.9	
100-F	○	12	4	100	61	56.4	32.4					1.4	

● : Stock Std. ○ : World Express

●Spare Parts

Description		Spare Parts				
		Clamp Screw	Wrench	Clamp Bolt	Wrench	Anti-seize Compound
						
Base Unit ➡E68	MHD 63-FMA-A	SB-3080TR	DT-10	HH16X90	LW-14	MP-1
	MHD 80-FMA-A			HH20X110	LW-17	
	MHD 100-FMA-A			HH24X110	LW-19	
Base Unit ➡E68	MHD 63-BT50-A			HH16X65	LW-14	
	MHD 80-BT50-A			HH20X90	LW-17	
	MHD 100-BT50-A			HH24X90	LW-19	
Front Piece ➡E68	MHD 63-F			-	-	-
	MHD 80-F					
	MHD 100-F					

· When purchasing the front piece separately, the wrench (DT-10) is not included.
· When purchasing the base unit and front pieces separately for assembly, the clamp bolt and wrench (for bolt) are not included.
· Various clamp bolts for front pieces are available. ➡E71

Apply a thin coating of Anti-seize Compound (MP-1) on the clamp screw when installing the inserts.

◆Applicable Inserts (common to MHD-SA / -SB / -C)

Description	Applicable Inserts ➡B21-B22				Applicable Inserts ➡B23		
			 1-Notched	 2-Notched		 2-Notched	 3-Notched
MHD 32-S32-SA	NDKW 090304ER	NDKT 090304ER-V	NDKT 090304ER-N1	NDKT 090304ER-N2	-	-	-
MHD 20S-S20-C			-	-			
MHD 25-S25-C 32-S32-C	-	-	NDKT 090304ER-N1	NDKT 090304ER-N2			
MHD 40-S32-SA 40-S42-SA 50-S42-SA MHD 40-S42-SB 50-S42-SB MHD 40-S42-C 50-S42-C	-	-	-	-	NDMM 12T308ER-T	NDMM 12T308ER-N2	NDMM 12T308ER-N3

· For installation of notched insert, ref. page ➡E70.

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed Vc: sfm)											
			Cermet			PVD Coated Carbide							Carbide	
	∅D ∅20~∅32 (mm)	∅D ∅40~∅100 (mm)	TN60	TN100M	TC60	PR630	PR730	PR830			PR660	PR905	PW30	KW10
Stainless Steel	0.002~0.005	0.002~0.007		☆ 325~650		☆ 250~600	☆ 250~600				★ 200~500			
Carbon Steel	0.002~0.006	0.002~0.008		★ 325~650		☆ 250~600	★ 250~600				☆ 200~500			
Alloy Steel	0.002~0.006	0.002~0.008		★ 250~600		☆ 250~600	★ 250~600				☆ 200~500			
Mold Steel	0.002~0.006	0.002~0.008		★ 250~600		☆ 200~500	★ 200~500				☆ 200~425			
Cast Iron	0.002~0.006	0.002~0.008										★ 200~500		☆ 200~425
Non-ferrous Metals	0.002~0.006	0.002~0.008												★ 325~975

· Reduce the ap by 20-50% when cutting with long overhang length or using long shank types.
· Reduce the cutting speed by 20-50% when cutting with multiple front pieces.
· Compressed air is recommended to aid in chip evacuation.

★: 1st Recommendation ☆: 2nd Recommendation

No. of inserts to be installed in the Plus Mill

Description		No. of Inserts	No. of Flutes	NDKT09 type			FPMT09 Type	RPMT10 Type
				Without notch	Notched			
					N1	N2		
Separate Type	MHD 32-S32-SA	10	2	-	5	5	-	-
	32-S32-4RSA				4	4	2	
Base Unit	MHD 32-S32-A	2	2	-	1	1	-	-
Front Piece	MHD 32-F	4	2	-	2	2	-	-
	32-4RF				1	1	2	
Integral Type	MHD 20S-S20-C	3	1	3	-	-	-	-
	25-S25-C	8	2	-	4	4		
	32-S32-C	10	2	-	5	5		

Description		No. of Inserts	No. of Flutes	NDMM12 type		RPMT10 Type	RPMT12 Type
				Notched			
				N2	N3		
Separate Type	MHD 40-S32-SA	10	2	5	5	-	-
	40-S42-SA						
	50-S42-SA						
	MHD 63-FMA-SA	21	3	7	14		
	80-FMA-SA	27	3	9	18		
	100-FMA-SA	40	4	20	20		
	MHD 63-BT50-SA	21	3	7	14		
	80-BT50-SA	27	3	9	18		
	100-BT50-SA	40	4	20	20		
	MHD 40-S32-5RSA	10	2	4	4	2	-
	40-S42-5RSA						
	50-S42-6RSA					-	2
	MHD 40-S42-SB	10	2	5	5	-	-
	50-S42-SB						
Base Unit	MHD 40-S32-A	2	2	1	1	-	-
	40-S42-A						
	50-S42-A						
	MHD 63-FMA-A	9	3	3	6		
	80-FMA-A						
	100-FMA-A	16	4	8	8		
	MHD 63-BT50-A	9	3	3	6		
	80-BT50-A						
	100-BT50-A	16	4	8	8		
	MHD 40-S42-B	6	2	3	3		
	50-S42-B						
Front Piece	MHD 40-F	4	2	2	2	-	-
	50-F						
	63-F	6	3	2	4		
	80-F	9		3	6		
	100-F	12	4	6	6		
	MHD 40-5RF	4	2	1	1	2	-
	50-6RF					-	2
Integral Type	MHD 40-S42-C	10	2	5	5	-	-
	50-S42-C						
	MHD 40-S42-5RC	10	2	4	4	2	-
	50-S42-6RC					-	2

Caution when installing Notched Insert

When installing Notched Inserts, it is important to install it in the correct position. When installed incorrectly, the tool cannot cut the workpiece and the toolholder body may be dammaged.

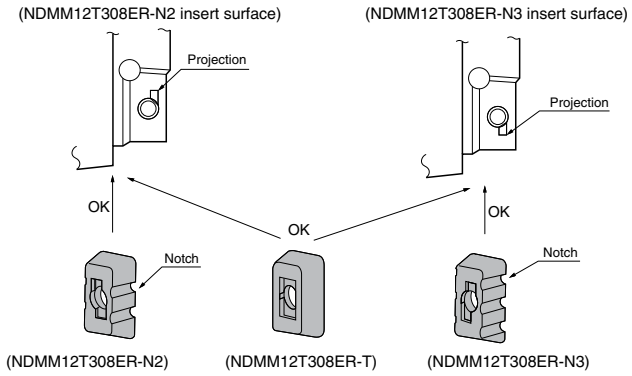
Description of Notched Insert	Applicable Toolholders
	In case of having insert installation mark
NDKT 090304ER-N1/N2	MHD25, 32
NDMM 12T308ER-N2/N3	MHD40, 50, 63, 80, 100

In case of "having insert installation mark"

Caution during insert installation

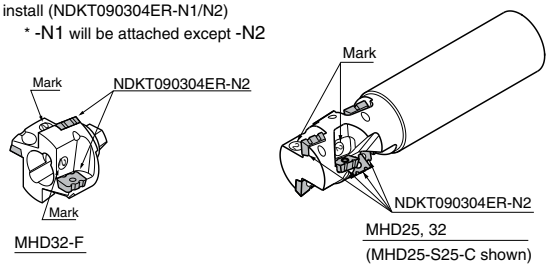
1) NDMM12T308ER-N2 or -3 in the insert pocket with projection (only MHD40 / 50)
2) ND□□○○○○○○ER-N2 in the insert pocket marked (2)
3) ND□□○○○○○○ER-N3 in the insert pocket marked (3)

1. How to install (MHD40, 50)

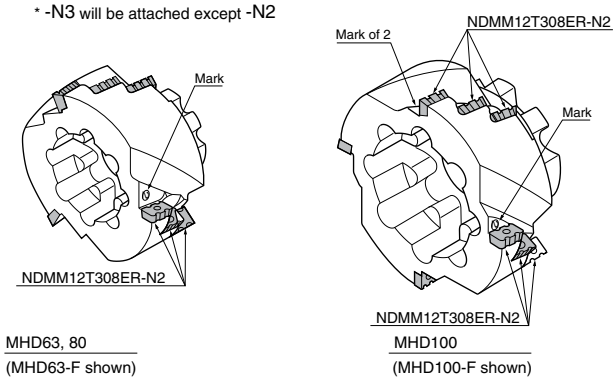


2. How to install (MHD25, 32, 63, 80, 100)

How to install (NDKT090304ER-N1/N2)
* -N1 will be attached except -N2

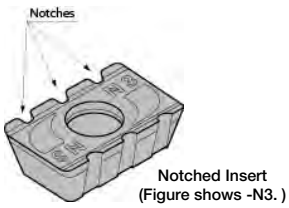


How to install (NDMM12T308ER-N2/N3)
* -N3 will be attached except -N2



Notched Insert Benefits

The Notched Insert does not only lower cutting force but it also has a great effect on reducing chatter.



Cutting Edge Length of the Plus Mill

Base Unit	No. of Flutes	No. of Inserts	Plus Mill E68, E65				Radius Plus Mill J10					
			Front Piece (Both Middle and End)		Length of cutting edge (mm)	Clamp Bolt	Front Piece (Middle)		Radius Front Piece (End)		Length of cutting edge (mm)	Clamp Bolt
			Description	No. of pcs			Description	No. of pcs	Description	No. of pcs		
MHD32-S32-A	2	6	MHD32-F	1	25.4	HH8X35	MHD32-F	0	MHD32-4RF	1	25.6	HH8X35
		10		2	41.8	HH8X50		1		1	42.0	HH8X50
		14		3	58.2	HH8X70		2		1	58.4	HH8X65
MHD40-S32-A MHD40-S42-A (MHD40-S42-B)	2	6	MHD40-F	1	32.8 (53.8)	HH8X40	MHD40-F	0	MHD40-5RF	1	27.2 (48.2)	HH8X35
		10		2	53.8 (74.8)	HH8X65		1		1	48.2 (69.2)	HH8X55
		14		3	74.8 (95.8)	HH8X85		2		1	69.2 (90.2)	HH8X80
		18		4	95.8 (116.8)	HH8X110		3		1	90.2 (111.2)	HH8X100
MHD50-S42-A (MHD50-S42-B)	2	6	MHD50-F	1	32.8 (53.8)	HH12X40	MHD50-F	0	MHD50-6RF	1	28.2 (49.2)	HH12X40
		10		2	53.8 (74.8)	HH12X65		1		1	49.2 (70.2)	HH12X55
		14		3	74.8 (95.8)	HH12X85		2		1	70.2 (91.2)	HH12X80
		18		4	95.8 (116.8)	HH12X110		3		1	91.2 (112.2)	HH12X100
		22		5	116.8 (137.8)	HH12X130		4		1	112.2 (133.2)	HH12X120
		26		6	137.8 (158.8)	HH12X150		5		1	133.2 (154.2)	HH12X140
MHD63-FMA-A	3	9	MHD63-F	0	32.7	HH16X45	-	-	-	-	-	-
		15		1	53.7	HH16X65						
		21		2	74.7	HH16X90						
		27		3	95.7	HH16X110						
		33		4	116.7	HH16X130						
MHD80-FMA-A	3	9	MHD80-F	0	32.7	HH20X40	-	-	-	-	-	-
		18		1	64.2	HH20X75						
		27		2	95.7	HH20X110						
		36		3	127.2	HH20X140						
		45		4	158.7	HH20X170						
MHD100-FMA-A	3	16	MHD100-F	0	43.2	HH24X40	-	-	-	-	-	-
		28		1	74.7	HH24X75						
		40		2	106.2	HH24X110						
		52		3	137.7	HH24X140						
		64		4	169.2	HH24X170						
MHD63-BT50-A	3	15	MHD63-F	1	53.7	HH16X45	-	-	-	-	-	-
		21		2	74.7	HH16X65						
		27		3	95.7	HH16X90						
		33		4	116.7	HH16X110						
MHD80-BT50-A	3	18	MHD80-F	1	64.2	HH20X55	-	-	-	-	-	-
		27		2	95.7	HH20X90						
		36		3	127.2	HH20X120						
		45		4	158.7	HH20X150						
MHD100-BT50-A	4	28	MHD100-F	1	74.7	HH24X60	-	-	-	-	-	-
		40		2	106.2	HH24X90						
		52		3	137.7	HH24X120						
		64		4	169.2	HH24X150						

· Dimension in ( ) is for Base Unit B.
· Clamp Bolt Description (HH○○X□□): ○○...indicates screw standard (M○○), □□...indicates bolt's nominal length (mm).
· Clamp Bolt Descriptions are common to both Base Unit A and B.

●Difference of Cutting Edge Length between Radius Plus Mill and Plus Mill

As shown in Fig.1, the edge length of front piece in Radius Plus Mill (l2) and the edge length of front piece in Plus Mill (l1) are different.

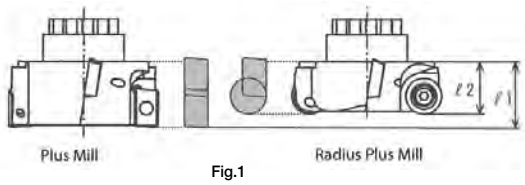


Fig.1

For Radius Plus Mill and Plus Mill,
the number of Front Piece required varies depending on the ap.

●Difference of Clamp Bolt Length in the Front Piece

Radius Plus Mill's inserts protrude from the bottom of the body for the function of ramping or helical milling, as well as the difference of Front Piece Length.
For this reason, the Radius Plus Mill's clamp bolt length in the front piece is shorter than that of Plus Mill. (Ref. to Fig.2)

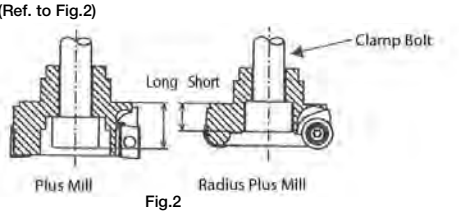
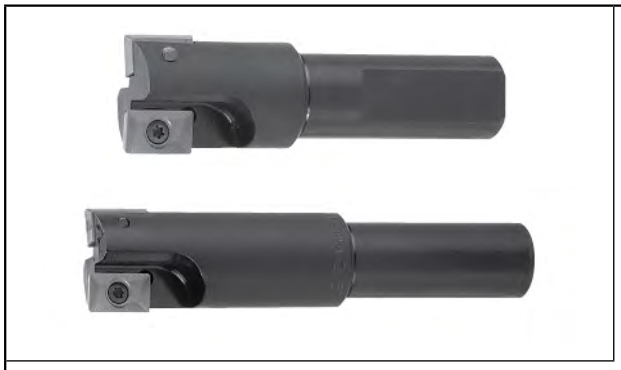


Fig.2

When using Radius Plus Mill's front piece, be careful for the difference of clamp bolt length as mentioned above.
If the length of clamp bolt is too long, the front piece will not be secured even when the bolt is tightened. Make sure to check the length of clamp bolt for installation of the front piece to avoid troubles such as tool damages.

Shouldering | Slotting | Facing

EM (Endmills / Extended Length Endmills)



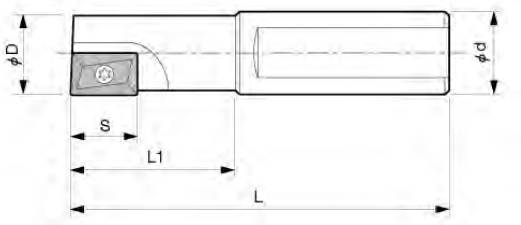


Fig.1

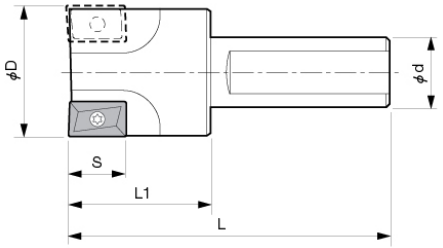


Fig.2

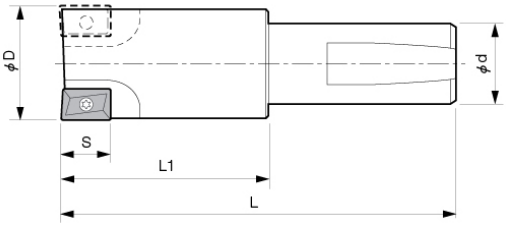


Fig.3

E

0° Lead Angle

● Toolholder Dimensions

Description		Stock	No. of Insert	Unit	Dimension (in) ØD	Ød	L	L1	S	Rake Angle (°) A.R.	R.R.	Shape	Capable of max. ramping angle (°)	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts B24
EM	0437-09	●	1	inch	7/16	1/2	2.78	1	0.37	3°	-11°	Fig.1	3°	SCR04	T7	XPMT0902
	0500-09	●			1/2					3°	-9°					
	0562-09	●			9/16					3°	-7°		8°			
	0625-09	●	2		5/8	5/8	2.90			5°	-6°	Fig.2				
	0688-09	●			11/16					3°	-5°					
	0750-09	●			3/4	3/4	3.03			5°	-2°					
	0875-09	●			7/8					5°	-4°			SCR01		
	1000-09-3F	●	3		1					3°	-2°					
EM	0625	●	1	inch	5/8	3/4	2.90	1	0.60	5°	14°	Fig.1	3°	SCR16	T10	XPMT15T3
	0688	●			11/16					5°	-12°					
	0750	●			3/4		3.40	1.50		5°	10°					
	0813	●			13/16					5°	-8°		8°			
	0875	●			7/8					5°	-7°					
	0938	●	2		15/16					5°	-5°	Fig.2				
	1000	●			1					5°	-5°					
	1000-100S	●				1	3.78			5°	-5°					
	1125	●			1-1/8	3/4	3.40			5°	-4°			SCR30		
	1250	●			1-1/4					3°	-3°					
	1250-3F	●	3			1	3.78			5°	-3°					
	1375	●	2		1-3/8	3/4	3.40			5°	-2°					
	1500	●			1-1/2					5°	-2°					
	1500-3F	●	3			1	3.78			5°	-2°					
EM	1000-2.5	●	2	inch	1	3/4	4.40	2.50	0.60	5°	-5°	Fig.3	8°	SCR16	T10	XPMT15T3
	1000-3.5	●				1	5.78	3.50		5°	-5°					
	1250-2.5	●			1-1/4		4.78	2.50		5°	-3°			SCR30		

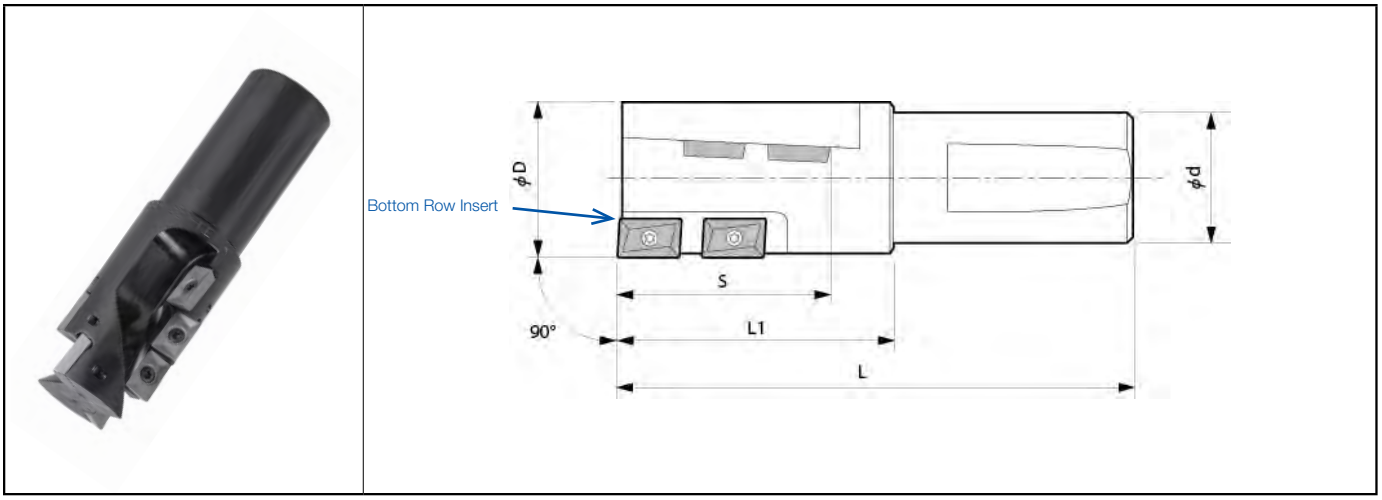
Recommended Cutting Conditions E73

● : Stock Std. ○ : World Express

Long Edge Endmill

Shouldering | Slotting | Facing

EM-LE (Long Edge Endmilll)



Toolholder Dimensions

Description	Stock	No. of Insert	No. of Flutes	Unit	Dimension					Rake Angle (°)		Spare Parts		Applicable Inserts B24	
					ØD	Ød	L	L1	S	A.R.	R.R.	Clamp Screw	Wrench	Bottom row✻	Side row
EM 1250-1500-LE	●	6	2	inch	1-1/4	1	4.41	2.13	1.50	5°	-3°	SCR16	T10	XPMT15T3..	XPMT15T308
1500-2000-LE	●	8			1-1/2	1-1/4	4.91	2.63	2.00	5°	-2°	SCR30			
2000-2775-LE	●	10			2	1-1/2	6.25	3.50	2.77	5°	0				

✻ XPMT 15T3_ _ to be chosen for bottom row insert pockets based on shoulder wall radius requirement

Recommended Cutting Conditions (EM, EM-LE, FM, FM-AL, EM-AL)

Work Material	Feed Rate (ipt)	Recommended Cutting Condition (Cutting Speed SFM)					
		Cermet		CVD Coated	PVD Coated		Carbide
		TN6020	TC60	CA2335	PR830	PR905	KW10
Low Carbon Steel	.003-.006	☆ 800~1400	★ 800~1400	-	-	-	-
Carbon Steel	.003-.006	☆ 600~1200	★ 600~1200	-	-	-	-
Alloy Steel	.003-.006	☆ 400~700	★ 400~700	-	-	-	-
Tool Steel	.003-.006	☆ 400~700	★ 400~700	-	-	-	-
Stainless Steel (Austenitic)	.002-.006	☆ 300~800	☆ 300~800	☆ 200~600	★ 200~600	-	-
Cast Iron	.003-.008	☆ 400~1200	☆ 400~1200	☆ 300~500	-	★ 300~800	-
Non-ferrous Metal	.005-.007	☆ 1500~1800	☆ 1500~1800	-	-	-	★ 2000~4000

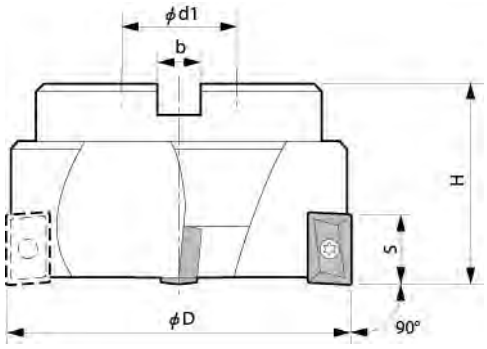
★: 1st Recommendation ☆: 2nd Recommendation

E

0° Lead Angle

● : Stock Std. ○ : World Express

FM-90 (Fixed Pocket Face Mills)



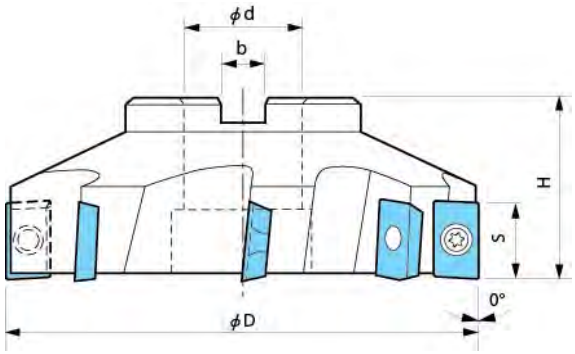
● Toolholder Dimensions

Description	Stock	No. of Flutes	Unit	Dimension					Rake Angle (°)		Spare Parts		Applicable Inserts ➡B24
				ØD	Ød1	S	b	H	A.R.	R.R.	Clamp Screw	Wrench	
FM 2000-90RH	●	3	inch	2	3/4	0.6	5/16	1-13/32	+5°	+3°	SCR30	T10	XPMT15T3
3000-90RH	●	4		3	1		3/8	1-25/32	+5°	+5°			

Recommended Cutting Conditions ➡ E73

● : Stock Std. ○ : World Express

FM-AL (Aluminum Cutting Face Mill)

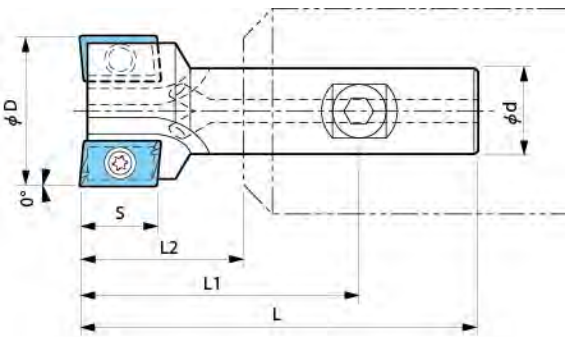


● Toolholder Dimensions

Description		Stock	No. of Insert	Unit	Dimension (in) ØD	Ød	H	b	S	Rake Angle (°) A.R.	R.R.	Capable of max. ramping angle (°)	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts B24
FM	AL-2500-90-3	●	3	inch	2-1/2	3/4	1.570	3/8	0.64	+5°	-3°	8°	SCR-02	T15	APET 1604
	3000-90-AL	●	6		3	1									
	4000-90-AL	●	8		4	1-1/4		1/2		+5°	+0°				
	4000-90-AL-125	●													
	AL-4000-90-5	●	5			1		3/8							
	5000-90-AL	●	8		5	1-1/4		1/2							

Recommended Cutting Conditions E73

EM-AL

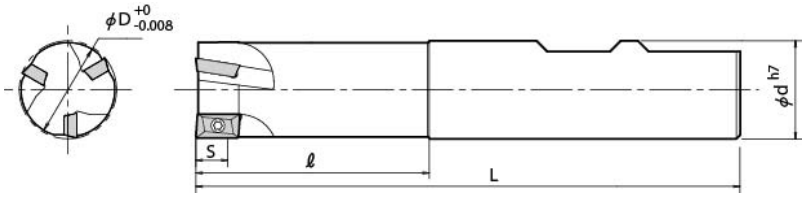


● Toolholder Dimensions

Description		Stock	No. of Insert	Unit	Dimension (in) ØD	Ød	L	L1	L2	S	Rake Angle (°) A.R.	R.R.	Capable of max. ramping angle (°)	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts B24
EM	0750-AL	●	2	inch	3/4	3/4	3.360	2.351	1.350	0.30	+5°	-8°	8°	SCR-01	T7	APET 0803
	0875-AL	●			7/8							-5°				
	1000-AL	●			1		3.380	2.365	1.360	0.64		-10°		SCR-02	T15	APET 1604
	1250-AL	●			1-1/4							-7°				
	1500-AL	●			1-1/2	1	4.000	2.864	1.740			-5°				
	2000-AL	●	3		2		4.250	3.110	1.990			-2°				
EM	1000-2.75-AL	●	2	inch	1	3/4	4.780	3.780	2.750	0.64		-10°	8°	SCR-02	T15	APET 1604
	1000-3.75-AL	●				1	6.015	4.875	3.750			-10°				
	1250-2.125-AL	●			1-1/4		4.433	3.293	2.125			-7°				

See Page K5 for Chamfering Endmill (**CM-AL**) for Aluminum Cutting.

MAP



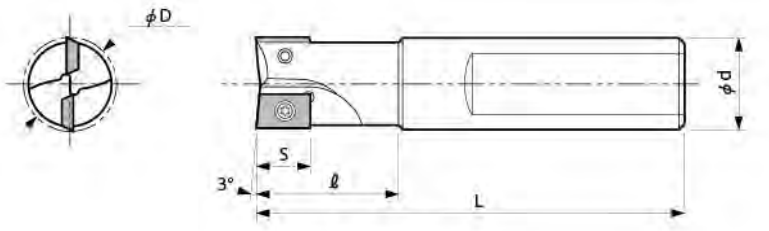
Toolholder Dimensions

Description		Stock	No. of Insert	Dimension (inch)							Rake angle (°)		Spare Parts			Applicable Inserts B20
				ØD	Ød	L	ℓ	S			A.R.	R.R.	Insert Screw	Wrench		
MAP	100R10-S100	●	3	1.000	1.000	3.78	1.417	0.354			+ 9°	- 10°	SB-2560TR	DT-8		APKT1003
	100R16-S100	●	2	1.000	1.000	3.78	1.417	0.590			+ 9°	- 13°	SB-4085TR	DT-15		APKT1604

E

0° Lead Angle

CEM



Toolholder Dimensions

Description		Stock	No. of flutes	Dimension (inch)							Rake angle (°)		Drawing	Spare Parts	
				ØD	Ød	L	ℓ	S			A.R.	R.R.		Insert Screw	Wrench
CEM	0375-1W	●	1	0.375	0.375	3.08	0.75	0.374			+ 3°	- 6°		SB-2545TR	FT-8
	0500-1W	●	1	0.500	0.500	3.08	1.00	0.374			+ 3°	- 5°			
	0625-1W	●	1	0.625	0.625	3.08	1.18	0.591			+ 3°	- 4°		SB-4STR	FT-15
	0750-1W	●	1	0.750	0.750	3.21	1.18	0.591			+ 3°	- 3°			
CEM	0625-2W	●	2	0.625	0.625	3.08	1.18	0.374			+ 8°	- 4°		SB-2545TR	FT-8
	0750-2W	●	2	0.750	0.750	3.21	1.18	0.500			+ 8°	- 3°	-	SB-3060TR	FT-10
	1000-2W	●	2	1.000	1.000	3.85	1.57	0.591			+ 3°	- 2°		SB-4STR	FT-15
	1000-2W-7.5	●	2	1.000	1.000	7.50	1.57	0.591			+ 3°	- 2°			
CEM	1000-3W	●	3	1.000	1.000	3.85	1.57	0.500			+ 8°	- 5°		SB-3060TR	FT-10
	1250-3W	●	3	1.250	1.250	3.85	1.57	0.591			+ 3°	- 3°		SB-4STR	FT-15
CEM	1500-4W	●	4	1.500	1.250	3.85	1.57	0.591			+ 6°	0°			

Applicable Inserts

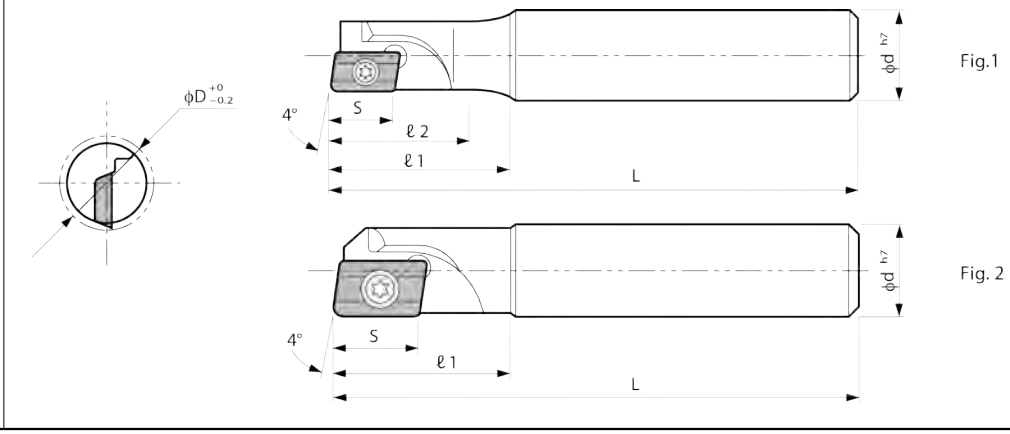
Endmill		Insert	
		B22	B22
CEM	0375-1W 0500-1W 0625-2W	NDCT831FR NDCT83○R-B NDCT832FR-B	NDMM831ER-SP
CEM	0750-2W 1000-3W	NDCT032TR NDCW031TR NDCW032TR NDCT032FR	NDMM03○ER-SP
CEM	0625-1W 0750-1W 1000-2W 1000-2W-7.5 1250-3W 1500-4W	NDCT322FR NDCT322R-B NDCT322FR-B NDCT322TR NDCW322FRX NDCW32○TRX	NDMM32○ER-SP

Shouldering Endmills

F

F1~F9

DMC Endmill



●Toolholder Dimensions

Description	Stock	No. of Inserts	Dimension (mm) ØD	Ød	L	ℓ1	ℓ2	S	Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts: Clamp Screw	Spare Parts: Wrench
DMC 810-S16	○	1	10	16	90	27	16	8.5	+3°	-11°	Fig.1	SB-2545TR	FT-8
811-S16	○		11						+3°	-10°			
812-S16	○		12			31	20		+5°	-10°			
813-S16	○		13			28.5			+5°	-9°			
814-S16	○		14		100	33.5	25		+6°	-8°			
815-S16	○		15						+6°	-8°			
816-S16	○	2	16			31			+6°	-4°			
818-S20	○		18	20					+6°	-3°			
820-S20	○	3	20		120	36	30		+8°	-6°			
822-S25	○		22	25					+8°	-5°			
825-S25	○		25			46	40		+8°	-5°			
DMC 810	○	1	10	10	70	20	-	8.5	+3°	-6°	Fig. 2	SB-2545TR	FT-8
812	○		12	12	80	25			+3°	-5°			
DMC 014	○	1	14	16	90	25	-	11.0	+3°	-4°	Fig. 2	SB-3060TR	FT-10
016	○		16						+4°	-2°			
020	○	2	20	20	110	30			+5°	0°			

●Applicable Inserts

Description	Applicable Inserts B22	
		
DMC8○○	NDCT 831R-B 832R-B 831FR	NDMM 831ER-SP
DMC014 DMC016 DMC020	NDCT 032TR 032FR	NDMM 031ER-SP 032ER-SP

● : Stock Std. ○ : World Express

DMC-SX Endmill

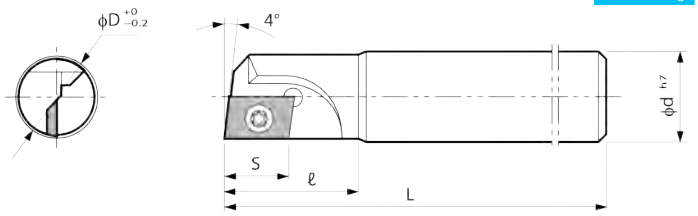


Fig.1

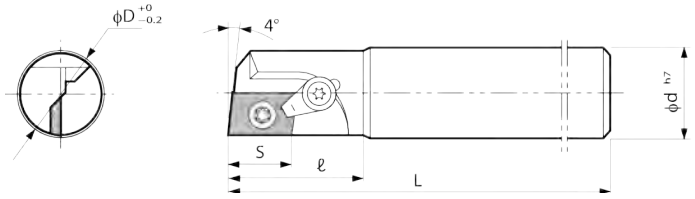


Fig. 2

●Toolholder Dimensions

Description	Stock	No. of Inserts	Dimension (mm) ØD	Ød	L	ℓ	S		Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts: Clamp Set	Clamp Screw	Wrench
DMC 316SXT	○	1	16	16	90	30	14.0		+3°	-3°	Fig.1	-	SB-4060TR	FT-15
320SX	○	1	20	20	110	30	14.0		+3°	-3°	Fig.1	-	SB-4060TR	FT-15
325SX	○	2	25	25	120	40	14.0		+3°	-2°	Fig. 2	CPS-2TR	SB-4065TR	FT-15
332SX	○	2	32	32	130	40	14.0		+3°	0°	Fig. 2	CPS-2TR	SB-4065TR	FT-15
340SX	○	2	40	32	150	40	14.0		+3°	0°	Fig. 2	CPS-2TR	SB-4065TR	FT-15
DMC 320SX-200	○	1	20	20	200	50	14.0		+3°	-3°	Fig.1	-	SB-4065TR	FT-15
325SX-220	○	2	25	25	220	60	14.0		+3°	-2°	Fig.1	-	SB-4065TR	FT-15
332SX-250	○	2	32	32	250	80	14.0		+3°	0°	Fig.1	-	SB-4065TR	FT-15

●Applicable Inserts (All inserts shown below can be used in the DMC cutter family)

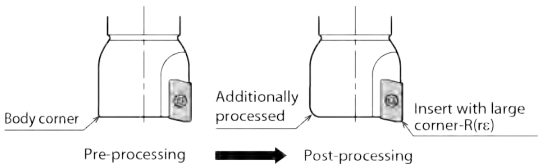
Description	Applicable Inserts ➡B22		
DMC 316SXT	(NDCW 320.5TRX)	NDCT 322TR	NDMM 331ER-SP
320SX	NDCW 321TR	322R-B	331ER-SP
325SX	322TR	322FR	
332SX	(NDCW 322TRX)	322FR-B	
340SX	(NDCW 322FRX)	(NDCT 322TRX)	
DMC 320SX-200	NDCW 324TR		
325SX-220	325TR		
332SX-250	(NDCW 325TRX)		
	NDCW 327.5TR		
	(NDCW 327.5TRX)		
	NDCW 3210TR		
	(NDCW 3210TRX)		

(Ref. to **B22** for information regarding the use of DMC cutters with the inserts shown in parentheses ( ).)

■ When using inserts with corner radii of 2.0/3.0/4.0mm, additional modifications for the body will be necessary. See the chart below for the recommended modifications.

Insert Corner-R(rε)	Additional Processing Dimension to Body Corner
2.0	R1.0
3.0	R1.6
4.0	R2.0

* Round- shaped additional processing is recommended.
When applying chamfer, do not exceed removal amount stated in the chart.



◆DMC / DMC-SX Recommended Cutting Conditions

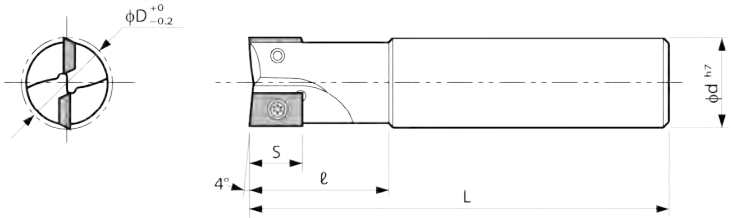
Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm) Cermet TN60	Cermet TN100M	Cermet TC60	PVD Coated Carbide PR630	PR730	PR830			PR660	PR905	Carbide PW30	Carbide KW10	Max. ap (inch) Cutting Dia. ØD(mm)	Slotting (ap)	Shouldering (apxae)
Stainless Steel	~0.006		☆ 400~650	☆ 400~650	☆ 325~650	★ 400~650								≤Ø12mm	0.06	0.16× ×0.08
														≥Ø14mm	0.08	0.24×0.08
Carbon Steel	~0.008		★ 400~650	☆ 400~650	☆ 325~650	★ 400~650								≤Ø12mm	0.08	0.24×0.08
														≥Ø14mm	0.12	0.35×0.12
Alloy Steel	~0.008		★ 325~600	☆ 325~600	☆ 325~600	★ 325~600								≤Ø12mm	0.08	0.24×0.08
														≥Ø14mm	0.12	0.35×0.12
Mold Steel	~0.006		★ 325~600	☆ 325~600	☆ 275~500	★ 275~500								≤Ø12mm	0.08	0.24×0.08
														≥Ø14mm	0.12	0.35×0.12
Cast Iron	~0.008												★ 275~500	≤Ø12mm	0.08	0.24×0.08
														≥Ø14mm	0.12	0.35×0.12
Non-ferrous Metals	~0.008												★ 325~1000	≤Ø12mm	0.08	0.24×0.08
														≥Ø14mm	0.12	0.35×0.12

· Use DMC8○○ with d=6mm MAX. for shouldering.

★: 1st Recommendation ☆: 2nd Recommendation

● : Stock Std. ○ : World Express

DMC-H Endmill (High Rake type)



●Toolholder Dimensions

Description	Stock	No. of Inserts	Dimension (mm) ØD	Ød	L	ℓ	S		Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts Clamp Screw	Wrench	
DMC 316H	○	1	16	16	90	30	14.0		+5°	-3.5°	-	SB-4060TR	FT-15	
320H	○		20	20	110				+6°	-2°				
325H	○	2	25	25	120	40			+8°	-2°		SB-4065TR		
332H	○		32	32	130				+8°	0°				
340H	○		40		150				+8°	0°				

●Applicable Inserts

Description	Applicable Inserts B22			Applicable Inserts B27
DMC 316H 320H 325H 332H 340H	NDMM 321ER-SP 322ER-SP	NDCT 322TRX	NDCW 322TRX 322FRX	NDCW 320.5FRX-NE 320.5FRX (PCD)

• Above inserts are also applicable to DMC○○○SX type, but the conventional NDCW32○○TR type insert is not applicable for this endmill.

F

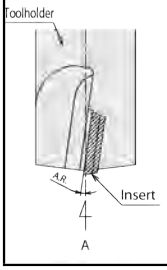
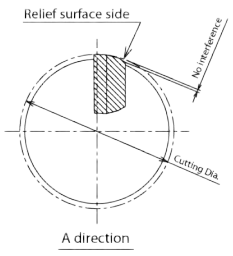
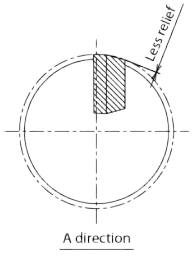
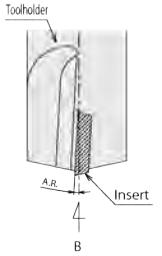
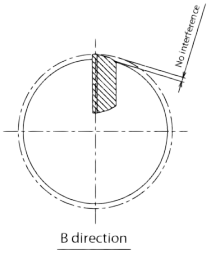
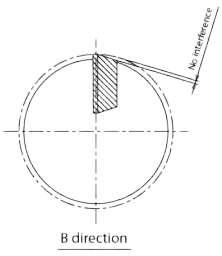
Shouldering Endmill

● : Stock Std. ○ : World Express

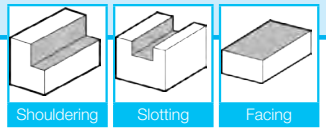
◆DMC-H type Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)												Max. ap (inch)		
		Cermet		PVD Coated Carbide							Carbide		PCD			
		TN100M	TC60	PR630	PR730	PR830			PR660	PR905	PW30	KW10	KPD230 (KPD001)	KPD010	Cutting Dia. (ØD)	Slotting (ap)	Shouldering (ap×ae)
Stainless Steel	~0.006	☆ 400~650	☆ 400~650	☆ 325~650	★ 400~650										Ø≤20mm	0.120	0.24×0.08
															Ø≥25mm	0.240	0.52×0.12
Carbon Steel	~0.008	★ 400~650	☆ 400~650	☆ 325~650	★ 400~650										Ø≤20mm	0.160	0.32×0.16
															Ø≥25mm	0.320	0.55×0.24
Alloy Steel	~0.006	★ 325~600	☆ 325~600	☆ 325~600	★ 325~600										Ø≤20mm	0.160	0.32×0.16
															Ø≥25mm	0.320	0.52×0.24
Mold Steel	~0.008	★ 325~600	☆ 325~600	☆ 275~500	★ 275~500										Ø≤20mm	0.120	0.20×0.08
															Ø≥25mm	0.240	0.39×0.12
Cast Iron	~0.008											★ 275~500			Ø≤20mm	0.160	0.32×0.16
															Ø≥25mm	0.240	0.55×0.24
Non-ferrous Metals	~0.008											★ 325~1000	★ 1000~600	☆ 1000~600	Ø≤20mm	0.160	0.32×0.16
															Ø≥25mm	0.240	0.55×0.24

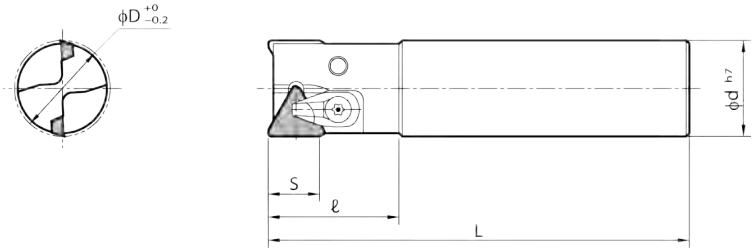
★: 1st Recommendation ☆: 2nd Recommendation

Insert Description / Description	NDCT···TRX NDCW···(T/F)RX	NDCW···TR NDCT···(T/F)R	Insert Description / Description	NDCT···TRX NDCW···(T/F)RX	NDCW···TR NDCT···(T/F)R
DMC-H	No interference of relief surface	Less relief	DMC-SX	No interference of relief surface	No interference of relief surface
		ap must be less than 5mm. 			

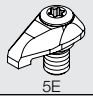
MTES Endmill



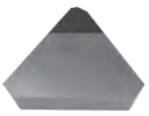
MTES



Toolholder Dimensions

Description	Stock	No. of Inserts	Dimension (mm)						Rake Angle (°)		Spare Parts		
			ØD	Ød	L	ℓ	S		A.R.	R.R.	Clamp Set	Wrench	
											 5E		
MTES 325	○	2	25	25	110	35	13.5		+11°	-2°	CPS-5E	FT-15	
330	○	2	30	32	125	45			+15°	-2°			
335	○	3	35	32	125	45			+15°	0°			

Applicable Inserts

Description	Applicable Inserts		
	B15	**B15**	**B27**
			
MTES 325 330 335	TEMR 32PTER-H	TEKN 32PTTR 32PTFR	TEEN 32PTFR-NE 32PTFR (PCD)

Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)													Max. ap (inch)		
		Cermet			MEGACOAT		PVD Coated Carbide				Carbide		CBN	PCD			
		TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR905	PW30	KW10	KBN525 (KBN510)	KPD001 (KPD010)	Cutting Dia. ØD (mm)	Slotting (ap)	Shouldering (ap×ae)
Stainless Steel	~0.005	-	☆ 400~650	☆ 400~650	★ 400~725	-	☆ 400~650	★ 400~650		-	☆ 250~400	-	-	-	Ø≤20mm	0.080	0.20×0.08
															Ø≥25mm	0.160	0.52×020
Carbon Steel	~0.006	☆ 500~650	★ 400~650	☆ 400~650	★ 400~825	-	☆ 400~650	★ 325~650		-	☆ 200~400	-	-	-	Ø≤20mm	0.120	0.20×0.08
															Ø≥25mm	0.240	0.52×020
Alloy Steel	~0.006	☆ 400~650	★ 325~600	☆ 325~600	★ 325~725	-	☆ 325~600	★ 325~600		-	☆ 200~400	-	-	-	Ø≤20mm	0.120	0.20×0.08
															Ø≥25mm	0.240	0.52×020
Mold Steel	~0.006	☆ 400~650	★ 325~600	☆ 325~600	★ 250~600	-	☆ 250~500	★ 250~500		-	☆ 200~400	-	-	-	Ø≤20mm	0.120	0.20×0.08
															Ø≥25mm	0.240	0.52×020
Cast Iron	~0.008	-	-	-	-	★ 325~725	-	-		☆ 250~500	-	☆ 250~500	★ 1000~1600	-	Ø≤20mm	0.120	0.20×0.08
															Ø≥25mm	0.240	0.52×020
Non-ferrous Metals	~0.008	-	-	-	-	-	-	-		-	-	★ 325~1000	-	★ 1000~1600	Ø≤20mm	0.120	0.20×0.08
															Ø≥25mm	0.240	0.52×020
Hard Materials	~0.002	-	-	-	-	-	-	-		-	-	-	★ 250~500	-	Ø≤20mm	-	0.20×0.08

★: 1st Recommendation ☆: 2nd Recommendation

● : Stock Std. ○ : World Express

MEA / MEB Endmill


Standard


Same Shank


Long Shank

●Cylindrical

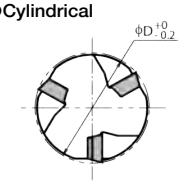


Fig.1

●Same Shank type

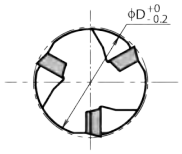


Fig.2

●Cylindrical Long Shank

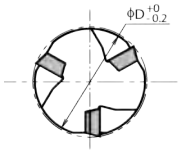


Fig.3

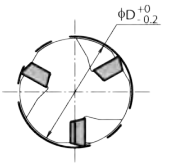


Fig.4

●**Toolholder Dimensions (MEA) Cutting Edge S = 9.0mm**

Description			Stock	No. of Inserts	Dimension (mm) ØD	Ød	L	ℓ	S		Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts B22
Standard	MEA	12-S10	○	1	12	10	80	20	9.0		+9°	-24°	Fig.1	SB-2560TR	DT-8	NDKW09 NDKT09
		12-S16	○			16		27				-24°	-			
		13-S12	○		13	12		20				-22°	Fig.1			
		14-S12	○		14							-21°				
		16-S12	○	2	16		90	23				-14°				
		17-S16	○		17	16						-13°				
		18-S16	○		18							-12°				
		19-S16	○		19		110	26				-11°				
		20-S16	○	3	20							-13°				
		21-S20	○		21	20						-12°				
		22-S20	○		22							-12°				
		24-S20	○		24			29				-11°				
		25-S20	○		25							-10°				
		28-S25	○		28	25						-10°				
		30-S25	○	4	30		130	32				-7°				
		32-S25	○		32							-4°				
		40-S32	○	5	40	32						-3°				
		50-S32	○	6	50			35				-3°				
		63-S32	○	8	63							-3°				
		80-S32	○		80							-3°				
Same Shank	MEA	10-S10	○	1	10	10	80	17	9.0		+4°	-31°	Fig.2	SB-2560TR	DT-8	NDKW09 NDKT09
		16-S16	○	2	16	16	90	30			+9°	-14°				
		20-S20	○	3	20	20	110					-13°				
		20-S20-Z2	○	2								-13°				
		25-S25	○	3	25	25						-10°				
		32-S32	○	4	32	32	130	40				-4°				
Long Shank	MEA	20-S20-130	○	2	20	20	130	60	9.0		+9°	-13°	Fig.3	SB-2560TR	DT-8	NDKW09 NDKT09
		25-S25-140	○	3	25	25	140					-10°				
		32-S25-160	○	4	32		160	32				-4°	Fig.4			
		40-S32-200	○		40	32	200					-3°				

● : Stock Std. ○ : World Express

MEA / MEB Endmill

●Toolholder Dimensions (MEB) Cutting Edge S = 15.0mm

	Description	Stock	No. of Inserts	Dimension (mm) ØD	Ød	L	ℓ	S		Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts ➡B22
Standard	MEB 25-S20	○	2	25	20	120	36	15.0		+11°	-11°	Fig.1	SB-4085TR	DT-15	NDKW15 NDKT15
	32-S25	○	3	32	25		40				-9°				
	40-S32	○	4	40	32		45				-7°				
	50-S32	○		50		150					-6°				
	63-S32	○	5	63							-5°				
	80-S32	○	6	80							-4°				
Same Shank Size Shank	MEB 25-S25	○	2	25	25	120	36	15.0		+11°	-11°	Fig.2	SB-4085TR	DT-15	NDKW15 NDKT15
	32-S32	○	3	32	32		40				-9°				

● Applicable Inserts

Description	Applicable Inserts ➡B22				
			 1-Notched	 2-Notched	 3-Notched
MEA	NDKW 090304ER	NDKT 090304ER-V	NDKT 090304ER-N1	NDKT 090304ER-N2	-
MEB	NDKW 150408ER	NDKT 150408ER-V	-	-	NDKT 150408ER-N3

◆Recommended Cutting Conditions (MEA / MEB)

Workpiece Material	fz (ipt) ØD Ø12~Ø20 mm	ØD Ø21~Ø80 mm	Recommended Insert Grades (Cutting Speed Vc: sfm) Cermet TN100M	PVD Coated Carbide PR630	PR730	PR660	PR905	Carbide KW10	MEA Max. ap (inch) Cutting Dia. (ØD)	Slotting (ap)	Shouldering (ap×ae)	MEB Max. ap (inch) Cutting Dia. (ØD)	Slotting (ap)	Shouldering (ap×ae)
Stainless Steel	0.0012~ 0.0031	0.0028~ 0.0059	☆ 400~650	☆ 400~650	☆ 400~650	★ 325~650			Ø≤14	0.040	0.32×0.04	Ø25	0.080	0.55×0.12
									Ø16~Ø28	0.120	0.32×0.12	Ø32, Ø40	0.120	0.55×0.20
									Ø30~Ø80	0.080	0.32×0.20	Ø50, Ø80	–	0.55×0.39
Carbon Steel	0.0012~ 0.0047	0.0028~ 0.0059	★ 400~650	☆ 400~650	★ 400~650	☆ 325~600			Ø≤14	0.060	0.32×0.08	Ø25	0.200	0.55×0.28
									Ø16~Ø28	0.240	0.32×0.24	Ø32, Ø40	0.200	0.55×0.39
									Ø30~Ø80	0.120	0.32×0.39	Ø50, Ø80	–	0.55×0.79
Alloy Steel	0.0012~ 0.0047	0.0028~ 0.0059	★ 325~600	☆ 325~600	★ 325~600	☆ 250~500			Ø≤14	0.060	0.32×0.08	Ø25	0.160	0.55×0.24
									Ø16~Ø28	0.200	0.32×0.20	Ø32, Ø40	0.200	0.55×0.32
									Ø30~Ø80	0.120	0.32×0.39	Ø50, Ø80	–	0.55×0.59
Mold Steel	0.0012~ 0.0039	0.0028~ 0.0059	★ 325~600	☆ 250~500	★ 250~500	☆ 200~425			Ø≤14	0.060	0.32×0.08	Ø25	0.160	0.55×0.24
									Ø16~Ø28	0.160	0.32×0.16	Ø32, Ø40	0.200	0.55×0.32
									Ø30~Ø80	0.120	0.32×0.39	Ø50, Ø80	–	0.55×0.59
Cast Iron	0.0020~ 0.0059	0.0039~ 0.0079					★ 325~650	☆ 250~500	Ø≤14	0.060	0.32×0.08	Ø25	0.240	0.55×0.32
									Ø16~Ø28	0.240	0.32×0.24	Ø32, Ø40	0.200	0.55×0.08
									Ø30~Ø80	0.160	0.32×0.39	Ø50, Ø80	–	0.55×0.79
Non-ferrous Metals	0.0020~ 0.0079	0.0039~ 0.0100						★ 325~1000	Ø≤14	0.120	0.32×0.12	Ø25	0.280	0.55×0.39
									Ø16~Ø28	0.240	0.32×0.39	Ø32, Ø40	0.200	0.55×0.59
									Ø30~Ø80	0.160	0.32×0.79	Ø50, Ø80	–	0.55×1.18

· Reduce the ap by 20-50% when machining with long overhang length or using long shank types.
· Slotting with a tool over Ø50mm is not recommended.

★: 1st Recommendation ☆: 2nd Recommendation

●Precautions when installing inserts with notches

· It is important to install the appropriate notched insert into the correct position.
If it is installed incorrectly, the tool cannot cut the workpiece and it may damage the toolholder body.
· Please bear the following in mind when installing Inserts to toolholders. There is no indication marked near the Insert pocket for MEA / MEB. Please refer to Table1 or Table2 and make the correct combination.
Installing the same notched insert in all pockets will result in toolholder failure (-N1, -N2 or -N3).

Table 1

Description	No. of Flutes	NDK○09 type Without notch	Notched N1	Notched N2
MEA 12-S10 12-S16 13-S12 14-S12	1	1	N/A	N/A
16-S12 17-S16 18-S16 19-S16	2	-	1	1
20-S16 21-S20 22-S20 24-S20 25-S20 28-S25	3	-	2	1

Description	No. of Flutes	NDK○09 type Without notch	Notched N1	Notched N2
MEA 30-S25 32-S25	4	-	2	2
40-S32	5	-	3	2
50-S32	6	-	3	3
63-S32 80-S32	8	-	4	4
MEA 10-S10	1	1	-	-
16-S16 20-S20-Z2	2	-	1	1
20-S20 25-S25	3	-	2	1
32-S32	4	-	2	2
MEA 20-S20-130	2	-	1	1
25-S25-140	3	-	2	1
32-S25-160 40-S32-200	4	-	2	2

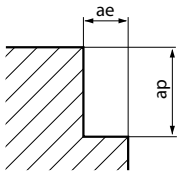
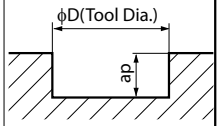
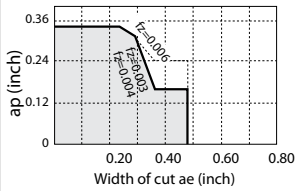
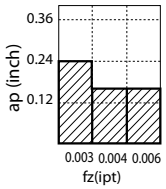
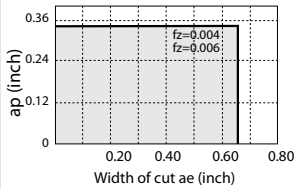
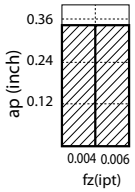
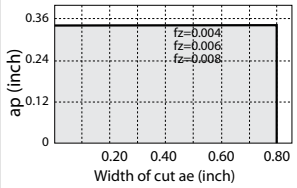
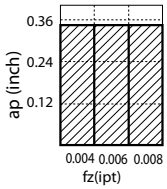
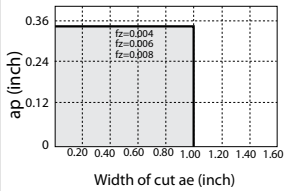
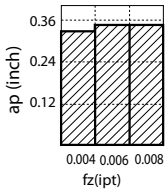
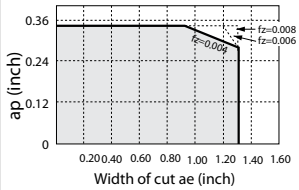
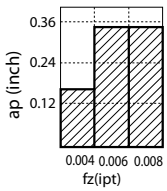
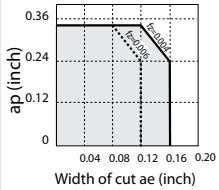
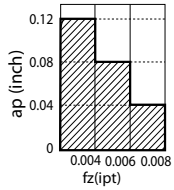
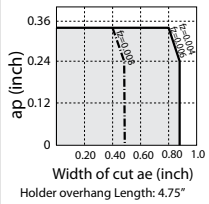
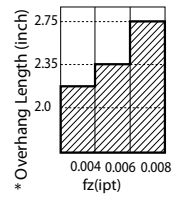
Table 2

Description	No. of Flutes	NDK○15 type Without notch	Notched N3
MEB 25-S20 25-S25	2	1	1
32-S25 32-S32	3	2	1
40-S32 50-S32	4	2	2
63-S32	5	3	2
80-S32	6	3	3

● : Stock Std. ○ : World Express

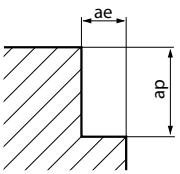
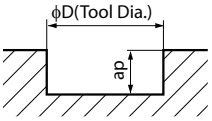
◆Cutting Performance of MEA

[Cutting Conditions]
Cutting Speed: Vc=325 sfm
Overhang Length: same as ℓ in the dimension table
Insert: NDKT090304ER-V (PR660),
Coolant: No

Workpiece Material	Shouldering	Slotting
1050 Steel (Overhang Length: 0.80")		
Description		
MEA12-S10 (Overhang Length: 0.80")		
MEA16-S10 (Overhang Length: 0.90")		
MEA20-S16 (Overhang Length: 1.00")		
MEA25-S20 (Overhang Length: 1.15")		
MEA32-S25 (Overhang Length: 1.25")		
MEA20-S20-130 (Overhang Length: 2.35")		
MEA40-S32-200		

◆Cutting Performance of MEB

[Cutting Conditions]
Cutting Speed: Vc=325 sfm
Overhang Length: same as ℓ in the dimension table
Insert: NDKT150408ER-V (PR660),
Coolant: No

Workpiece Material	Shouldering	Slotting
1050 Steel (Overhang Length: 0.80")		
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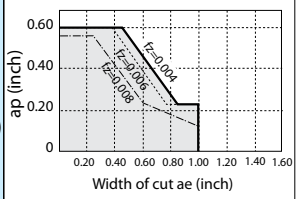
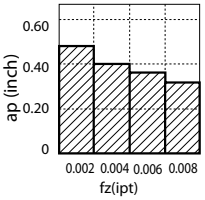
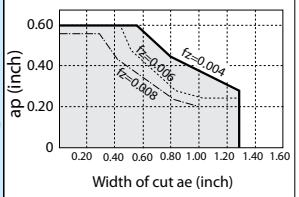
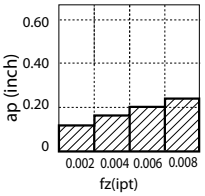
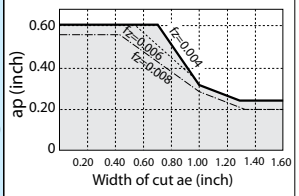
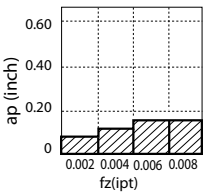
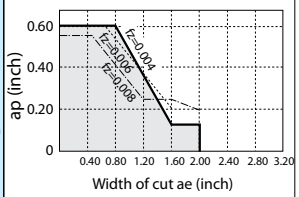
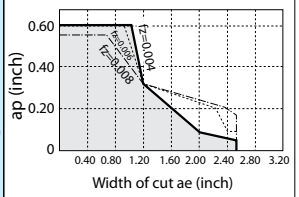
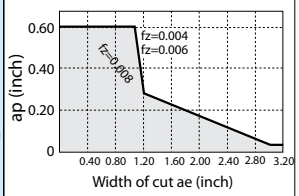
MEB25-S20 (Overhang Length: 1.40")		
MEB32-S25 (Overhang Length: 1.60")		
MEB40-S32 (Overhang Length: 1.75")		
MEB50-S32 (Overhang Length: 1.75")		Not recommended for Slotting
MEB63-S32 (Overhang Length: 1.75")		Not recommended for Slotting
MEB80-S32 (Overhang Length: 1.75")		Not recommended for Slotting

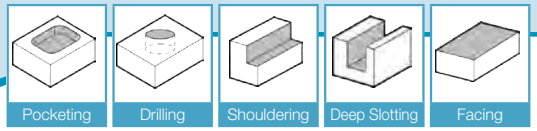
* In this case only, ap is fixed at 0.120in and overhang length is changed.

Multi-Function Machining Endmill

G1~G9

G

MEY Multi-Function Endmill



MEY


Standard

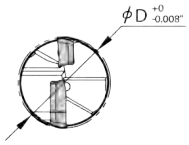
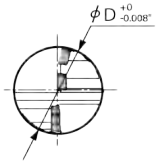


Fig.1



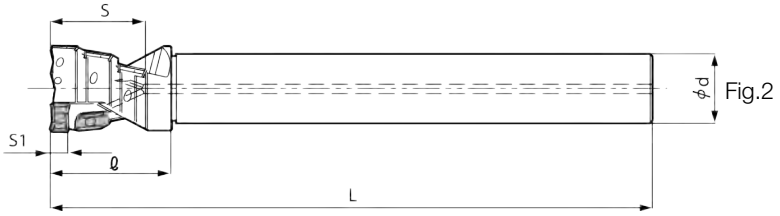


Fig.2

Toolholder Dimensions (inch-size)

	Description	Stock	No. of Inserts	No. of Flutes	Dimension (in)						Rake Angle (°)		Drawing	Spare Parts		
					øD	ød	L	ℓ	S	S1	A.R.	R.R.		Clamp Screw	Wrench	Anti-seize Compound
Standard	MEY 625-S625-HG	●	4	2	0.630	0.625	4.699	1.195	0.748	0.177	+11°	-11°	Fig.1	SB-2040TRG	FT-6	MP-1
	750-S750-HG	●	4	2	0.787	0.750	5.091	1.350	0.866	0.236	+13°	-9°		SB-2555TRG	DT-8	
	1000-S100-HG	●	4	2	1.000	1.000	5.486	1.549	1.102	0.295	+13°	-11°		SB-3070TRG	DT-10	
	1250-S125-HG	●	4	2	1.250	1.250	5.858	1.921	1.417	0.374	+13°	-9°		SB-4070TRG	DT-15	
	1500-S125-HG	●	7	2	1.500	1.250	6.260	2.126	1.654	0.295	+13°	-11°	Fig.2	SB-3070TRG	DT-10	
	2000-S150-HG	●	7	2	1.984	1.500	6.649	2.712	2.126	0.374	+13°	-9°		SB-4070TRG	DT-15	

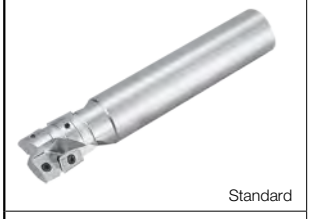
· S1 shows the edge length of the complete 2-flute part.

Insert Selection Guide G4

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

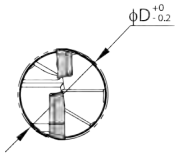
● : Stock Std. ○ : World Express

MEY


Standard


Long Head


Long Shank



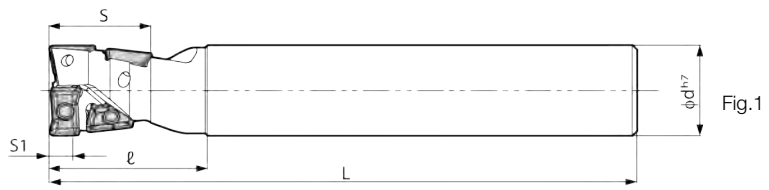
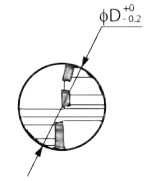


Fig.1



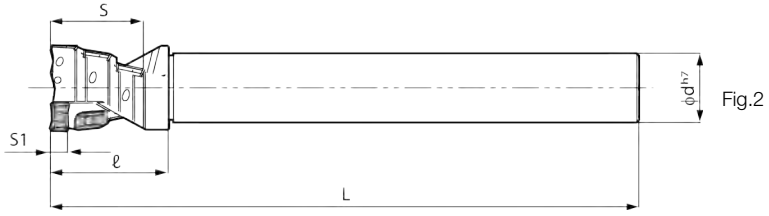


Fig.2

Toolholder Dimensions (metric-size)

	Description	Stock	No. of Inserts	No. of Flutes	Dimension (mm) øD	ød	L	ℓ	S	S1	Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts: Clamp Screw	Wrench	Anti-seize Compound
Standard	MEY 16-S16	○	4	2	16	16	120	31	19	4.5	+11°	-11°	Fig.1	SB-2040TRG	DTM-6	MP-1
	17-S16	○			17											
	20-S20	○			20	20	130	35	22	6	+13°	- 9°		SB-2555TRG	DT-8	
	21-S20	○			21											
	25-S25	○			25	25	140	40	28	7.5	+13°	-11°		SB-3070TRG	DT-10	
	26-S25	○			26											
	32-S32	○			32	32	150	50	36	9.5	+13°	- 9°		SB-4070TRG	DT-15	
	33-S32	○			33											
	40-S32	○	7		40		160	55	42	7.5	+13°	-11°	Fig.2	SB-3070TRG	DT-10	
	50-S42	○			50	42	170	70	54	9.5		- 9°		SB-4070TRG	DT-15	
Long Head	MEY 16-S16-140H	○	4	2	16	16	140	51	19	4.5	+11°	-11°	Fig.1	SB-2040TRG	DTM-6	MP-1
	20-S20-150H	○			20	20	150	53	22	6	+13°	- 9°		SB-2555TRG	DT-8	
	25-S25-170H	○			25	25	170	70	28	7.5		-11°		SB-3070TRG	DT-10	
	32-S32-180H	○			32	32	180	80	36	9.5		- 9°		SB-4070TRG	DT-15	
Long Shank	MEY 16-S16-190	○	4	2	16	16	190	61	19	4.5	+11°	-11°	Fig.1	SB-2040TRG	DTM-6	MP-1
	17-S16-190	○			17			31								
	20-S20-200	○			20	20	200	63	22	6	+13°	- 9°		SB-2555TRG	DT-8	
	21-S20-200	○			21			35								
	25-S25-220	○			25	25	220	80	28	7.5		-11°		SB-3070TRG	DT-10	
	26-S25-220	○			26			40								
	32-S32-230	○			32	32	230	90	36	9.5		- 9°		SB-4070TRG	DT-15	
	33-S32-230	○			33			50								
	40-S32-240	○	7		40		240	55	42	7.5		-11°	Fig.2	SB-3070TRG	DT-10	
	50-S42-250	○			50	42	250	70	54	9.5		- 9°		SB-4070TRG	DT-15	

· S1 shows the edge length of the complete 2-flute part.

Insert Selection Guide G4

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

● : Stock Std. ○ : World Express

MEY Multi-Function Endmill

●Applicable Inserts

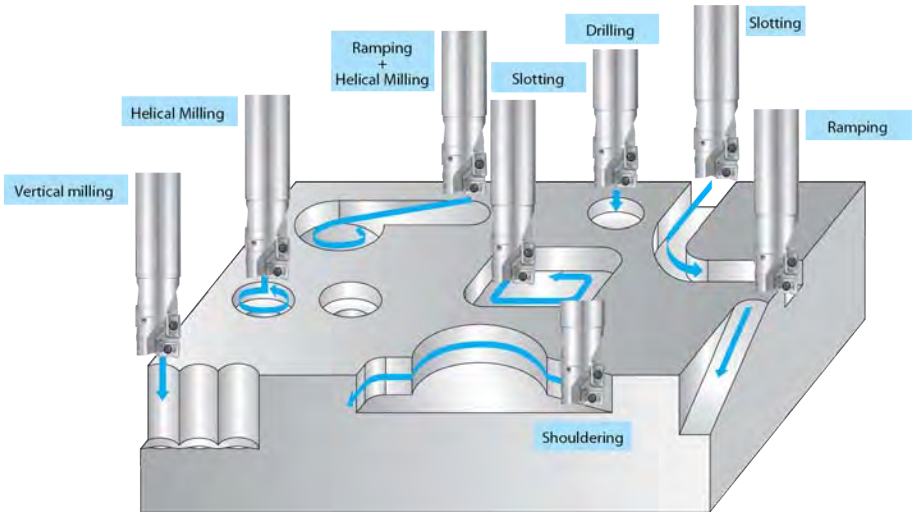
Description		Applicable Inserts B21			
					
		Side Edge Insert	No. of Inserts	Center Edge Insert	No. of Inserts
MEY	625-S625-HG	JOMT08T208ER-D	3	GOMT08T208ER-D	1
	750-S750-HG	JOMT100308ER-D		GOMT100308ER-D	
	1000-S100-HG	JOMT13T308ER-D		GOMT13T308ER-D	
	1250-S125-HG	JOMT160408ER-D		GOMT160408ER-D	
	1500-S125-HG	JOMT13T308ER-D	6	GOMT13T308ER-D	
	2000-S150-HG	JOMT160408ER-D		GOMT160408ER-D	
	16-S16(-...)	JOMT08T208ER-D	3	GOMT08T208ER-D	
	17-S16(-...)				
	20-S20(-...)	JOMT100308ER-D		GOMT100308ER-D	
	21-S20(-...)				
	25-S25(-...)	JOMT13T308ER-D		GOMT13T308ER-D	
	26-S25(-...)				
	32-S32(-...)	JOMT160408ER-D		GOMT160408ER-D	
	33-S32(-...)				
	40-S32(-...)	JOMT13T308ER-D	6	GOMT13T308ER-D	
	50-S42(-...)	JOMT160408ER-D		GOMT160408ER-D	

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed Vc: sfm)												
			Cermet			MEGACOAT		PVD Coated Carbide						Carbide	
	Drilling	Shouldering Slotting	TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10
Stainless Steel	0.003~0.005	0.002~0.006				★ 400~725	-			☆ 325~600		-		
Carbon Steel	0.003~0.006	0.002~0.010				★ 400~825	-			☆ 400~650		-		
Alloy Steel	0.003~0.006	0.002~0.010				★ 325~725	-			☆ 325~600		-		
Mold Steel	0.003~0.005	0.002~0.006				★ 265~600	-			☆ 265~500		-		
Cast Iron	0.002~0.008	0.002~0.010				-	★ 325~725			-		☆ 325~650		

★: 1st Recommendation ☆: 2nd Recommendation

Examples of MEY Multi-function Cutting

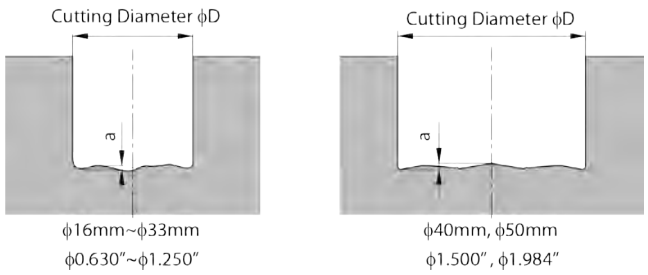


Drilling Precautions

(1) Drilling conditions should be calculated as one flute effective.
(2) Use compressed air during drilling.
(3) Carbon Steel other than low carbon steel can be drilled to a depth of 0.5D without step feeding. For soft steel or sticky material such as stainless steel, step feed drilling (0.5-1.0mm) is recommended.
(4) For stainless steel drilling, coolant is recommended.
(5) Please refer to the chart for maximum hole depth.

Cutting Dia. (øD)	max. hole depth (mm)
ø16mm / 0.630"	13 / 0.52"
ø17 / 0.669"	13 / 0.52"
ø20 / 0.787"	17 / 0.68"
ø21 / 0.827"	17 / 0.68"
ø25 / 0.984"	22 / 0.88"
ø26 / 1.024"	22 / 0.88"
ø32 / 1.260"	29 / 1.14"
ø33 / 1.299"	29 / 1.14"
ø40 / 1.500"	36 / 1.42"
ø50 / 1.984"	40 / 1.57"

Drilled Hole Bottom Shape



ϕ16mm~ϕ33mm
ϕ0.630"~ϕ1.250"

ϕ40mm, ϕ50mm
ϕ1.500", ϕ1.984"

Cutting Diameter	ø16mm, ø17mm ø0.630"	ø16mm, ø17mm ø0.630"	ø16mm, ø17mm ø0.630"	ø16mm, ø17mm ø0.630"	ø16mm, ø17mm ø0.630"	ø16mm, ø17mm ø0.630"
a(mm) a(inch)	0.5mm 0.020"	0.64mm 0.025"	0.85mm 0.033"	1.12mm 0.044"	1.54mm 0.044"	1.65mm 0.065"

◆Cutting Performance of MEY

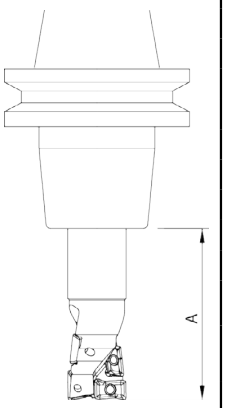
[Workpiece Material: S50C]

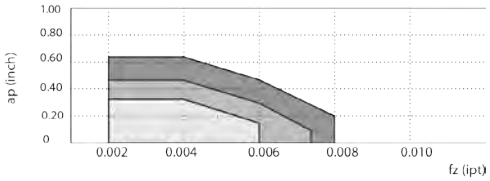
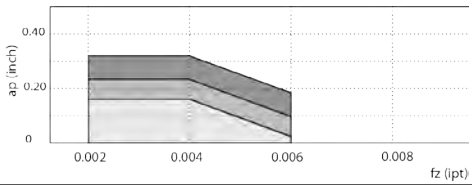
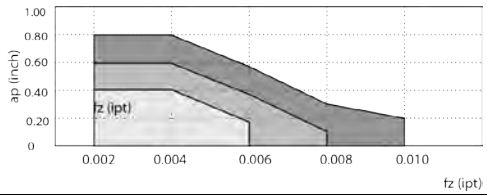
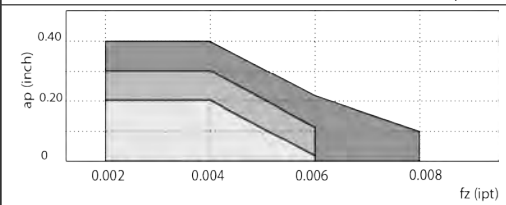
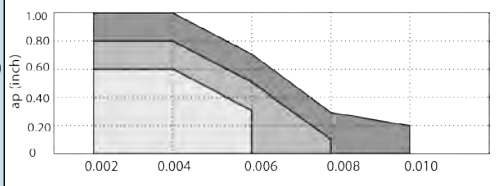
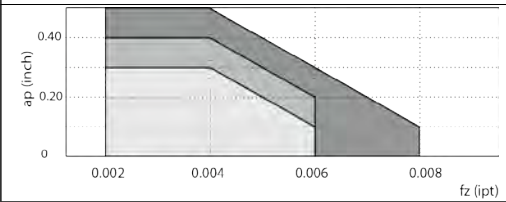
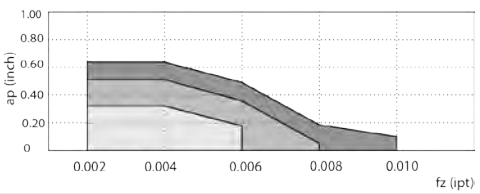
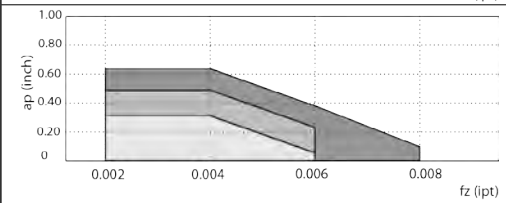
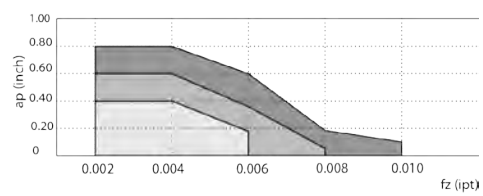
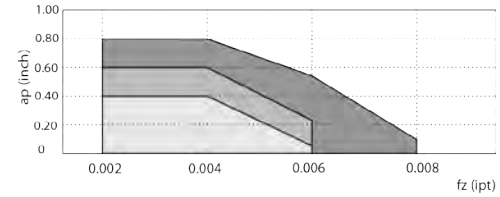
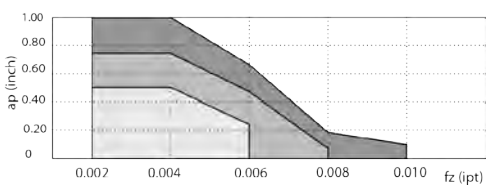
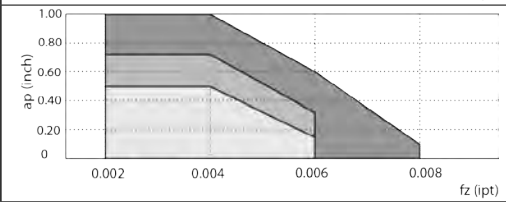
Cutting Dia.	Description	Overhang Length A (mm)		
ø0.630"	**MEY625-S625-HG**	1.24	[~2.44]	(Not Recommended)
ø16mm	**MEY16-S16**	1.24	[~2.44]	(Not Recommended)
	MEY16-S16-140H	-	~2.44	[~3.64]
	MEY16-S16-190	-	2.44	~3.64
ø17mm	**MEY17-S16**	1.24	[~2.44]	(Not Recommended)
	MEY17-S16-190	1.24	~2.44	~3.64
0.787"	**MEY750-S750**			
ø20mm	**MEY20-S20**	1.40	[~2.60]	(Not Recommended)
	MEY20-S20-150H	-	~2.60	[~3.80]
	MEY20-S20-200	-	2.60	~3.80
ø21mm	**MEY21-S20**	1.40	[~2.60]	(Not Recommended)
	MEY21-S20-200	1.40	~2.60	~3.80

When using in [ ] dimension, be careful that the chucking amount is sufficient.

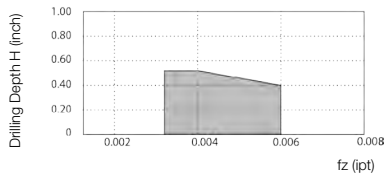
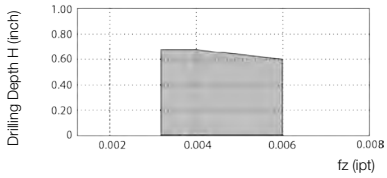
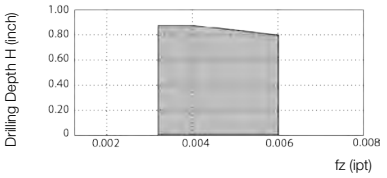
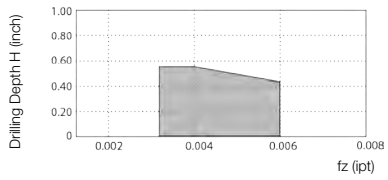
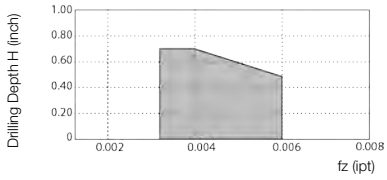
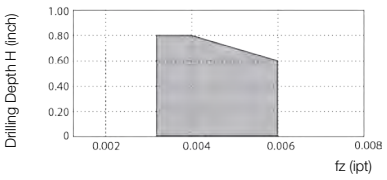
Cutting Dia.	Description	Overhang Length A (mm)		
1.000"	**MEY1000-S1000**	1.60	[~2.80]	(Not Recommended)
ø25	**MEY25-S25**	1.60	[~2.80]	(Not Recommended)
	MEY25-S25-170H	-	2.80	[~4.00]
	MEY25-S25-220	-	~3.20	~4.00
ø26	**MEY26-S25**	1.60	[~3.60]	(Not Recommended)
	MEY26-S25-220	1.60	~3.60	~4.00
1.250"	**MEY1250-S125**	2.00	[~3.20]	(Not Recommended)
ø32	**MEY32-S32**	2.00	[~3.20]	(Not Recommended)
	MEY32-S32-180H	-	~3.20	[~4.40]
	MEY32-S32-230	-	90	~4.40]
ø33	**MEY33-S32**	2.00	[~3.20]	(Not Recommended)
	MEY33-S32-230	2.00	~3.20	~4.40
1.500"	**MEY1500-S125**	2.20	[~3.40]	[~4.60]
ø40	**MEY40-S32**	2.20	[~85]	[~4.60]
	MEY40-S32-240	2.20	~85	~5.20
1.984"	**MEY2000-S150**	2.80	[~4.00]	[~5.20]
ø50	**MEY50-S42**	2.80	[~100]	[~5.20]
	MEY50-S42-250	2.80	~100	~5.20

Shape



Description	■ Shouldering (Cutting width ae = øD/2) Note) ▭ Part ae=øD/4	■ Slotting ■ Ramping and Helical Milling
MEY625-S625 **MEY16-S16** **MEY17-S16**		
MEY750-S750 **MEY20-S20** **MEY21-S20**		
MEY1000-S1000 **MEY25-S25** **MEY26-S25**		
MEY1250-S125 **MEY32-S32** **MEY33-S32**		
MEY1500-S125 **MEY40-S32**		
MEY2000-S150 **MEY50-S42**		

■ Drilling Depth [Standard / Long Head / Long Shank: 1050]

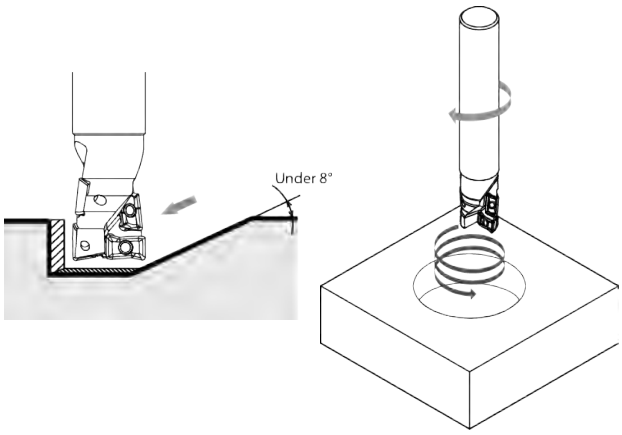
MEY625-S625-HG MEY16-S16 / MEY17-S16	MEY750-S750-HG MEY20-S20 / MEY21-S20	MEY1000-S100-HG MEY25-S25 / MEY26-S25
		
MEY1250-S125-HG MEY32-S32 / MEY33-S32	**MEY1500-S125-HG MEY40-S32**	**MEY2000-S150-HG MEY50-S42**
		

◆How to Use MEY Effectively

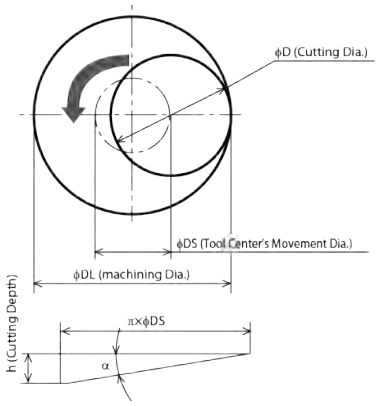
Ramping / Helical Milling

- Ramping angle is recommended to be under 8°.
- Plunge depth per revolution of helical milling should be set under 1/2 of the tool diameter.

Use compressed air during machining.



■ Helical Milling Factors



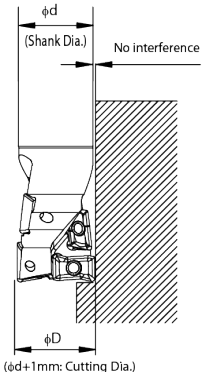
How to find "ϕDS"
ϕDS=ϕDL-ϕD

How to find "h"
h=π×ϕDS×tanα
α should be under 8°

Shouldering

- Tools with 1mm larger cutting diameter than shank diameter are available.
  High wall shouldering is possible
- Lineup

Description	Unit	øD	ød
MEY625-S625-HG	inch	0.630"	0.625"
MEY750-S750-HG		0.787"	0.750"
MEY1500-S125-HG		1.500"	1.250"
MEY2000-S1500-HG		1.984"	1.500"
MEY17-S16	mm	17	16
MEY21-S20		21	20
MEY26-S25		26	25
MEY33-S32		33	32
MEY17-S16-190		17	16
MEY21-S20-200		21	20
MEY26-S25-220		26	25
MEY33-S32-230		33	32



Pocketing | Drilling | Shouldering | Deep Slotting | Facing

MEZ-G


Standard


Long Shank / Long Head

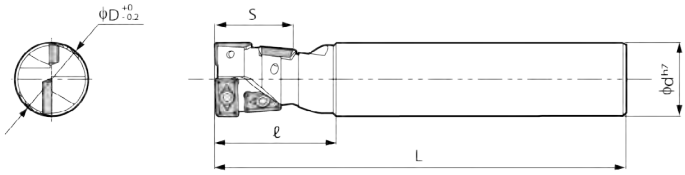


Fig.1

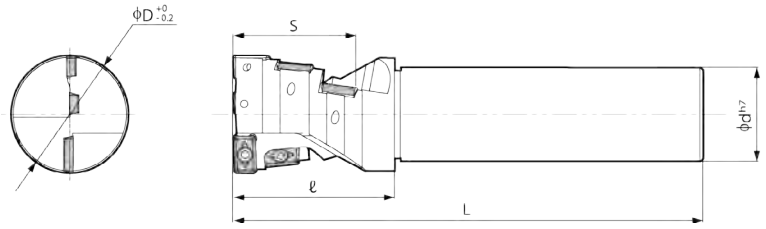


Fig.2

●Toolholder Dimensions

	Description	Stock	No. of Inserts	No. of Flutes	Dimension (mm) øD	ød	L	ℓ	S	Rake Angle (°) A.R.	R.R.	Insert	Spare Parts Clamp Screw	Wrench	Applicable Inserts ➡B23
Standard	MEZ16-S16G	○	4	2	16	16	120	31	16	+9°	-5°	Fig.1	SB-2040TRG	DTM-6	NDMT 080208ER-D○
	20-S20G	○			20	20	130	33	21		-4°		SB-2555TRG	DT-8	NDMT 10T208ER-D○
	25-S25G	○			25	25	140	40	25		-5°		SB-3070TRG	DT-10	NEMT 120308ER-D○
	32-S32G	○			32	32	150	50	33		-2°		SB-4070TRG	DT-15	NEMT 16T308ER-D○
	40-S32G	○	7		39	32	160	55	39		-3°	Fig.2	SB-3070TRG	DT-10	NEMT 120308ER-D○
	50-S42G	○			49	42	170	70	51		-2°		SB-4070TRG	DT-15	NEMT 16T308ER-D○
Long Head	MEZ16-S16-140HG	○	4		16	16	140	51	16	+9°	-5°	Fig.1	SB-2040TRG	DTM-6	NDMT 080208ER-D○
	20-S20-150HG	○			20	20	150	53	21		-4°		SB-2555TRG	DT-8	NDMT 10T208ER-D○
	25-S25-170HG	○			25	25	170	70	25		-5°		SB-3070TRG	DT-10	NEMT 120308ER-D○
	32-S32-180HG	○			32	32	180	80	33		-2°		SB-4070TRG	DT-15	NEMT 16T308ER-D○
Long Shank	MEZ16-S16-190G	○	4		16	16	190	61	16	+9°	-5°	Fig.1	SB-2040TRG	DTM-6	NDMT 080208ER-D○
	20-S20-200G	○			20	20	200	63	21		-4°		SB-2555TRG	DT-8	NDMT 10T208ER-D○
	25-S25-220G	○			25	25	220	80	25		-5°		SB-3070TRG	DT-10	NEMT 120308ER-D○
	32-S32-230G	○			32	32	230	90	33		-2°		SB-4070TRG	DT-15	NEMT 16T308ER-D○
	40-S32-240G	○	7		39	32	240	55	39		-3°	Fig.2	SB-3070TRG	DT-10	NEMT 120308ER-D○
	50-S42-250G	○			49	42	250	70	51		-2°		SB-4070TRG	DT-15	NEMT 16T308ER-D○

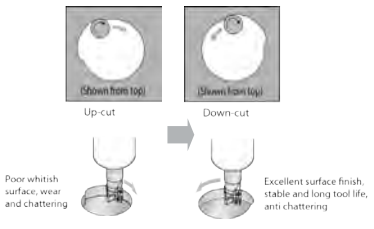
◆Recommended Cutting Conditions

Workpiece Material	fz (ipt) Drilling	Shouldering Slotting	Recommended Insert Grades (Cutting Speed Vc: sfm) Cermet TN100M	MEGACOAT PR1225	PR1210	PVD Coated Carbide PR630	PR730	PR660	PR905	Carbide KW10
Stainless Steel	0.002~0.005	0.002~0.006	☆ 400~650	★ 400~725	-	☆ 400~650	☆ 400~650	☆ 325~600	-	-
Carbon Steel	0.002~0.008	0.002~0.008	★ 400~650	★ 400~825	-	☆ 400~650	☆ 400~650	☆ 325~600	-	-
Alloy Steel	0.002~0.008	0.002~0.008	★ 325~600	★ 325~725	-	☆ 325~600	☆ 325~600	☆ 265~500	-	-
Mold Steel	0.002~0.005	0.002~0.006	★ 325~600	★ 265~600	-	☆ 265~500	☆ 265~500	☆ 200~425	-	-
Cast Iron	0.002~0.008	0.002~0.008	-	-	★ 325~725	-	-	-	☆ 325~600	☆ 265~500
Non-ferrous Metals	0.002~0.008	0.002~0.008	-	-	-	-	-	-	-	★ 325~1000

★: 1st Recommendation ☆: 2nd Recommendation

· Drilling conditions should be calculated as one flute effective. Step feed (0.5-0.1mm) is recommended.
· Coolant is recommended when drilling stainless steel / cast iron.
· PR660 is recommended for heavy drilling.

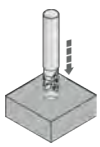
· Down-Cut milling is recommended for the improvement of tool life and surface finish.
· Compressed air is recommended.



◆How to use the Silver Drill Mill (MEZ-G) effectively

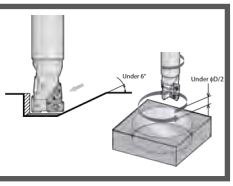
Drilling

· Step feeding is recommended for good chip control (Depth approx. 1mm).
· Drill depth should be under 0.5D. (D: Drilling Dia.)
Use compressed air during cutting.
· PR660 is recommended for heavy drilling.



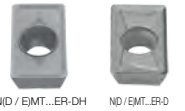
Ramping · Helical Milling

· Ramping angle is recommended to be under 6°.
· Plunge depth per revolution when helical milling should be under 1/2D. Use compressed air during cutting.



End milling

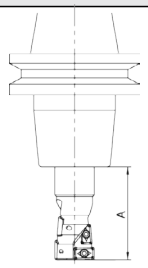
· Tough edge insert is recommended for high load end milling. (High feed rate, large ap)
Use a low cutting force insert to prevent chattering.


N(D / E)MT...ER-DH (Tough Edge type)
N(D / E)MT...ER-D (Low Cutting Force type)

● : Stock Std. ○ : World Express

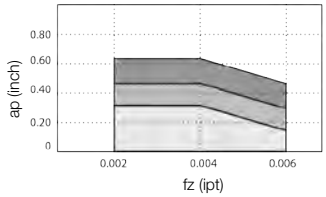
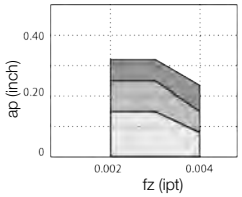
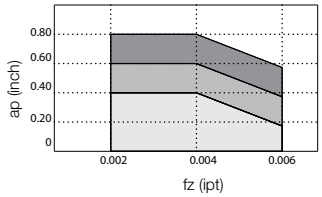
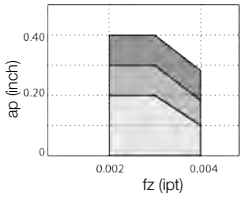
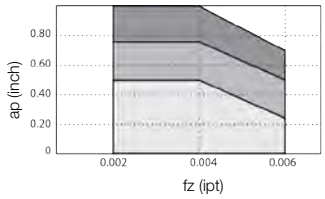
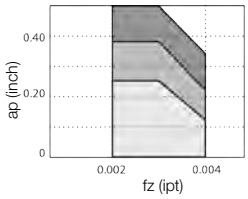
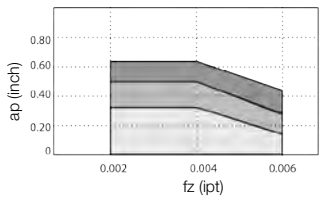
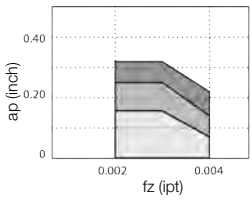
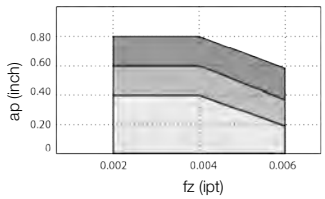
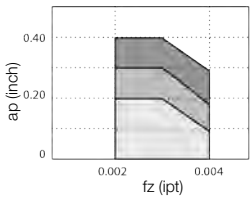
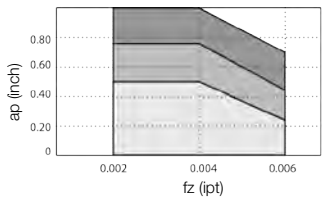
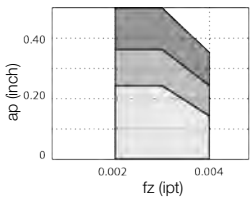
◆Cutting Performance of MEZ-G

[Workpiece Material: S50C]

Cutting Dia.	Description	Overhang Length A (mm)			Cutting Dia.	Description	Overhang Length A (mm)			Shape
ø16	MEZ16-S16G	1.22	[~2.40]	(Not Recommended)	ø32	MEZ32-S32G	1.97	[~3.15]	(Not Recommended)	
	MEZ16-S16-140HG	-	~2.40	[~3.58]		MEZ32-S32-180G	-	3.15	[~4.33]	
	MEZ16-S16-190G	-	2.40	~3.58		MEZ32-S32-230G	-	3.54	~4.33	
ø20	MEZ20-S20G	1.30	[~2.48]	(Not Recommended)	ø40	MEZ40-S32G	2.17	[~3.35]	[~4.53]	
	MEZ20-S20-150HG	-	~2.48	[~3.66]		-	-	-	-	
	MEZ20-S20-200G	-	2.48	~3.66		MEZ40-S32-240G	2.17	~3.35	~4.53	
ø25	MEZ25-S25G	1.57	[~2.76]	(Not Recommended)	ø1.97	MEZ50-S42G	2.76	[~3.94]	[~5.12]	
	MEZ25-S25-170HG	-	2.76	[~3.94]		-	-	-	-	
	MEZ25-S25-220G	-	3.15	~3.94		MEZ50-S42-250G	2.76	~3.94	~5.12	

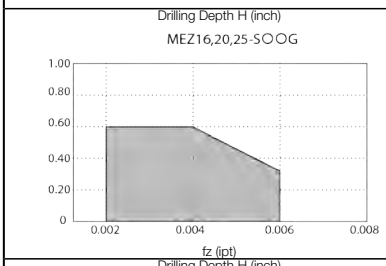
When using in [ ] dimension, be careful that the chucking amount is sufficient.

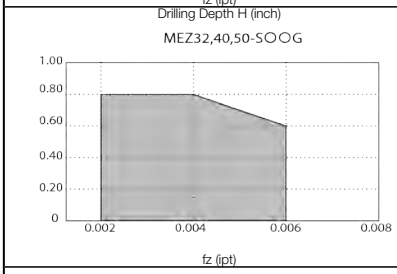
■ Shouldering / Slotting

Description	■ Shouldering (Cutting width ae=øD/2) Note) ▭ Part ae=øD/4	■ Slotting ■ Ramping and Helical Milling
MEZ16-S16G		
MEZ20-S20G		
MEZ25-S25G		
MEZ32-S32G		
MEZ40-S32G		
MEZ50-S42G		

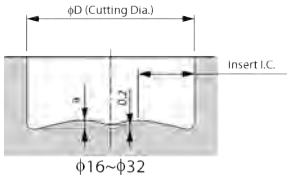
■ Drilling Depth

■ Drilling Depth
(Standard / Long Head / Long Shank)

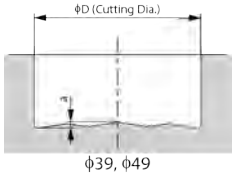




Shape of the bottom of the drilled hole
(ø16~ø49)



Cutting Dia.	ø16	ø20	ø25	ø32
a (mm)	0.30	0.33	0.38	0.45



Cutting Dia.	ø39	ø49
a (mm)	0.68	0.74

Slot Mill

H

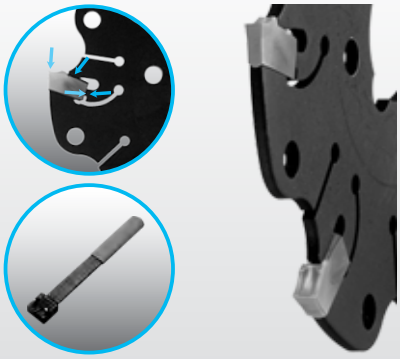
H1~H27

Slot Mill MST

Full range from 1.6mm to 23.3mm in 3 types

Slot Mill MSTA (Slot width 1.6, 2.2, 3.0, 4.0mm)

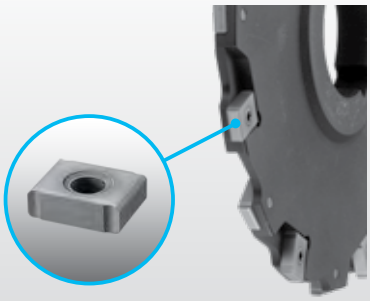
- Self-clamping type Slot Mill
  MSTA Slot Mills have simple self-clamping system to allow for easy attachment by just installing the insert.
- High Rigidity Clamping System
  Owing to the highly rigid clamping system - with an end - stopper, the Toolholder enable high operability and stable slotting by maintaining an accurate edge position.
- Double-Prism Clamping System
  High replacement precision due to the clamping system with two prisms.
- Easy replacement
  The replacement of inserts is easy and quick by using special wrench.



Wrench is not attached. Please purchase it separately.

Slot Mill MSTB (Slot width 6.0~13.0mm)

- On Edge type / semi-adjustable slot width
- Easy and secure screw holding
  Inserts can be attached to the MSTB Slot Mills very easily by using clamp screws.
- Inserts have four edge and are, therefore, cost-effective
- Applicable to a variety of slotting by choosing different inserts.
  By changing the thickness of inserts, it's a applicable to various slotting widths up to max 1mm in 0.5mm increments.

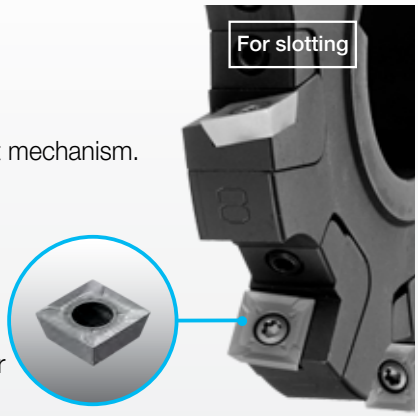


Full lineup of MST Series Slot Mills

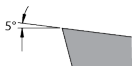
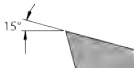
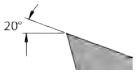
Type	Applicable Inserts	Features	Slot Width (mm)													
			1.6	2.2	3	4	6	8	10	13	14	16	18	20	22	24
MSTA	SLT..	1.6~4mm fixed	●	●	●	●										
MSTB	LNEU12..	6~13mm semi-adjustable					←			→						
							* Adjustable in 0.5mm increments between 6mm and 13mm with the combination of inserts									
MSTC	SP..10T3..	14~18mm full-adjustable									←	→				
											* Adjustable between 14mm and 18mm					
	SD..1204...	18~23.3mm full-adjustable												←	→	
														* Adjustable between 18mm and 23.3mm		

Slot Mill MSTC (Slot width 14.0~23.3mm)

- Lay-down type / fully adjustable slot width
- Applicable to various slotting needs. Slotting widths: 14.0mm to 23.3mm.
  Cutter Dia.: from 100mm to 160mm
- Smooth slotting width adjustment is possible owing to unique cam style adjustment mechanism.
- Four-sided inserts that are cost-effective.
- Wide range corner-R repertories are available.
- When utilizing wiper edge insert, an excellent surface finish can be expected.
- By offering numerous insert geometries and grades, they are applicable for various types of workpiece machining.



Feature of Insert Grades

Insert Shape			
Symbol	SB	SD	SE
Rake Angle			
Shape			

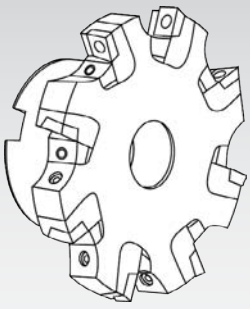
CA0835
· TiN+TiCN+Al_2O_3 based CVD Coated Carbide
· For Carbon Steel, Alloy Steel, Stainless Steel and Nodular Cast Iron.
· For middle to high speed cutting

PR0725
· TiN+TiCN+TiN based Multi-layer PVD Coated Carbide
· For carbon steel, alloy steel, stainless steel, heat resistant alloys and nodular cast iron.
· For middle speed cutting

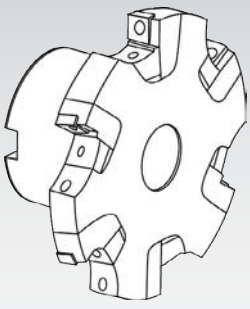
PR0110
TiB_2 based PVD Coated Carbide
· For Non-ferrous Metals such as Aluminum Alloy (Si<10%) and Titanium Alloy
· For high speed cutting

With Boss

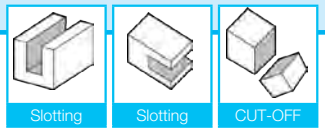
Right-hand



Left-hand



Slot Mill SLT type Insert: Self Clamping

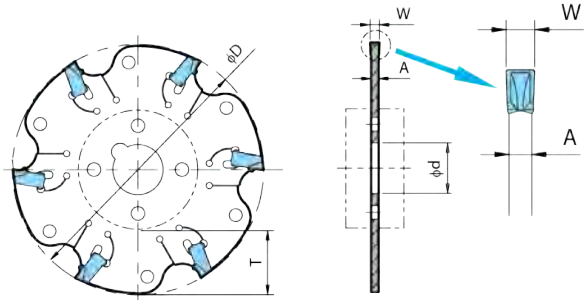


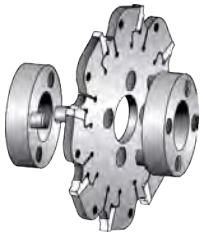
Identification System

MSTA ○○○ N ○○○-○○T

MSTA	○○○	N	○○○-○○T
Self-clamping type Slot Mill	External	Neutral	Edge Width / No. of Inserts

MSTA (Metric)





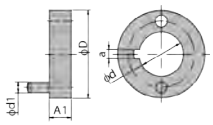
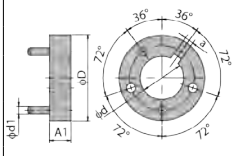
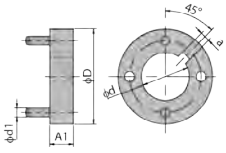
Drive Ring (sold separately)
Assembly Example

●Toolholder Dimensions

Description		Stock	Edge Width W (mm)	Slot Depth T (mm)	No. of Inserts	Dimension (mm) øD	Dimension (mm) ød (H7)	Dimension (mm) A	Weight (kg)	Applicable Inserts ➡H6	Max. Revolution (min^{-1})	Spare Parts Wrench	Recommended Cutting Conditions	Applicable Arbor
MSTA	63N16-5T	○	1.6	15	5	63	16	1.3	0.03	SLT16…	5,100	MS-FRW1 (Wrench is not included. Please purchase it separately) · How to use Wrench Ref. page ➡H7	Ref. page ➡H7	Ref. page ➡H27
	80N16-7T	○		21	7	80			0.04		4,000			
	100N16-9T	○		27	9	100	22		0.07		3,200			
	125N16-11T	○		35	11	125	32		0.1		2,600			
MSTA	63N22-5T	○	2.2	15	5	63	16	1.8	0.03	SLT22…	5,100			
	80N22-7T	○		21	7	80			0.05		4,000			
	100N22-9T	○		27	9	100	22		0.08		3,200			
	125N22-11T	○		35	11	125	32		0.12		2,600			
	160N22-14T	○		40	14	160	40		0.3		2,000			
MSTA	63N30-4T	○	3.0	15	4	63	16	2.4	0.05	SLT30…	5,100			
	80N30-6T	○		21	6	80			0.08		4,000			
	100N30-9T	○		27	9	100	22		0.13		3,200			
	125N30-11T	○		35	11	125	32		0.2		2,600			
	160N30-14T	○		40	14	160	40		0.35		2,000			
MSTA	63N40-4T	○	4.0	15	4	63	16	3.4	0.06	SLT40…	5,100			
	80N40-6T	○		21	6	80			0.1		4,000			
	100N40-9T	○		27	9	100	22		0.15		3,200			
	125N40-11T	○		35	11	125	32		0.25		2,600			
	160N40-14T	○		40	14	160	40		0.4		2,000			

Note) 1. Attach the drive ring (sold separately) to MSTA type slot mill to use. Drive ring is sold singulary.
Please purchase two drive rings per one MSTA type slot mill.
2. Do not exceed the max revolution.
3. Do not operate cutting on reverse revolution.
4. Wrench (MS-FRW1) is not attached. Please purchase it separately.

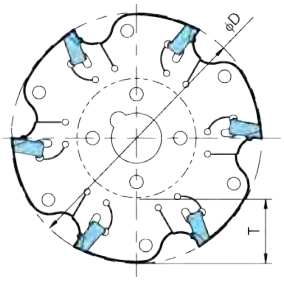
●Drive Ring (For Metric)

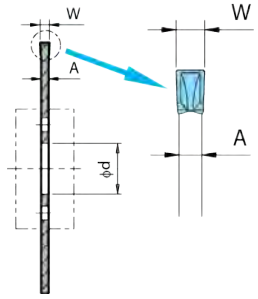
Shape	Description	Stock	Dimension (mm) ød	øD	A1	a	ød1	Drawing	Applicable Toolholders
 Fig.1	DR16-32A	○	16	32	8	4.1	3	Fig.2	MSTA 63N16-5T, 63N22-7T
 Fig.2	DR16-32B	○					4	Fig.1	MSTA 63N30-4T, 63N40-4T
 Fig. 3	DR16-38	○		38				Fig.3	MSTA 80N00-0T
	DR22-46	○	22	46	10	6.1	5		MSTA 100N00-0T
	DR32-55	○	32	55		8.1	6		MSTA 125N00-00T
	DR40-80	○	40	80	12	10.1	12		MSTA 160N00-00T

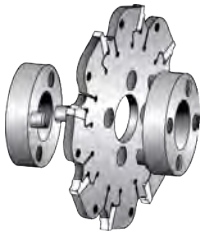
Wrenches and drive rings are sold in 1 piece per 1 box.

● : Stock Std. ○ : World Express

MSTA (inch spec)







Drive Ring (sold separately)
Assembly Example

●Toolholder Dimensions

Description		Stock	Edge Width W (inch)	Slot Depth T (inch)	No. of Inserts	Dimension (inch) øD	Dimension (inch) ød (H7)	Dimension (inch) A	Weight (kg)	Applicable Inserts ➡H6	Max. Revolution (min^{-1})	Spare Parts Wrench	Recommended Cutting Conditions	Applicable Arbor
MSTA	02N063-5T	○	.063 (1.6mm)	.625 (15.875mm)	5	2.500 (63.5mm)	.625 (15.875mm)	.051 (1.3mm)	0.03	SLT16…	5,100	MS-FRW1 (Wrench is not included. Please purchase it separately) · How to use Wrench Ref. page➡H7	Ref. page ➡H7	Ref. page ➡H27
	03N063-7T	○		.875 (22.225mm)	7	3.000 (76.2mm)			0.04		4,000			
	04N063-9T	○		1.063 (27.000mm)	9	4.000 (101.6mm)	1.000 (25.4mm)		0.07		3,200			
	05N063-11T	○		1.375 (34.925mm)	11	5.000 (127mm)	1.250 (31.75mm)		0.1		2,600			
MSTA	03N089-7T	○	.089 (2.2mm)	.875 (22.225mm)	7	3.000 (76.2mm)	.625 (15.875mm)	.071 (1.8mm)	0.05	SLT22…	4,000			
	04N089-9T	○		1.063 (27.000mm)	9	4.000 (101.6mm)	1.000 (25.4mm)		0.08		3,200			
	06N089-14T	○		1.438 (36.525mm)	14	6.000 (152.4mm)	1.250 (31.75mm)		0.3		2,000			
MSTA	02N126-4T	○	.120 (3.0mm)	.625 (15.875mm)	4	2.500 (63.5mm)	.625 (15.875mm)	.095 (2.4mm)	0.05	SLT30…	5,100			
	03N126-6T	○		.875 (22.225mm)	6	3.000 (76.2mm)			0.08		4,000			
	04N126-9T	○		1.063 (27.000mm)	9	4.000 (101.6mm)	1.000 (25.4mm)		0.13		3,200			
	05N126-11T	○		1.375 (34.925mm)	11	5.000 (127mm)	1.250 (31.75mm)		0.2		2,600			
	06N126-14T	○		1.438 (36.525mm)	14	6.000 (152.4mm)			0.35		2,000			
MSTA	03N164-6T	○	.160 (4.0mm)	.875 (22.225mm)	6	3.000 (76.2mm)	.625 (15.875mm)	.134 (3.4mm)	0.1	SLT40…	4,000			
	04N164-9T	○		1.063 (27.000mm)	9	4.000 (101.6mm)	1.000 (25.4mm)		0.15		3,200			
	05N164-11T	○		1.375 (34.925mm)	11	5.000 (127mm)	1.250 (31.75mm)		0.25		2,600			

Note) 1. Attach the drive ring (sold separately) to MSTA type slot mill to use. Drive ring is sold singulary.
Please purchase two drive rings per one MSTA type slot mill.
2. Do not exceed the max revolution.
3. Do not operate cutting on reverse revolution.
4. Wrench (MS-FRW1) is not attached. Please purchase it separately.

●Drive Ring (For Inch spec)

Shape	Description	Stock	Dimension (inch) ød	ød D	A1	a	ød1	Drawing	Applicable Toolholders
Fig.1	DR0625-1250A	○	.625 (15.875mm)	1.250 (31.75mm)	.315 (8mm)	.130 (3.3mm)	.158 (4mm)	Fig.1	MSTA 02N126-4T
Fig.2	DR0625-1250B	○					.120 (3mm)	Fig.2	MSTA 02N063-5T
Fig.3	DR0625-1250C	○						Fig.3	MSTA 03NOOO-OT
	DR1000-1875	○	1.000 (25.4mm)	1.875 (47.625mm)	.394 (10mm)	.256 (6.5mm)	.200 (5mm)		MSTA 04NOOO-OT
	DR1250-2250	○	1.250 (31.75mm)	2.250 (57.15mm)		.319 (8.1mm)	.240 (6mm)		MSTA 05NOOO-OT
	DR1250-3125	○	1.250 (31.75mm)	3.125 (79.375mm)	.472 (12mm)	.319 (8.1mm)	.472 (12mm)		MSTA 06NOOO-OT

● : Stock Std. ○ : World Express

Wrenches and drive rings are sold in 1 piece per 1 box.

Slot Mill SLT type Insert: Self Clamping

Inserts Identification System

SLT	16	-	15	S	KB
(1)	(2)		(3)	(4)	(5)

(1)Insert Symbol

(2)Edge Width

Symbol	Edge Width
16	1.6mm
22	2.2mm
30	3.05mm
40	4.05mm

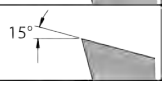
(3)Corner-R(rε)

Symbol	Corner-R (rε)
15	0.15mm
20	0.2mm

(4)Cutting Edge Spec.

Symbol	Cutting Edge Spec.
S	Chamfer + R-honed

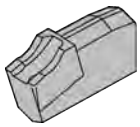
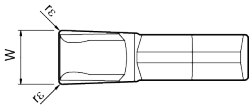
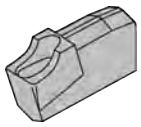
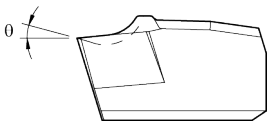
(5)Chipbreaker Symbol

Symbol	Rake Angle
KB	
KD	

SLT

P	Carbon Steel / Alloy Steel	★	☆
M	Stainless Steel	☆	★
K	Cast Iron	☆	
N	Non-ferrous Metals		
S	Heat-resistant Alloys		★
	Titanium Alloys		

Classification of usage
★: 1st Choice
☆: 2nd Choice

Insert		Description		Dimension (mm) W	Dimension (mm) rε	Rake Angle (°) θ	CVD Coated Carbide CA0835	PVD Coated Carbide PR0735	Ref. Page for Applicable Toolholder
		SLT	16-15SKB	1.6 +0 -0.1	0.15	5°	○	○	H4 H5
			22-20SKB	2.2 +0.08 -0.05	0.2		○	○	
			30-20SKB	3.05 +0.15 -0			○	○	
			40-20SKB	4.05 +0.15 -0			○	○	
 Low Cutting Force Chipbreaker		SLT	16-15SKD	1.6 +0 -0.1	0.15	15°	○	○	
			22-20SKD	2.2 +0.08 -0.05	0.2		○	○	
			30-20SKD	3.05 +0.15 -0			○	○	
			40-20SKD	4.05 +0.15 -0			○	○	

Chipbreaker selection

KB Chipbreaker … General purpose chipbreaker for Steel and Cast Iron
KD Chipbreaker … Low cutting force chipbreaker for Stainless Steel

Feature of Insert Grades

CA0835

· TiN+TiCN+Al_2O_3 based CVD Coated Carbide
· For Carbon Steel, Alloy Steel, Stainless Steel and Nodular Cast Iron.
· For middle to high speed cutting

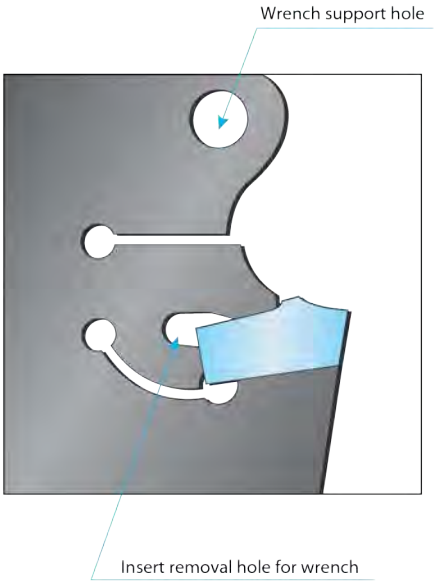
PR0735

· TiN base PVD Coated Carbide
· For Stainless Steel, Heat-Resistant Alloys, etc
· For low to middle speed cutting

Inserts are sold in 10 piece boxes

● : Stock Std. ○ : World Express

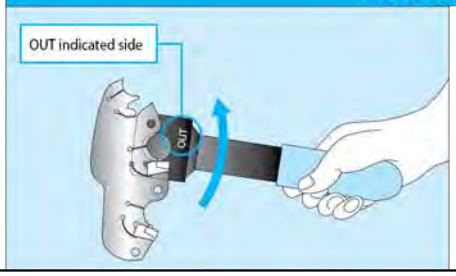
Set up



How to attach inserts

1. Put insert inside the slot mill.
2. Insert one of the pins on the wrench (on IN indicated side) into the wrench support hole.
3. Using the other pin, push the front relief surface of the insert.
4. Rotate the wrench until insert's back end makes contact with slot mill.

How to detach inserts



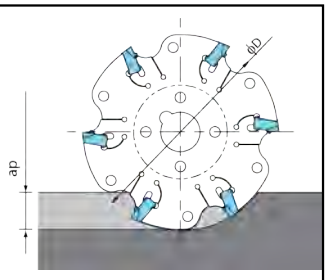
1. Insert one of the pins on the wrench (on OUT indicated side) into the wrench support hole, and insert other pin into the insert releasing hole.
2. Insert can be uninstalled by rotating the wrench counter clock wise. (A magnet is installed on OUT indicated side.)

Note) Use appropriate wrench for set up.

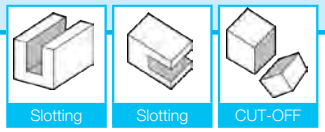
◆Recommended Cutting Conditions

Workpiece Material		Hardness	Recommended Insert Grades (Cutting Speed Vc: sfm)		fz (ipt)				Remarks
			CVD Coated Carbide	PVD Coated Carbide	Edge Width (in)				
			CA0835	**PR0735**	1.6	2.2	3.0	4.0	
Low Carbon Steel	SS400 S10C~S25C	125	825-1025	650-825	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	Coolant
Carbon Steel	S30C~S58C (Annealed)	190	525-625	425-525	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	
	S30C~S58C (Heat treated)	250	450-600	350-500	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	
Alloy Steel	SCM, SCr, etc. (Annealed)	180	450-600	350-500	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	
	SCM, SCr, etc. (Heat treated)	275	400-525	325-425	0.001-0.004	0.002-0.005	0.002-0.006	0.003-0.007	
High Carbon Alloy	SKD11, SKD61, etc.	280	325-450	250-400	0.001-0.004	0.002-0.005	0.002-0.006	0.003-0.007	
Stainless Steel	SUS304, SUS316, SUH310, etc.	220	500-625	250-400	0.001-0.004	0.002-0.005	0.002-0.006	0.003-0.007	
	SUS403, SUS410, SUH430F, etc.	300	450-600	200-250	0.001-0.004	0.002-0.005	0.002-0.006	0.003-0.007	
Gray Cast Iron	FC250~FC350	260	525-650	-	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	Dry
Nodular Cast Iron	FCD400~FCD500	160	425-525	-	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	
	FCD600~FCD800	250	350-450	-	0.001-0.005	0.002-0.006	0.002-0.007	0.003-0.008	

Note) 1. Use down-cut cutting.
2. If ap is under 1/10 of Cutter Dia.(øD), it is possible to increase feed per tooth(fz) 40%.



Up-Right Slot Mill: LN Insert



Identification System

●MSTB Slot Mill

Metric

MSTB OOOAN OOOO -OT

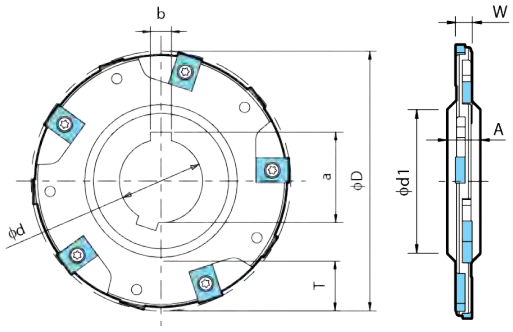
Slot Mill with Up-right Insert	Cutting Dia. (mm)		Edge Width (mm)	No. of Flutes
		A: Without Boss S: With Boss	N: Neutral	

Inch spec

MSTB OOOAN OOO- OT

Slot Mill with Up-right Insert	Cutting Dia. (inch)		Min. Edge Width (inch)	No. of Flutes
		A: Without Boss	N: Neutral	

Without Boss



In order to be used in combination with two or more mills, this slot mill has 2 key slots.

●Toolholder Dimensions (Metric)

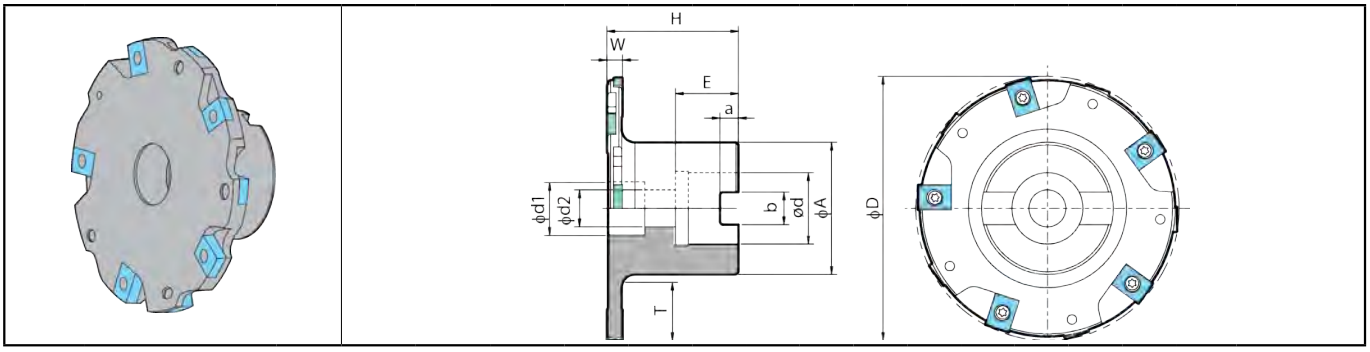
Description	Stock	Edge Width (mm) W (min)	Edge Width (mm) W (max)	Slot Depth T (mm)	No. of Inserts	No. of Edge Lines	Dimension (mm) øD	ød (H7)	ød1	A	a	b	Weight (kg)	Max. Revolution (min^{-1})
MSTB 80AN0607-4T	○	6	7	15	8	4	80	27	44	12	29.8	7	0.3	9,240
100AN0607-5T	○			21	10	5	100	32	52		34.8	8	0.4	8,270
125AN0607-6T	○			28	12	6	125	40	63		43.5	10	0.7	7,390
160AN0607-8T	○			45.5	16	8	160						1.1	6,540
MSTB 80AN0809-4T	○	8	9	16	8	4	80	27	44		29.8	7	0.4	9,240
100AN0809-5T	○			22	10	5	100	32	52		34.8	8	0.5	8,270
160AN0809-8T	○			45.5	16	8	160	40	63		43.5	10	1.3	6,540
MSTB 125AN1011-4T	○	10	11	30	12	4	125						0.9	7,390
160AN1011-5T	○			47.5	15	5	160						1.6	6,540
MSTB 160AN1213-5T	○	12	13	48.5	15	5	160						1.6	6,540

●Toolholder Dimensions (Inch spec)

Description	Stock	Edge Width (inch) W (min)	Edge Width (inch) W (max)	Slot Depth T (inch)	No. of Inserts	No. of Edge Lines	Dimension (inch) øD	ød (H7)	ød1	A	a	b	Weight (kg)	Max. Revolution (min^{-1})
MSTB 3000AN250-4T	○	.250 (6.35mm)	.289 (7.34mm)	.625 (15.875mm)	8	4	3.000 (76.2mm)	1.000 (25.4mm)	1.500 (38.1mm)	.500 (12.7mm)	1.106 (28.1mm)	.250 (6.35mm)	0.3	9,470
4000AN250-5T	○			.935 (23.8mm)	10	5	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.8mm)		1.386 (35.2mm)	.312 (7.92mm)	0.3	8,200
5000AN250-6T	○			1.435 (36.4mm)	12	6	5.000 (127mm)						0.7	7,300
6000AN250-8T	○			1.750 (44.45mm)	16	8	6.000 (152.4mm)	1.500 (38.1mm)	2.250 (57.2mm)		1.665 (42.3mm)	.375 (9.52mm)	1.0	6,700
MSTB 4000AN312-5T	○	.312 (7.92mm)	.351 (8.91mm)	.966 (24.5mm)	10	5	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.8mm)		1.386 (35.2mm)	.312 (7.92mm)	0.5	7,400
5000AN312-6T	○			1.466 (37.2mm)	12	6	5.000 (127mm)						0.8	6,600
6000AN312-8T	○			1.781 (45.2mm)	16	8	6.000 (152.4mm)	1.500 (38.1mm)	2.250 (57.2mm)		1.665 (42.3mm)	.375 (9.52mm)	1.1	6,000
MSTB 4000AN375-3T	○	.375 (9.525mm)	.414 (10.52mm)	1.000 (25.4mm)	9	3	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.8mm)		1.386 (35.2mm)	.312 (7.92mm)	0.5	7,400
5000AN375-4T	○			1.500 (38.1mm)	12	4	5.000 (127mm)						0.8	6,600
6000AN375-5T	○			1.812 (46.0mm)	15	5	6.000 (152.4mm)	1.500 (38.1mm)	2.250 (57.2mm)		1.665 (42.3mm)	.375 (9.52mm)	1.3	6,000
MSTB 4000AN500-3T	○	.500 (12.7mm)	.539 (13.69mm)	1.060 (26.9mm)	9	3	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.8mm)		1.386 (35.2mm)	.312 (7.92mm)	0.6	4,900
5000AN500-4T	○			1.560 (39.6mm)	12	4	5.000 (127mm)						1.1	4,400
6000AN500-5T	○			1.875 (47.6mm)	15	5	6.000 (152.4mm)	1.500 (38.1mm)	2.250 (57.2mm)		1.665 (42.3mm)	.375 (9.52mm)	1.7	4,000

● : Stock Std. ○ : World Express

With Boss



Toolholder Dimensions

Description	Stock	Unit	Edge Width W (min)	Edge Width W (max)	Slot Depth T (mm)	No. of Inserts	No. of Edge Lines	Dimension øD	Dimension ød (H7)	Dimension øA	Dimension H (min)	Dimension E	Dimension a	Dimension b	Dimension ød1	Dimension ød2	Weight (kg)	Max. Revolution (min⁻¹)
MSTB 2500SN250-3T	○	inch	0.250	0.289	0.550	6	3	2.500	0.750	1.580	1.875	0.075	0.220	0.332	-	0.406	0.5	10,400
2500SN312-3T	○	inch	0.312	0.351	0.550	6	3	2.500	0.750	1.580	1.875	0.075	0.220	0.332	-	0.406	0.6	9,400
MSTB 80SN0607-4T	○	mm	6	7	16	8	4	80	22	40	50	23	6.3	10.4	18	12	0.7	9,240
100SN0607-5T	○	mm	6	7	21	10	5	100	27	50	50	24	7	12.4	20	14	1.0	8,270
160SN0607-8T	○	mm	6	7	41	16	8	160	40	70	50	28	9	16.4	33	22	1.9	6,540
MSTB 80SN0809-4T	○	mm	8	9	16	8	4	80	22	40	50	23	6.3	10.4	18	12	0.8	9,240
100SN0809-5T	○	mm	8	9	21	10	5	100	27	50	50	24	7	12.4	20	14	1.2	8,270
160SN0809-8T	○	mm	8	9	41	16	8	160	40	70	50	28	9	16.4	33	22	2.2	6,540
MSTB 125SN1011-4T	○	mm	10	11	26	12	4	125	40	70	50	28	9	16.4	33	22	2.0	7,390
160SN1011-5T	○	mm	10	11	43	15	5	160	40	70	50	28	9	16.4	33	22	2.5	6,540

Note) H (min) dimension shows case of minimum edge width.

Spare Parts and Applicable Inserts

Spare Parts

		Description	Spare Parts: Clamp Screw	Spare Parts: Wrench	Spare Parts: Anti-seize Compound	Spare Parts: Arbor Clamp Screw	Applicable Inserts	Recommended Cutting Conditions	Applicable Arbor
Metric	Without Boss	MSTB ○○○AN0607-○T	SE-40050TR	TT-15L	MP-1	-	LN12... Ref. page H10, H11	Ref. page H12	Ref. page H27
		○○○AN0809-○T	SE-40068TR						
		○○○AN1011-○T	SE-40068TR						
		160AN1213-5T	SE-40090TR						
	With Boss	MSTB 80SN0607-4T	SE-40050TR	TT-15L	MP-1	HH10X35			
		100SN0607-5T	SE-40050TR	TT-15L	MP-1	HH12X35			
		160SN0607-8T	SE-40050TR	TT-15L	MP-1	HH20X40			
		MSTB 80SN0809-4T	SE-40068TR	TT-15L	MP-1	HH10X35			
		100SN0809-5T	SE-40068TR	TT-15L	MP-1	HH12X35			
		160SN0809-8T	SE-40068TR	TT-15L	MP-1	HH20X40			
		MSTB ○○○SN1011-○T	SE-40068TR	TT-15L	MP-1	HH20X40			
Inch spec	Without Boss	MSTB ○○○○AN250-○T	SE-40055TR	TT-15L	MP-1	-			
		○○○○AN312-○T	SE-40068TR	TT-15L	MP-1	-			
		○○○○AN375-○T	SE-40068TR	TT-15L	MP-1	-			
		○○○○AN500-○T	SE-40090TR	TT-15L	MP-1	-			

Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

● : Stock Std. ○ : World Express

On-Edge Slot Mill: LN Insert

Inserts Identification System

LNEU	12	35	-	03	S
(1)	(2)	(3)		(4)	(5)

(1)Insert Symbol

(2)Insert Length

Symbol	Insert Length
12	12.7mm

(3)Edge Width

Symbol	Edge Width
35	3.5mm
40	4.0mm

(4)Corner-R(rε)

Symbol	Corner-R (rε)
03	0.3mm
04	0.4mm

(5)Cutting Edge Spec.

Symbol	Cutting Edge Spec.
S	Chamfer + R-honed

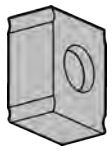
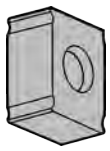
LN

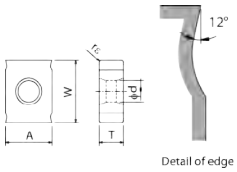
(mm)

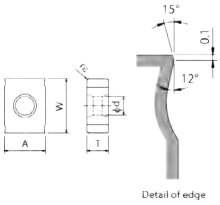
Description	W	A	ød
LENU12	12.7	9.6	4.4

Classification of usage
★: 1st Choice
☆: 2nd Choice

		PVD Coated Carbide
P	Carbon Steel / Alloy Steel	★
M	Stainless Steel	★
K	Cast Iron	☆
N	Non-ferrous Metals	
S	Heat-resistant Alloys	★
	Titanium Alloys	☆

Insert	Description	No. of Edges	Dimension (mm) T	Dimension (mm) rε	PVD Coated Carbide PR0725	Applicable Clamp Screw	Ref. Page for Toolholder	Ref. Page for Recommended Cutting Conditions
 Honed	LNEU 1235-03-4	4	3.5	0.3	○	SE-40050TR	H8 H9	H12
	1240-08-4	4	4.0	0.8	○	SE-40055TR		
	1245-04	4	4.5	0.4	○	SE-40068TR		
	1245-08			0.8	○			
	1250-04	4	5.0	0.4	○	SE-40080TR		
	1250-08			0.8	○			
	1255-04	4	5.5	0.4	○	SE-40090TR		
	1255-08			0.8	○			
	1260-04	4	6.0	0.4	○	SE-40100TR		
 Tough Edge	LNEU 1235-03S-4	4	3.5	0.3	○	SE-40050TR		
	1240-03S-4	4	4.0	0.3	○	SE-40055TR		
	1245-04S	4	4.5	0.4	○	SE-40068TR		
	1245-08S			0.8	○			
	1250-04S	4	5.0	0.4	○	SE-40080TR		
	1250-08S			0.8	○			





Notes) 1. Please select the applicable clamp screw depending on each insert description.
2. Ref. page H11 for insert description and applicable clamp screw depending on edge width.

Feature of Insert Grades

●PR0725

- TiN+TiCN+TiN based Multi-layer PVD Coated Carbide
- For Carbon Steel, Alloy Steel, Stainless Steel, Heat Resistant Alloys and Nodular Cast Iron.
- For middle speed cutting

Inserts are sold in 10 piece boxes

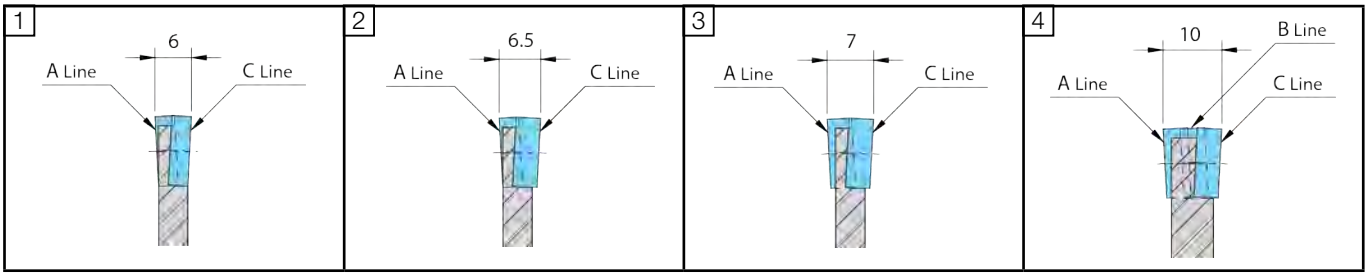
● : Stock Std. ○ : World Express

Combination of Applicable Inserts

	Description	Clamp Screw (Standard attachment parts)	Edge Width mm	Edge Width inch (mm)	A Line Applicable Inserts	A Line Clamp Screw	B Line Applicable Inserts	B Line Clamp Screw	C Line Applicable Inserts	C Line Clamp Screw	Wrench For Clamp Screw	Tightening Torque (Nm)
Metric	MSTB ○○○AN0607-○T	SE-40050TR	6	-	LNEU1235..	SE-40050TR	-	-	LNEU1235..	SE-40050TR	TT-15L	3
	○○○SN0607-○T		6.5						LNEU1240..	SE-40055TR		
			7		LNEU1240..	SE-40055TR						
	MSTB ○○○AN0809-○T	SE-40068TR	8	-	LNEU1245..	SE-40068TR	-	-	LNEU1245..	SE-40068TR		
	○○○SN0809-○T		8.5						LNEU1250..	SE-40080TR		
			9		LNEU1250..	SE-40080TR						
	MSTB ○○○AN1011-○T	SE-40068TR	10	-	LNEU1245..	SE-40068TR	LNEU1245..	SE-40068TR	LNEU1245..	SE-40068TR		
	○○○SN1011-○T		10.5						LNEU1250..	SE-40080TR		
			11		LNEU1250..	SE-40080TR	LNEU1250..	SE-40080TR				
	MSTB ○○○AN1213-○T	SE-40090TR	12	-	LNEU1255...	SE-40090TR	LNEU1255...	SE-40090TR	LNEU1255...	SE-40090TR		
			12.5						LNEU1260...	SE-40100TR		
			13		LNEU1260...	SE-40100TR	LNEU1260...	SE-40100TR				
Inch spec	MSTB ○○○○AN250-○T	SE-40055TR	-	.250 (6.35mm)	LNEU1240..	SE-40055TR	-	-	LNEU1240..	SE-40055TR		
				.270 (6.86mm)					LNEU1245..	SE-40068TR		
				.289 (7.34mm)	LNEU1245..	SE-40068TR						
	MSTB ○○○○AN312-○T	SE-40068TR	-	.312 (7.92mm)	LNEU1245..	SE-40068TR	-	-	LNEU1245..	SE-40068TR		
				.332 (8.43mm)					LNEU1250..	SE-40080TR		
				.351 (8.91mm)	LNEU1250..	SE-40080TR						
	MSTB ○○○○AN375-○T	SE-40068TR	-	.375 (9.525mm)	LNEU1245..	SE-40068TR	LNEU1245..	SE-40068TR	LNEU1245..	SE-40068TR		
				.395 (10.33mm)					LNEU1250..	SE-40080TR		
				.414 (10.52mm)	LNEU1250..	SE-40080TR	LNEU1250..	SE-40080TR				
	MSTB ○○○○AN500-○T	SE-40090TR	-	.500 (12.7mm)	LNEU1255...	SE-40090TR	LNEU1255...	SE-40090TR	LNEU1255...	SE-40090TR		
				.520 (13.21mm)					LNEU1260...	SE-40100TR		
				.539 (13.69mm)	LNEU1260...	SE-40100TR	LNEU1260...	SE-40100TR				

* For clamp screw, above listed "Standard attachment parts" are included. In case of necessity of another size of clamp screw by changing slotting width, please purchase separately.

Slot width (edge width) adjustment



●The Slot width (edge width) of MSTB-Type slot Mills is adjustable by a maximum of 1mm (.039'') with the combination of inserts.

1. In the case of MSTB ○○○AN0607-○T the width (W) is 6mm by installing LNEU1235 on both A line and C line.
2. By replacing C line only with LNEU1240 the width (W) is 6.5mm.
3. By replacing A line and C line with LNEU1240 the width (W) is 7mm.
4. If the slotting width (edge width) is 10mm (.375'') or more, the B line (middle edge) is necessary.

* Caution

1) There is no description such as "A line", "B line", and "C line" on the actual slot Mill. These are only for explanation of the combination of insert.
2) Use proper clamp screws for applicable inserts on the basis of the above chart.
3) Please do not use any slot mills, that have a difference of width of more than 1mm (.039")

Bottom cutting shape of MSTB Slot Mill

Slot bottom shape will be (Fig.1) convex shape.

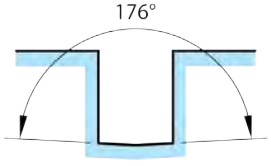


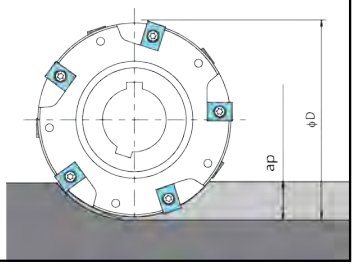
Fig.1 Convex bottom shape

On-Edge Slot Mill: LN Insert

◆Recommended Cutting Conditions

Workpiece Material		Hardness	Recommended Insert Grades (Vc: sfm)	fz (ipt)		Remarks
			PVD Coated Carbide	Insert Thickness (in)		
			PR0725	0.138~0.158	0.177~0.236	
Low Carbon Steel	SS400 S10C~S25C	125	550-675	0.003-0.008	0.004-0.009	Dry
Carbon Steel	S30C~S58C (Annealed)	190	325-450	0.003-0.008	0.004-0.009	
	S30C~S58C (Heat treated)	250	300-400	0.003-0.008	0.004-0.009	
Alloy Steel	SCM, SCr, etc. (Annealed)	180	300-400	0.003-0.008	0.004-0.009	
	SCM, SCr, etc. (Heat treated)	275	250-350	0.002-0.007	0.003-0.008	
High Carbon Alloy	SKD11, SKD61, etc.	280	225-300	0.002-0.007	0.003-0.008	
Stainless Steel	SUS304, SUS316, SUH310, etc.	220	350-450	0.002-0.007	0.003-0.008	Coolant
	SUS403, SUS410,SUH430F, etc.	300	325-400	0.002-0.007	0.003-0.008	
Heat-resistant Alloys	Inconel 718, etc.	350	50-100	0.002-0.007	0.003-0.008	
Titanium Alloys	TiAl6V4, etc.	270	75-175	0.002-0.007	0.003-0.008	
Gray Cast Iron	FC250~FC350	260	350-425	0.003-0.009	0.004-0.010	Dry
Nodular Cast Iron	FCD400~FCD500	160	250-325	0.003-0.009	0.004-0.010	
	FCD600~FCD800	250	225-300	0.003-0.009	0.004-0.010	

Note) 1. Use down-cut cutting.
2. If ap is under 1/10 of Cutter Dia.(øD), it is possible to increase feed per tooth(fz) 40%.



Identification System

●MSTC Slot Mill

Metric

M S T C ○ ○ ○ **A** **N** ○ ○ ○ ○ - ○ ○ - ○ ○ **T**

Slot Mill with Lay-down type	Cutting Dia. (mm)	A: Without Boss S: With Boss	N: Neutral R: Right-hand L: Left-hand	Edge Width (mm)	Applicable Inserts 10 : SP..10T3.. 12 : SD..1204..
				No. of Inserts	

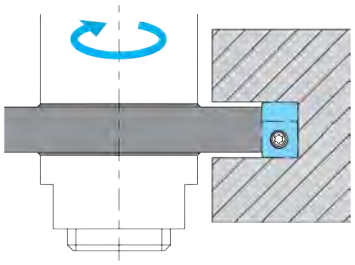
Inch spec

M S T C ○ ○ ○ **A** **N** ○ ○ ○ - ○ ○ ○ - ○ ○

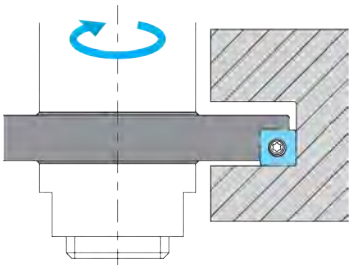
Slot Mill with Lay-down type	Cutting Dia. (inch)	A: Without Boss	N: Neutral R: Right-hand L: Left-hand	Edge Width (inch)	Applicable Inserts 10 : SP..10T3.. 12 : SD..1204..

Cutting Direction of MSTC Slot Mill

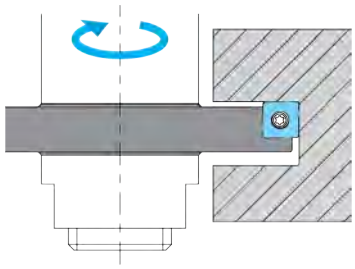
AN (Slotting)



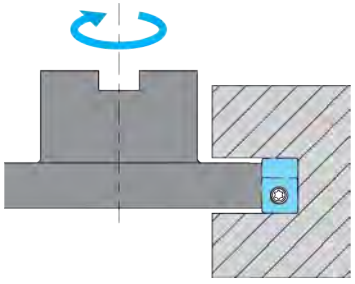
AR (Lower surface machining)



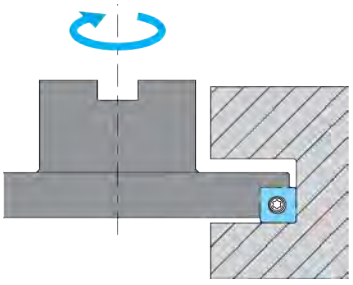
AL (Upper surface machining)



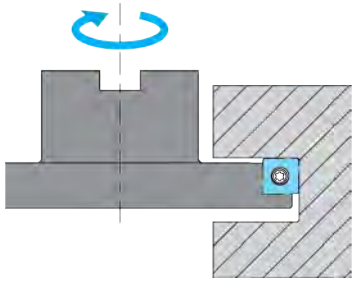
SN (Slotting)



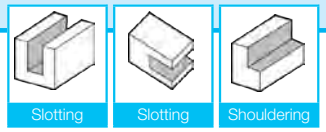
SR (Lower surface machining)



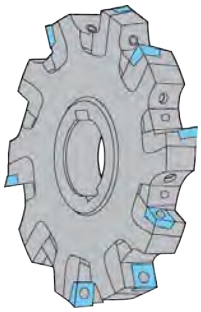
SL (Upper surface machining)

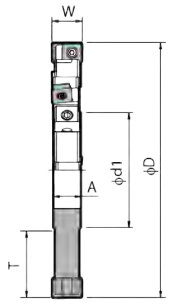


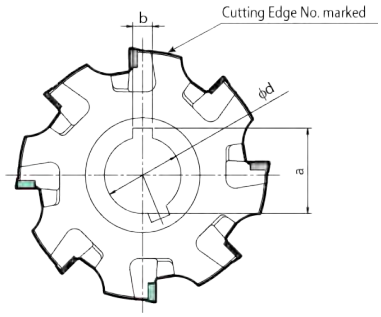
Lay-Down Slot Mill



Without Boss







In order to be used in combination with two or more mills, this slot mill has 2 key ways.

●Toolholder Dimensions (Metric)

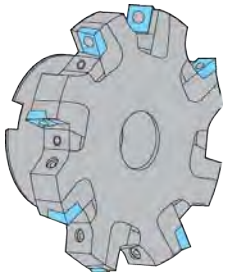
Description	Stock	Edge Width (mm) W (min)	Edge Width (mm) W (max)	Slot Depth T (mm)	No. of Inserts	No. of Edge Lines	Dimension (mm) øD	Dimension (mm) ød (H7)	Dimension (mm) ød1	Dimension (mm) A	Dimension (mm) a	Dimension (mm) b	Weight (kg)	Max. Revolution (min^{-1})
MSTC 100AN1416-10-3T	○	14	16	25.9	6	3	100	32	46.8	13.9	34.8	8	0.5	17,250
125AN1416-10-4T	○			34.4	8	4	125	40	54.8		43.5	10	0.8	15,450
160AN1416-10-5T	○			51.9	10	5	160						1.5	13,650
MSTC 125AN1618-10-4T	○	16	18	34.4	8	4	125			15.9			1.0	15,450
160AN1618-10-5T	○			51.9	10	5	160						1.8	13,650
MSTC 125AN1820-12-4T	○	18	20.7	34	8	4	125			18.2			1.0	10,350
160AN1820-12-5T	○			51.5	10	5	160						1.8	9,150
MSTC 125AN2123-12-4T	○	21	23.3	34	8	4	125			20.8			1.2	10,350
160AN2123-12-5T	○			51.5	10	5	160						2.1	9,150

●Toolholder Dimensions (Inch spec)

Description	Stock	Edge Width (inch) W (min)	Edge Width (inch) W (max)	Slot Depth T (inch)	No. of Inserts	No. of Edge Lines	Dimension (inch) øD	Dimension (inch) ød (H7)	Dimension (inch) ød1	Dimension (inch) A	Dimension (inch) a	Dimension (inch) b	Weight (kg)	Max. Revolution (min^{-1})
MSTC 400AN551-630-10	○	.551 (14.0mm)	.630 (16.0mm)	1.030 (26.1mm)	6	3	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.75mm)	.545 (13.84mm)	1.386 (35.2mm)	.312 (7.92mm)	0.6	17,100
500AN551-630-10	○			1.345 (34.1mm)	8	4	5.000 (127.0mm)	1.500 (38.1mm)	2.250 (57.15mm)		1.665 (42.3mm)	.375 (9.52mm)	0.9	15,300
600AN551-630-10	○			1.845 (46.8mm)	10	5	6.000 (152.4mm)						1.4	14,000
MSTC 500AN630-709-10	○	.630 (16.0mm)	.709 (18.0mm)	1.345 (34.1mm)	8	4	5.000 (127.0mm)			.624 (15.85mm)			1.1	15,300
600AN630-709-10	○			1.845 (46.8mm)	10	5	6.000 (152.4mm)						1.6	14,000
MSTC 500AN709-813-12	○	.709 (18.0mm)	.813 (20.6mm)	1.331 (33.8mm)	8	4	5.000 (127.0mm)			.716 (18.2mm)			1.1	10,300
600AN709-813-12	○			1.831 (46.5mm)	10	5	6.000 (152.4mm)						1.7	9,400
MSTC 500AN813-917-12	○	.813 (20.6mm)	.917 (23.2mm)	1.331 (33.8mm)	8	4	5.000 (127.0mm)			.820 (20.8mm)			1.3	10,300
600AN813-917-12	○			1.831 (46.5mm)	10	5	6.000 (152.4mm)						2.0	9,400

● : Stock Std. ○ : World Express

With Boss



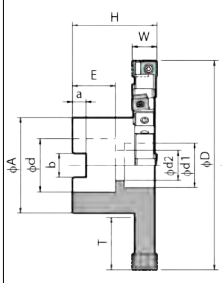


Fig.1

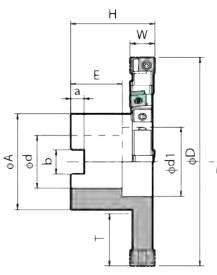


Fig.2

●Toolholder Dimensions (Metric)

Description	Stock	Edge Width (mm)		Slot Depth	No. of Inserts	No. of Edge Lines	Dimension (mm)									Drawing	Weight (kg)	Max. Revolution (min^{-1})
		W (min)	W (max)	T (mm)			øD	ød (H7)	øA	H (min)	E	a	b	ød1	ød2			
MSTC 100SN1416-10-3T	○	14	16	24.4	6	3	100	27	48	50.8	24	7	12.4	20	14	Fig. 1	1.0	17,250
125SN1416-10-4T	○			31.9	8	4	125	32	58		26	8	14.4	27	18		1.6	15,450
160SN1416-10-5T	○			43.4	10	5	160	40	70		30	9	16.4	56	-	Fig.2	2.0	13,650
MSTC 125SN1618-10-4T	○	16	18	31.9	8	4	125	32	58	50.8	26	8	14.4	27	18	Fig. 1	1.7	15,450
160SN1618-10-5T	○			43.4	10	5	160	40	70		30	9	16.4	56	-	Fig.2	2.3	13,650
MSTC 125SN1820-12-4T	○	18	20.7	31.9	8	4	125	32	58	51.0	26	8	14.4	27	18	Fig. 1	1.6	10,350
160SN1820-12-5T	○			43.4	10	5	160	40	70		30	9	16.4	56	-	Fig.2	2.3	9,150
MSTC 125SN2123-12-4T	○	20.7	23.3	31.9	8	4	125	32	58	51.0	26	8	14.4	27	18	Fig. 1	1.7	10,350
160SN2123-12-5T	○			43.4	10	5	160	40	70		30	9	16.4	56	-	Fig.2	2.6	9,150

Note) H(min) dimension shows case of minimum edge width.

Applicable Inserts (common to Inch spec / Metric)

Description	Edge No. (Marked)	Applicable Inserts ➡ H22-H23	
		With hand	Neutral
MSTC...AN...10.. **MSTC...SN...10..**	Odd Number	**SP..10T3...R...**	**SP..10T3...N...**
	Even Number	**SP..10T3...L...**	
MSTC...AN...12.. **MSTC...SN...12..**	Odd Number	**SD..1204...R...**	**SD..1204...N...**
	Even Number	**SD..1204...L...**	

· When installing handed inserts to slot mill above, the number of Right-hand and Left-hand inserts needs to match with the number of edge line.

Recommended Cutting Conditions ➡ H24

Spare Parts (common to Inch spec / Metric)

· For spare parts, ref. page ➡ H20

Slot width (edge width) adjustment

· Ref. page ➡ H25-H26

Applicable Arbor

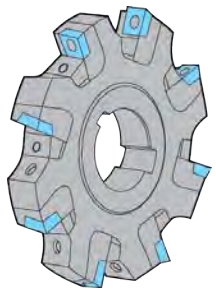
· Ref. page ➡ H27

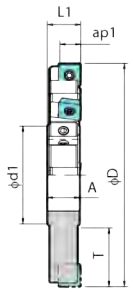
● : Stock Std. ○ : World Express

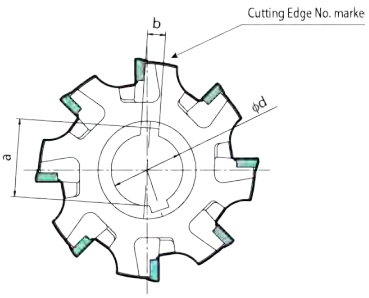
Half Side Slot Mill

Shouldering

Without Boss (Right-hand)







• Right-hand shown

In order to be used in combination with two or more mills, this slot mill has 2 key ways.

●Toolholder Dimensions (Metric)

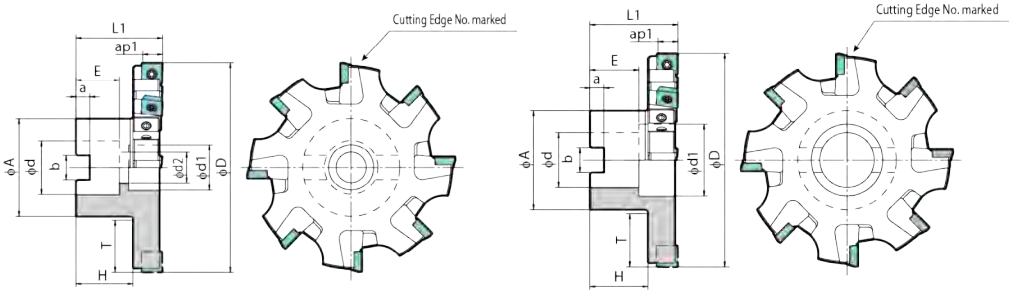
Description	Stock	No. of Inserts	Dimension (mm)										Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	Ød1	A	L1 (min)	L1 (max)	T	ap1 (max)	a	b		
MSTC 100AR1416-10-6T	○	6	100	32	46.8	13.9	13.9	14.9	25.9	9.1	34.8	8	0.5	17,250
125AR1416-10-8T	○	8	125	40	54.8				34.4		43.5	10	0.8	15,450
160AR1416-10-10T	○	10	160						51.9				1.5	13,650
MSTC 125AR1618-10-8T	○	8	125			15.9	15.2	16.2	34.4				1.0	15,450
160AR1618-10-10T	○	10	160						51.9				1.8	13,650
MSTC 125AR1820-12-8T	○	8	125			18.2	18.1	19.4	34.0	11.7			1.0	10,350
160AR1820-12-10T	○	10	160						51.5				1.8	9,150
MSTC 125AR2123-12-8T	○	8	125			20.8	20.7	22.0	34.0				1.2	10,350
160AR2123-12-10T	○	10	160						51.5				2.1	9,150

●Toolholder Dimensions (Inch spec)

Description	Stock	No. of Inserts	Dimension (inch)										Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	Ød1	A	L1 (min)	L1 (max)	T	ap1 (max)	a	b		
MSTC 400AR551-630-10	○	6	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.75mm)	.545 (13.84mm)	.548 (13.92mm)	.588 (14.94mm)	1.030 (26.1mm)	.359 (9.1mm)	1.386 (35.2mm)	.312 (7.92mm)	0.6	17,100
500AR551-630-10	○	8	5.000 (127.0mm)	1.500 (38.1mm)	2.250 (57.15mm)				1.345 (34.1mm)		1.665 (42.3mm)	.375 (9.52mm)	0.9	15,300
600AR551-630-10	○	10	6.000 (152.4mm)						1.845 (46.8mm)				1.4	14,000
MSTC 500AR630-709-10	○	8	5.000 (127.0mm)			.624 (15.85mm)	.627 (15.93mm)	.667 (16.94mm)	1.345 (34.1mm)				1.1	15,300
600AR630-709-10	○	10	6.000 (152.4mm)						1.845 (46.8mm)				1.6	14,000
MSTC 500AR709-813-12	○	8	5.000 (127.0mm)			.716 (18.2mm)	.712 (18.1mm)	.764 (19.4mm)	1.331 (33.8mm)	.461 (11.7mm)			1.1	10,300
600AR709-813-12	○	10	6.000 (152.4mm)						1.831 (46.5mm)				1.7	9,400
MSTC 500AR813-917-12	○	8	5.000 (127.0mm)			.820 (20.8mm)	.816 (20.7mm)	.868 (22.04mm)	1.331 (33.8mm)				1.3	10,300
600AR813-917-12	○	10	6.000 (152.4mm)						1.831 (46.5mm)				2.0	9,400

● : Stock Std. ○ : World Express

With Boss (Right-hand)



•Right-hand shown

Fig.1

Fig.2

●Toolholder Dimensions (Metric)

Description	Stock	No. of Inserts	Dimension (mm)													Drawing	Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	ØA	H	L1 (min)	L1 (max)	T	ap1 (max)	E	a	b	Ød1	Ød2			
MSTC 100SR1416-10-6T	○	6	100	27	48	37.7	50.8	51.8	24.4	9.1	24	7	12.4	20	14	Fig.1	1.0	17,250
125SR1416-10-8T	○	8	125	32	58				31.9		26	8	14.4	27	18		1.6	15,450
160SR1416-10-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.0	13,650
MSTC 125SR1618-10-8T	○	8	125	32	58	35.7			31.9		26	8	14.4	27	18	Fig.1	1.7	15,450
160SR1618-10-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.3	13,650
MSTC 125SR1820-12-8T	○	8	125	32	58	34.0	51.0	52.3	31.9	11.7	26	8	14.4	27	18	Fig.1	1.6	10,350
160SR1820-12-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.3	9,150
MSTC 125SR2123-12-8T	○	8	125	32	58	31.4			31.9		26	8	14.4	27	18	Fig.1	1.7	10,350
160SR2123-12-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.6	9,150

●Toolholder Dimensions (inch spec)

Description	Stock	No. of Insert	Dimension (inch)													Shape	Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	ØA	L1 (min)	L1 (max)	T	ap1 (max)	E	a	b	Ød1	Ød2				
MSTC 400SR551-630-10	○	6	4.000	1.000	2.132	2.033	2.072	0.872	0.359	0.750	0.236	0.394	0.858	0.531	Fig.1	1.2	17,100
500SR551-630-10	○	8	5.000	1.250	2.880			0.997		0.750	0.319	0.500	1.050	0.656	Fig.1	2.0	15,300
600SR551-630-10	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	2.8	14,000
MSTC 500SR630-709-10	○	8	5.000	1.250	2.880	2.033	2.072	0.997	0.359	0.750	0.319	0.500	1.050	0.656	Fig.1	2.1	15,300
600SR630-709-10	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	2.9	14,000
MSTC 500SR709-813-12	○	8	5.000	1.250	2.880	2.041	2.093	0.997	0.461	0.750	0.319	0.500	1.050	0.656	Fig.1	2.1	10,300
600SR709-813-12	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	2.9	9,400
MSTC 500SR813-917-12	○	8	5.000	1.250	2.880	2.041	2.093	0.997	0.461	0.750	0.319	0.500	1.050	0.656	Fig.1	2.2	10,300
600SR813-917-12	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	3.0	9,400

Applicable Inserts (common to Inch spec / Metric)

Description	Applicable Inserts H22-H23	
	With hand	Neutral
MSTC...AR...10.. MSTC...SR...10..	SP..10T3...R...	SP..10T3...N...
MSTC...AR...12.. MSTC...SR...12..	SD..1204...R...	SD..1204...N...

Recommended Cutting Conditions H24

Applicable Arbor

· Ref. page H27

Spare Parts (common to Inch spec / Metric)

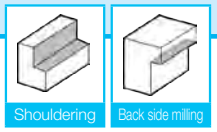
· For spare parts, ref. page H21

Slot width (edge width) adjustment

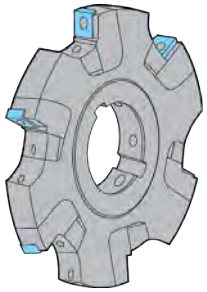
· Ref. page H25-26

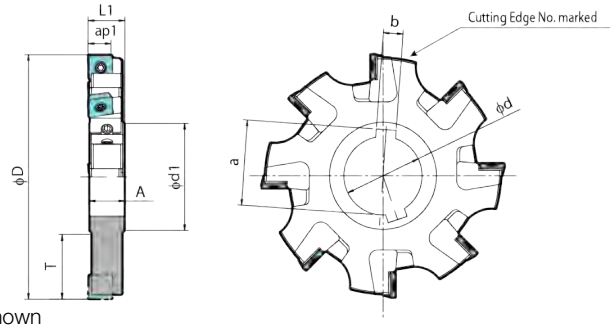
● : Stock Std. ○ : World Express

Half Side Slot Mill



Without Boss (Left-hand)





● Left-hand shown

In order to be used in combination with two or more mills, this slot mill has 2 key ways.

●Toolholder Dimensions (Metric)

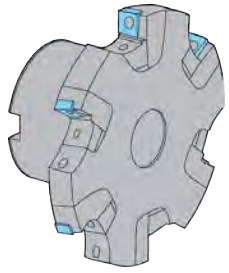
Description	Stock	No. of Inserts	Dimension (mm)										Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	Ød1	A	L1 (min)	L1 (max)	T	ap1 (max)	a	b		
MSTC 100AL1416-10-6T	○	6	100	32	46.8	13.9	13.9	14.9	25.9	9.1	34.8	8	0.5	17,250
125AL1416-10-8T	○	8	125	40	54.8				34.4		43.5	10	0.8	15,450
160AL1416-10-10T	○	10	160						51.9				1.5	13,650
MSTC 125AL1618-10-8T	○	8	125			15.9	15.2	16.2	34.4				1.0	15,450
160AL1618-10-10T	○	10	160						51.9				1.8	13,650
MSTC 125AL1820-12-8T	○	8	125			18.2	18.1	19.4	34.0	11.7			1.0	10,350
160AL1820-12-10T	○	10	160						51.5				1.8	9,150
MSTC 125AL2123-12-8T	○	8	125			20.8	20.7	22.0	34.0				1.2	10,350
160AL2123-12-10T	○	10	160						51.5				2.1	9,150

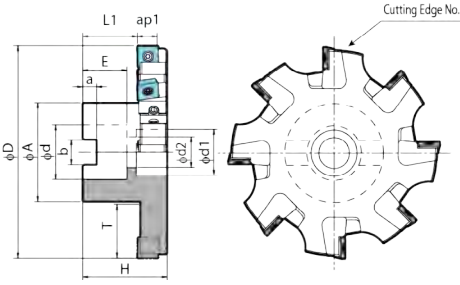
●Toolholder Dimensions (Inch spec)

Description	Stock	No. of Inserts	Dimension (inch)										Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	Ød1	A	L1 (min)	L1 (max)	T	ap1 (max)	a	b		
MSTC 400AL551-630-10	○	6	4.000 (101.6mm)	1.250 (31.75mm)	1.880 (47.75mm)	.545 (13.84mm)	.548 (13.92mm)	.588 (14.94mm)	1.030 (26.1mm)	.359 (9.1mm)	1.386 (35.2mm)	.312 (7.92mm)	0.6	17,100
500AL551-630-10	○	8	5.000 (127.0mm)	1.500 (38.1mm)	2.250 (57.15mm)				1.345 (34.1mm)		1.665 (42.3mm)	.375 (9.52mm)	0.9	15,300
600AL551-630-10	○	10	6.000 (152.4mm)						1.845 (46.8mm)				1.4	14,000
MSTC 500AL630-709-10	○	8	5.000 (127.0mm)			.624 (15.85mm)	.627 (15.93mm)	.667 (16.94mm)	1.345 (34.1mm)				1.1	15,300
600AL630-709-10	○	10	6.000 (152.4mm)						1.845 (46.8mm)				1.6	14,000
MSTC 500AL709-813-12	○	8	5.000 (127.0mm)			.716 (18.2mm)	.712 (18.1mm)	.764 (19.4mm)	1.331 (33.8mm)	.461 (11.7mm)			1.1	10,300
600AL709-813-12	○	10	6.000 (152.4mm)						1.831 (46.5mm)				1.7	9,400
MSTC 500AL813-917-12	○	8	5.000 (127.0mm)			.820 (20.8mm)	.816 (20.7mm)	.868 (22.04mm)	1.331 (33.8mm)				1.3	10,300
600AL813-917-12	○	10	6.000 (152.4mm)						1.831 (46.5mm)				2.0	9,400

● : Stock Std. ○ : World Express

With Boss (Left-hand)





● Left-hand shown

Fig.1

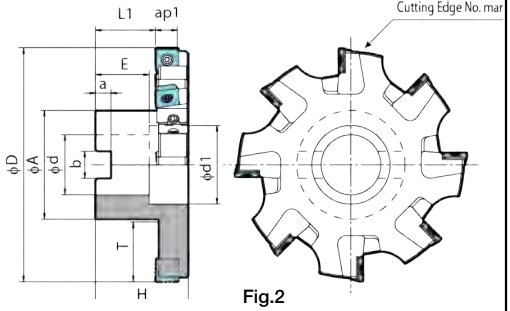


Fig.2

●Toolholder Dimensions (Metric)

Description	Stock	No. of Inserts	Dimension (mm)													Drawing	Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	ØA	H	L1 (min)	L1 (max)	T	ap1 (max)	E	a	b	Ød1	Ød2			
MSTC 100SL1416-10-6T	○	6	100	27	48	50	35.8	36.8	24.4	9.1	24	7	12.4	20	14	Fig.1	1.0	17,250
125SL1416-10-8T	○	8	125	32	58				31.9		26	8	14.4	27	18		1.6	15,450
160SL1416-10-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.0	13,650
MSTC 125SL1618-10-8T	○	8	125	32	58		33.8	34.8	31.9		26	8	14.4	27	18	Fig.1	1.7	15,450
160SL1618-10-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.3	13,650
MSTC 125SL1820-12-8T	○	8	125	32	58		31.7	33.0	31.9	11.7	26	8	14.4	27	18	Fig.1	1.6	10,350
160SL1820-12-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.3	9,150
MSTC 125SL2123-12-8T	○	8	125	32	58		29.1	30.4	31.9		26	8	14.4	27	18	Fig.1	1.7	10,350
160SL2123-12-10T	○	10	160	40	70				43.4		30	9	16.4	56	-	Fig.2	2.6	9,150

●Toolholder Dimensions (inch spec)

Description	Stock	No. of Insert	Dimension (inch)												Shape	Weight (kg)	Max. Revolution (min^{-1})
			ØD	Ød (H7)	ØA	L1 (min)	L1 (max)	T	ap1 (max)	E	a	b	Ød1	Ød2			
MSTC 400SL551-630-10	○	6	4.000	1.000	2.132	1.442	1.482	0.872	0.359	0.750	0.236	0.394	0.858	0.531	Fig.1	1.2	17,100
500SL551-630-10	○	8	5.000	1.250	2.880			0.997			0.319	0.500	1.050	0.656		2.0	15,300
600SL551-630-10	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	2.8	14,000
MSTC 500SL630-709-10	○	8	5.000	1.250	2.880	1.363	1.403	0.997	0.359	0.750	0.319	0.500	1.050	0.656	Fig.1	2.1	15,300
600SL630-709-10	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	2.9	14,000
MSTC 500SL709-813-12	○	8	5.000	1.250	2.880	1.280	1.332	0.997	0.461	0.750	0.319	0.500	1.050	0.656	Fig.1	2.1	10,300
600SL709-813-12	○	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	2.9	9,400
MSTC 500SL813-917-12	**s**	8	5.000	1.250	2.880	1.176	1.228	0.997	0.461	0.750	0.319	0.500	1.050	0.656	Fig.1	2.2	10,300
600SL813-917-12	**s**	10	6.000	1.500	3.810			1.032		0.972	0.394	0.626	2.500	-	Fig.2	3.0	9,400

Recommended Cutting Conditions ➔**H24**

Applicable Inserts (common to Inch spec / Metric)

Description	Applicable Inserts ➔**H22-H23**	
	With hand	Neutral
MSTC...AL...10.. **MSTC...SL...10..**	**SP..10T3...L...**	**SP..10T3...N...**
MSTC...AL...12.. **MSTC...SL...12..**	**SD..1204...L...**	**SD..1204...N...**

Spare Parts (common to Inch spec / Metric)

· For spare parts, ref. page ➔**H21**.

Slot width (edge width) adjustment

· Ref. page ➔**H25-H26**

Applicable Arbor

· Ref. page ➔**H27**

● : Stock Std. ○ : World Express

Spare Parts (common to Inch spec / Metric)

Description			Spare Parts										
			Cartridge		Wedge	Wedge Screw	Cam Pin	Clamp Screw	Wrench			Anti-seize Compound	Arbor Clamp Screw
			Right-hand	Left-hand					for Wedge Screw	for Cam Pin	for Clamp Screw		
													
Without Boss	Metric	MSTC 100AN1416-10-3T	C90SP1416-10R	C90SP1416-10L	WC-14	W6 X 18	AP-1416	SE-3070TRP	TH-3L	LW-2.5	DTP-9	MP-1	-
		MSTC 125AN1416-10-4T				W6 X 20							
		MSTC 160AN1416-10-5T											
		MSTC 125AN1618-10-4T	C90SP1618-10R	C90SP1618-10L	WC-16	W6 X 20							
		MSTC 160AN1618-10-5T											
		MSTC 125AN1820-12-4T	C90SD1820-12R	C90SD1820-12L	WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		
		MSTC 160AN1820-12-5T											
		MSTC 125AN2123-12-4T	C90SD2023-12R	C90SD2023-12L	WC-20								
		MSTC 160AN2123-12-5T											
	Inch spec	MSTC 400AN551-630-10	C90SP1416-10R	C90SP1416-10L	WC-14	W6 X 18	AP-1416	SE-3070TRP	TH-3L	LW-2.5	DTP-9		
		MSTC 500AN551-630-10				W6 X 20							
		MSTC 600AN551-630-10											
		MSTC 500AN630-709-10	C90SP1618-10R	C90SP1618-10L	WC-16	W6 X 20							
		MSTC 600AN630-709-10											
		MSTC 500AN709-813-12	C90SD1820-12R	C90SD1820-12L	WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		
		MSTC 600AN709-813-12											
		MSTC 500AN813-917-12	C90SD2023-12R	C90SD2023-12L	WC-20								
		MSTC 600AN813-917-12											
With Boss	Metric	MSTC 100SN1416-10-3T	C90SP1416-10R	C90SP1416-10L	WC-14	W6 X 20	AP-1416	SE-3070TRP	TH-3L	LW-2.5	DTP-9	MP-1	HH12 X 35
		MSTC 125SN1416-10-4T											HH16 X 35
		MSTC 160SN1416-10-5T											-
		MSTC 125SN1618-10-4T	C90SP1618-10R	C90SP1618-10L	WC-16								HH16 X 35
		MSTC 160SN1618-10-5T											-
		MSTC 125SN1820-12-4T	C90SD1820-12R	C90SD1820-12L	WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15	MP-1	HH16 X 35
		MSTC 160SN1820-12-5T											-
		MSTC 125SN2123-12-4T	C90SD2023-12R	C90SD2023-12L	WC-20								HH16 X 35
		MSTC 160SN2123-12-5T											-

 Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Tightening Torque

Wrench	TH-3L	DTP-9	DTP-15
			
Tightening Torque (Nm)	5-6	1.5	4

Spare Parts (common to Inch spec / Metric)

Description			Spare Parts											
			Cartridge		Wedge	Wedge Screw	Cam Pin	Clamp Screw	Wrench			Anti-seize Compound	Arbor Clamp Screw
			Right-hand	Left-hand					for Wedge Screw	for Cam Pin	for Clamp Screw		
													
Without Boss	Metric	MSTC 100AR1416-10-6T	C90SP1416-10R	-	WC-14	W6 X 18	AP-1416	SE-3070TRP	TH-3L	LW-2.5	DTP-9	MP-1	-
		MSTC 125AR1416-10-8T				W6 X 20							
		MSTC 160AR1416-10-10T											
		MSTC 125AR1618-10-8T	C90SP1618-10R		WC-16	W6 X 20							
		MSTC 160AR1618-10-10T											
		MSTC 125AR1820-12-8T	C90SD1820-12R		WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		
		MSTC 160AR1820-12-10T											
		MSTC 125AR2123-12-8T	C90SD2023-12R		WC-20								
		MSTC 160AR2123-12-10T											
		MSTC 100AL1416-10-6T	-	C90SP1416-10L	WC-14	W6 X 18	AP-1416	SE-3070TRP		LW-2.5	DTP-9		
		MSTC 125AL1416-10-8T				W6 X 20							
		MSTC 160AL1416-10-10T											
		MSTC 125AL1618-10-8T		C90SP1618-10L	WC-16	W6 X 20							
		MSTC 160AL1618-10-10T											
		MSTC 125AL1820-12-8T		C90SD1820-12L	WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		
		MSTC 160AL1820-12-10T											
		MSTC 125AL2123-12-8T		C90SD2023-12L	WC-20								
		MSTC 160AL2123-12-10T											
	Inch spec	MSTC 400AR551-630-10	C90SP1416-10R	-	WC-14	W6 X 18	AP-1416	SE-3070TRP	TH-3L	LW-2.5	DTP-9		
		MSTC 500AR551-630-10				W6 X 20							
		MSTC 600AR551-630-10											
		MSTC 500AR630-709-10	C90SP1618-10R		WC-16	W6 X 20							
		MSTC 600AR630-709-10											
		MSTC 500AR709-813-12	C90SD1820-12R		WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		
		MSTC 600AR709-813-12											
		MSTC 500AR813-917-12	C90SD2023-12R		WC-20								
		MSTC 600AR813-917-12											
		MSTC 400AL551-630-10	-	C90SP1416-10L	WC-14	W6 X 18	AP-1416	SE-3070TRP		LW-2.5	DTP-9		
		MSTC 500AL551-630-10				W6 X 20							
		MSTC 600AL551-630-10											
		MSTC 500AL630-709-10		C90SP1618-10L	WC-16	W6 X 20							
		MSTC 600AL630-709-10											
		MSTC 500AL709-813-12		C90SD1820-12L	WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		
		MSTC 600AL709-813-12											
		MSTC 500AL813-917-12		C90SD2023-12L	WC-20								
		MSTC 600AL813-917-12											
With Boss	Metric	MSTC 100SR1416-10-6T	C90SP1416-10R	-	WC-14	W6 X 20	AP-1416	SE-3070TRP	TH-3L	LW-2.5	DTP-9	MP-1	HH12 X 35
		MSTC 125SR1416-10-8T											HH16 X 35
		MSTC 160SR1416-10-10T											-
		MSTC 125SR1618-10-8T	C90SP1618-10R		WC-16								HH16 X 35
		MSTC 160SR1618-10-10T											-
		MSTC 125SR1820-12-8T	C90SD1820-12R		WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		HH16 X 35
		MSTC 160SR1820-12-10T											-
		MSTC 125SR2123-12-8T	C90SD2023-12R		WC-20								HH16 X 35
		MSTC 160SR2123-12-10T											-
		MSTC 100SL1416-10-6T	-	C90SP1416-10L	WC-14	W6 X 20	AP-1416	SE-3070TRP		LW-2.5	DTP-9		HH12 X 35
		MSTC 125SL1416-10-8T											HH16 X 35
		MSTC 160SL1416-10-10T											-
		MSTC 125SL1618-10-8T		C90SP1618-10L	WC-16								HH16 X 35
		MSTC 160SL1618-10-10T											-
		MSTC 125SL1820-12-8T		C90SD1820-12L	WC-18	W6 X 20	AP-1820	SB-3590TRP		LW-3	DTP-15		HH16 X 35
		MSTC 160SL1820-12-10T											-
		MSTC 125SL2123-12-8T		C90SD2023-12L	WC-20								HH16 X 35
		MSTC 160SL2123-12-10T											-


Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

Tightening Torque

Wrench	TH-3L	DTP-9	DTP-15
			
Tightening Torque (Nm)	5-6	1.5	4

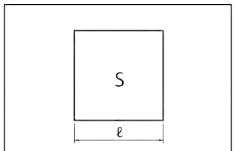
Inserts Identification System

Symbol	Insert
S	Square

(1) Shape

Symbol	Class		
	Corner Height	Thickness	I.C. Size
C	±0.013mm	±0.025mm	±0.025mm
E	±0.025mm		

(3) Tolerance



(5) Edge Length

Symbol	Corner-R (rε)
16	1.6mm
12	1.2mm
08	0.8mm
00	0.0mm

(7) Corner-R(rε)

Symbol	Hand of Tool
N	Neutral
L	Left-hand
R	Right-hand

(9) Hand of Tool

S	P	C	T	10	T3	08	E	R	-	SD
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)		(10)

Symbol	Relief Angle
D	15°
P	11°

(2) Relief Angle

Symbol	Shape
T	Single-sided chipbreaker, with hole

(4) Hole / Chipbreaker

Symbol	Thickness
T3	3.97mm
04	4.76mm

(6) Thickness

Symbol	Cutting Edge Spec.
E	Honed
F	Sharp Edge
S	Chamfer + R-honed

(8) Cutting Edge Spec.

Symbol	Rake Angle
SB	5°
SD	15°
SE	20°

(10) Chipbreaker Symbol

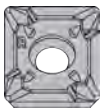
SP..10T3

Classification of usage
★: 1st Choice
☆: 2nd Choice

P	Carbon Steel / Alloy Steel	★	★	
M	Stainless Steel	☆	★	
K	Cast Iron	☆	★	
N	Non-ferrous Metals			★
S	Heat-resistant Alloys		★	
	Titanium Alloys		★	☆

Applicable Inserts (mm)

Description	A	T	Ød	α
SP..10T3	10.0	3.97	3.4	11°

Insert (Handed Insert shows Right-hand)	Description	No. of Edges	Dimension (mm) rε	Dimension (mm) Z (Wiper Edge)	CVD Coated Carbide CA0835	PVD Coated Carbide PR0725	PVD Coated Carbide PR0110
	SPCT 10T316EN-SD	4	1.6	-		○	
 With Wiper Edge	SPCT 10T308E[R/L]-SD		0.8	2.5		○	
	10T312E[R/L]-SD		1.2	1.8		○	
 Sharp Edge	SPCT 10T316FN-SE		1.6	-			○
 Sharp Edge / With Wiper Edge	SPCT 10T308F[R/L]-SE		0.8	2.7			○
	10T312F[R/L]-SE		1.2	2.2			○
 With Wiper Edge	SPET 10T308E[R/L]-SB		0.8	2.7	○	○	
 Tough Edge / With Wiper Edge	SPET 10T308S[R/L]-SB		0.8	2.7	○	○	

Inserts are sold in 10 piece boxes

● : Stock Std. ○ : World Express

SD..1204

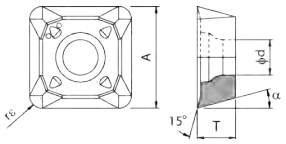
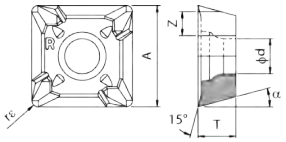
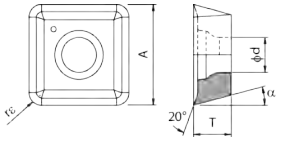
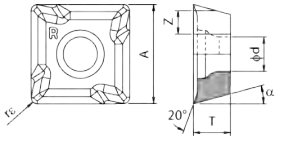
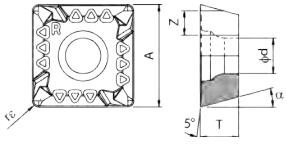
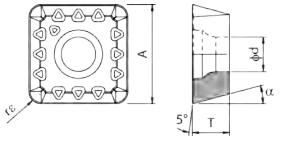
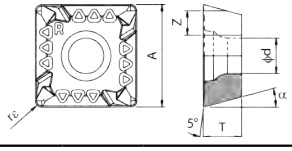
Classification of usage
★: 1st Choice
☆: 2nd Choice

P	Carbon Steel / Alloy Steel	★	★	
M	Stainless Steel	☆	★	
K	Cast Iron	☆	★	
N	Non-ferrous Metals			★
S	Heat-resistant Alloys		★	
	Titanium Alloys		★	☆

●Applicable Inserts

(mm)

Description	A	T	Ød	α
SD..1204	12.7	4.76	4.4	15°

Insert (Handed Insert shows Right-hand)	Description	No. of Edges	Dimension (mm) rε	Dimension (mm) Z (Wiper Edge)	CVD Coated Carbide CA0835	PVD Coated Carbide PR0725	PVD Coated Carbide PR0110
 	SDCT 120416EN-SD	4	1.6	-		○	
 With Wiper Edge 	SDCT 120408E$^{R}_{L}$-SD		0.8	2.5		○	
	120412E$^{R}_{L}$-SD		1.2	1.8		○	
 Sharp Edge 	SDCT 120416FN-SE		1.6	-			○
 Sharp Edge / With Wiper Edge 	SDCT 120408F$^{R}_{L}$-SE		0.8	2.7			○
	120412F$^{R}_{L}$-SE		1.2	1.9			○
 With Wiper Edge 	SDET 120408E$^{R}_{L}$-SB		0.8	2.5	○	○	
	120412E$^{R}_{L}$-SB		1.2	1.8	○	○	
 	SDET 120416SN-SB		1.6	-	○	○	
 Tough Edge / With Wiper Edge 	SDET 120408S$^{R}_{L}$-SB		0.8	2.5	○	○	

Feature of Insert Grades

●CA0835

· TiN+TiCN+Al_2O_3 based CVD Coated Carbide
· For Carbon Steel, Alloy Steel, Stainless Steel and Nodular Cast Iron.
· For middle to high speed cutting

●PR0725

· TiN+TiCN+TiN based Multi-layer PVD Coated Carbide
· For Carbon Steel, Alloy Steel, Stainless Steel, Heat Resistant Alloys and Nodular Cast Iron.
· For middle speed cutting

●PR0110

· TiB_2 based PVD Coated Carbide
· For Non-ferrous Metals such as Aluminum Alloy (Si<10%) and Titanium Alloy
· For high speed cutting

● : Stock Std. ○ : World Express

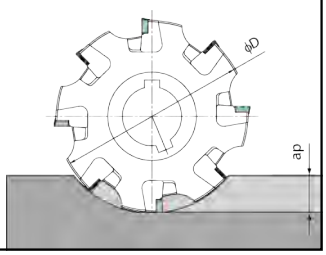
Inserts are sold in 10 piece boxes

Lay-Down Slot Mill / Half Side Slot Mill

◆Recommended Cutting Conditions (For CA0835 / PR0725)

Workpiece Material		Hardness (HB)	Recommended Insert Grades (Vc: sfm)		fz (ipt)			Remarks
			CVD Coated Carbide	PVD Coated Carbide	Chipbreaker			
			CA0835	**PR0725**	EN-SD ER-SD EL-SD	ER-SB EL-SB	SN-SB SR-SB SL-SB	
Low Carbon Steel	SS400 S10C~S25C	125	825-1025	550-700	0.003-0.008	0.004-0.009	0.006-0.012	Dry
Carbon Steel	S30C~S58C (Annealed)	190	525-625	325-400	0.003-0.008	0.004-0.009	0.006-0.012	
	S30C~S58C (Heat treated)	250	450-600	300-400	0.003-0.008	0.004-0.009	0.006-0.012	
Alloy Steel	SCM, SCr, etc. (Annealed)	180	450-600	300-400	0.003-0.008	0.004-0.009	0.006-0.012	
	SCM, SCr, etc. (Heat treated)	275	400-525	250-350	0.002-0.007	0.003-0.008	0.005-0.010	
High Carbon Alloy	SKD11, SKD61, etc.	280	350-425	225-300	0.002-0.007	0.003-0.008	0.005-0.010	
Stainless Steel	SUS304, SUS316, SUH310, etc.	220	525-650	350-400	0.002-0.007	0.003-0.008	0.005-0.010	Coolant
	SUS403, SUS410, SUH430F, etc.	300	500-600	325-400	0.002-0.007	0.003-0.008	0.005-0.010	
Heat-resistant Alloys	Inconel 718, etc.	350	-	50-100	0.002-0.007	0.003-0.008	0.005-0.010	
Titanium Alloys	Ti-6Al-4V, etc.	270	-	75-150	0.002-0.007	0.003-0.008	0.005-0.010	
Gray Cast Iron	FC250~FC350	260	525-650	350-425	0.003-0.009	0.004-0.010	0.006-0.014	Dry
Nodular Cast Iron	FCD400~FCD500	160	425-525	250-325	0.003-0.009	0.004-0.010	0.006-0.014	
	FCD600~FCD800	250	350-450	225-300	0.003-0.009	0.004-0.010	0.006-0.014	

Note) 1. Use down-cut cutting.
2. If ap is under 1/10 of Cutter Dia.(ØD), it is possible to increase feed per tooth(fz) 40%.



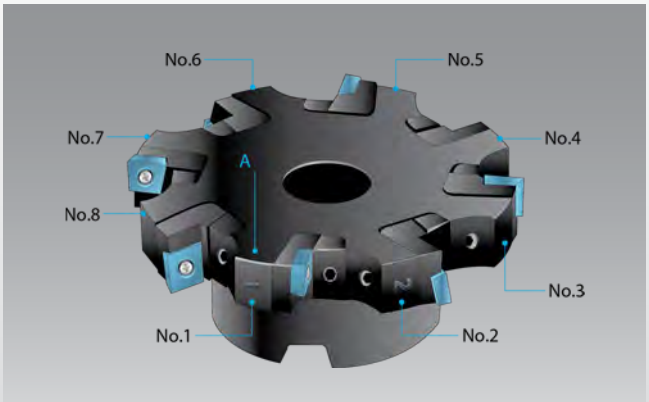
◆Recommended Cutting Conditions (For PR0110)

Workpiece Material		Hardness (HB)	Recommended Insert Grades (Vc: sfm)	fz (ipt)	Remarks
			PVD Coated Carbide	Chipbreaker	
			PR0110	FN-SE FR-SE FL-SE	
Non-ferrous Metals	AC4A, A7050, etc.	-	2450-3125	0.003-0.008	Coolant

Note) 1. Use down-cut cutting.
2. If ap is under 1/10 of Cutter Dia.(ØD), it is possible to increase feed per tooth(fz) 40%.

Slot width (edge width) adjustment of MSTC slot mills

Slot width (edge width) measurement



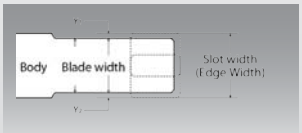
(1) Please check slot mill edge location number.
(The edge location number is marked on the slot mill body.)

(2) Set up the slot mill on length measuring equipment such as tool presetters.

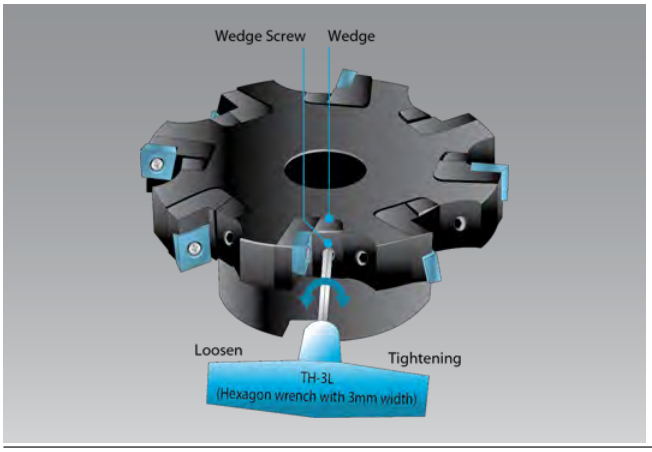
(3) Place the point A of the slot mill body near the position No.1 to “0 (zero)” of the length measuring equipment.

(4) Move the length measuring equipment to the insert corner part and measure the step (Y1) between the point A and the insert No.1.

(5) Likewise, measure the step between the slot mill body and the insert, and you will obtain the slot width (edge width).



In the case of changing the slot width (edge width)

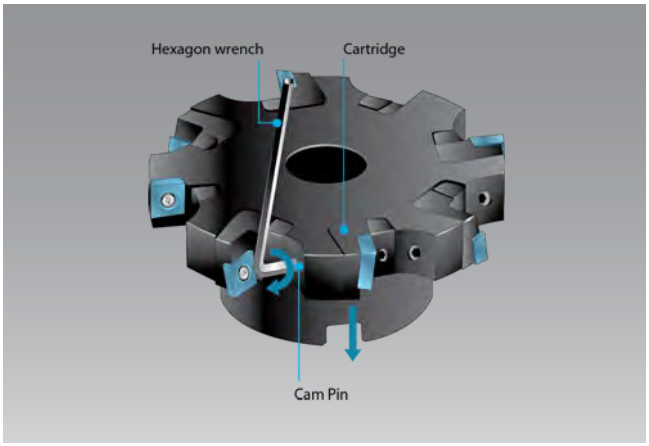


(1) Set up the slot mill on length measuring equipment such as tool presetters.

(2) Insert a 3mm Hexagon wrench(TH-3L) into the wedge screw.

(3) Turn TH-3L counterclockwise to loosen the Wedge.

(4) Turn TH-3L clockwise by the torque of 1 Nm to tighten the wedge lightly and make the wedge contact the cartridge and the slot mill body.
In doing so, some resistance occurs against the cartridge.

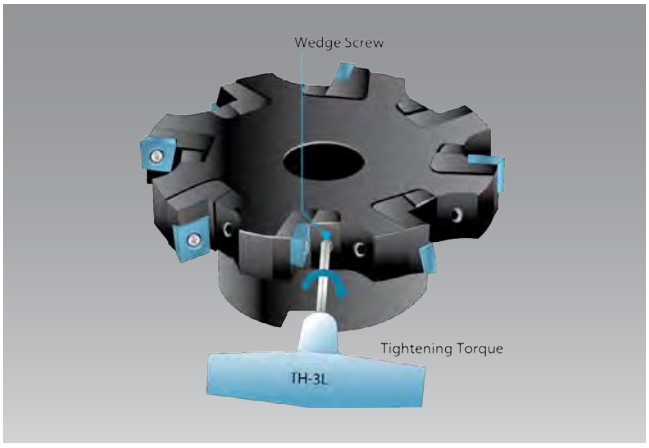


(5) Insert a Hexagon wrench (LW-2.5 or LW-3) into the Cam Pin on the back of the cartridge.

(6) Turn the wrench and adjust the position of the Cartridge.

(7) To secure the adjustment, back-turn the Cam Pin and make sure that it does not touch the groove surface of the back of the Cartridge.

(8) Remove the Hexagon wrench from the Cam Pin.



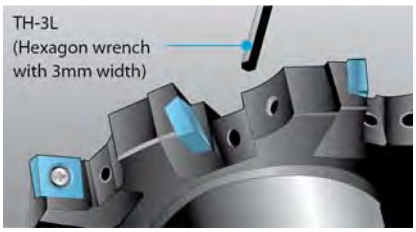
(9) Insert TH-3L into the Wedge Screw.

(10) Tighten the Wedge Screw by the torque of 5-6Nm.
(Use a torque wrench to get the correct torque.)

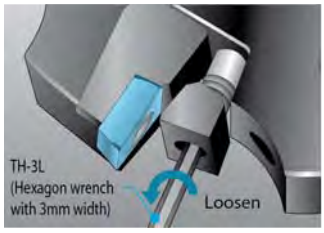
(11) Make sure there is no gap between the Cartridge and the Slot Mill body.

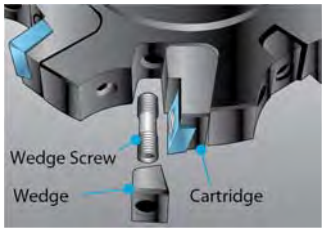
Replacement of the Cartridge

Follow the instruction below to replace the Cartridge.



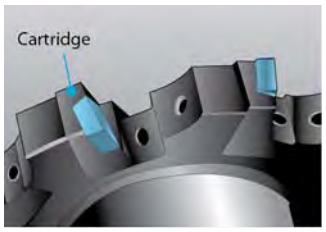
(1) Insert Hexagon wrench with 3mm width (TH-3L) into the Wedge Screw.

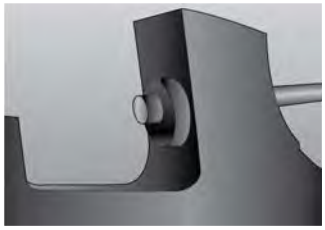




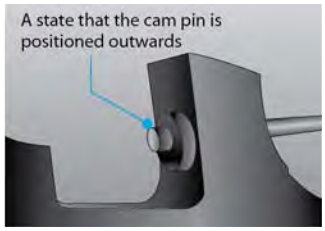
(2) Loosen the Wedge Screw.

(3) Remove the Wedge Screw and Wedge.

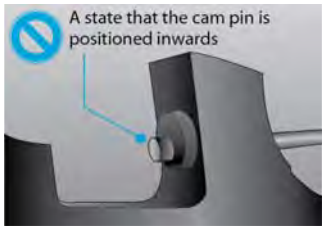




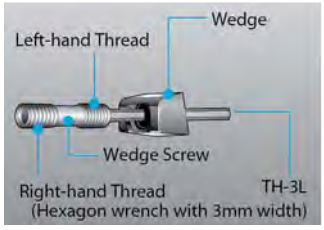
(4) Remove the Cartridge.

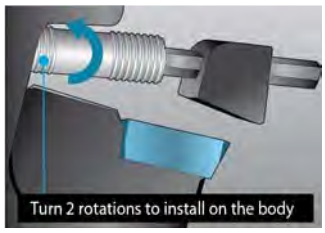


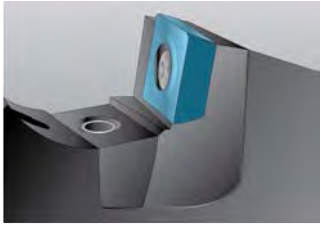
(5) Before replacing the Cartridge, make sure that the Cam Pin is positioned radially-outwards.



(6) If the Cam Pin is in the position shown in the left diagram, assembling the Cartridge is not possible.







(7) Place the wedge so that its larger slant surface faces toward the Cartridge.

(8) Turn the Wedge Screw two times to install the Wedge to the body.

(9) When installing the Wedge Screw to the body, keep the Wedge from rotating and screw it in.

(10) Tighten the Wedge Screw by the torque of 5-6Nm.
Keep the Screw head and the Wedge even (prevent either of those from sticking out)

Slot Mill Applicable Arbor

BT Shank

Shape	Ref. Page	Toolholder Description		Bore Dia. (ØD)	BT Shank				
					BIG	MST	NIKKEN	SHOWA	NT TOOL
Without Boss	27	MSTA	63N..	16			BT$_{ii}$-SCA16..		BT○○-SCA16..
			80N..	16			BT○○-SCA16..		BT○○-SCA16..
			100N..	22			BT○○-SCA22..		BT○○-SCA22..
			125N..	32			BT○○-SCA32..		BT○○-SCA32..
			160N..	40			BT○○-SCA40..		BT○○-SCA40..
	27	MSTA	02N..	.625 (15.875)			BT○○-SCA15.875..	BT○○-SCA15.875..	BT○○-SCA15.875..
			03N..	.625 (15.875)			BT○○-SCA15.875..	BT○○-SCA15.875..	BT○○-SCA15.875..
			04N..	1.000 (25.4)	BT○○-SCA25.4..	BT○○-SCA25.4..	BT○○-SCA25.4..	BT○○-SCA25.4..	BT○○-SCA25.4..
			05N..	1.250 (31.75)	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..
			06N..	1.250 (31.75)	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..
	27	MSTB	80AN..	27			BT○○-SCA27..		BT○○-SCA27..
			100AN..	32			BT○○-SCA32..		BT○○-SCA32..
			125AN..	40			BT○○-SCA40..		BT○○-SCA40..
			160AN..	40			BT○○-SCA40..		BT○○-SCA40..
	27	MSTB	3000AN..	1.000 (25.4)	BT○○-SCA25.4..	BT○○-SCA25.4..	BT○○-SCA25.4..	BT○○-SCA25.4..	BT○○-SCA25.4..
			4000AN..	1.250 (31.75)	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..
			5000AN..	1.250 (31.75)	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..
			6000AN..	1.500 (38.1)	BT○○-SCA38.1..		BT○○-SCA38.1..	BT○○-SCA38.1..	BT○○-SCA38.1..
	27 27 27	MSTC	100A○..	32			BT○○-SCA32..		BT○○-SCA32..
			125A○..	40			BT○○-SCA40..		BT○○-SCA40..
			160A○..	40			BT○○-SCA40..		BT○○-SCA40..
		MSTC	400A○..	1.250 (31.75)	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..	BT○○-SCA31.75..
			500A○..	1.500 (38.1)	BT○○-SCA38.1..		BT○○-SCA38.1..	BT○○-SCA38.1..	BT○○-SCA38.1..
			600A○..	1.500 (38.1)	BT○○-SCA38.1..		BT○○-SCA38.1..	BT○○-SCA38.1..	BT○○-SCA38.1..
With Boss	27	MSTB	80SN..	22	BBT○○-FMC22..		BT○○-FMC22..	BT○○-FMC22..	BT○○-FMC22..
			100SN..	27	BBT○○-FMC27..		BT○○-FMC27..	BT○○-FMC27..	BT○○-FMC27..
			125SN..	40	BBT○○-FMB40..		BT○○-FMB40..	BT○○-FMB40..	BT○○-FMB40..
			160SN..	40	BBT○○-FMB40..		BT○○-FMB40..	BT○○-FMB40..	BT○○-FMB40..
	27 27 27	MSTC	100S○..	27	BBT○○-FMC27..		BT○○-FMC27..	BT○○-FMC27..	BT○○-FMC27..
			125S○..	32	BBT○○-FMC32..		BT○○-FMC32..	BT○○-FMC32..	BT○○-FMC32..
			160S○..	40	BBT○○-FMB40..		BT○○-FMB40..	BT○○-FMB40..	BT○○-FMB40..

Straight Shank

Shape	Ref. Page	Toolholder Description		Bore Dia. (ØD)	Straight Shank				
					BIG	MST	NIKKEN	SHOWA	NT TOOL
Without Boss	27	MSTA	63N..	16					
			80N..	16					
			100N..	22					
			125N..	32					
			160N..	40					
	27	MSTA	02N..	.625 (15.875)				STO○-SCA15.875..	
			03N..	.625 (15.875)				STO○-SCA15.875..	
			04N..	1.000 (25.4)		S○○-SCA25.4..	K○○-SCA25.4..	STO○-SCA25.4..	
			05N..	1.250 (31.75)				STO○-SCA31.75..	
			06N..	1.250 (31.75)				STO○-SCA31.75..	
	27	MSTB	80AN..	27					
			100AN..	32					
			125AN..	40					
			160AN..	40					
		MSTB	3000AN..	1.000 (25.4)		S○○-SCA25.4..	K○○-SCA25.4..	STO○-SCA25.4..	
			4000AN..	1.250 (31.75)				STO○-SCA31.75..	
			5000AN..	1.250 (31.75)				STO○-SCA31.75..	
			6000AN..	1.500 (38.1)				STO○-SCA38.1..	
	27 27 27	MSTC	100A○..	32					
			125A○..	40					
			160A○..	40					
		MSTC	400A○..	1.250 (31.75)				STO○-SCA31.75..	
			500A○..	1.500 (38.1)				STO○-SCA38.1..	
			600A○..	1.500 (38.1)				STO○-SCA38.1..	

This table is created, based on companies' catalogues and publications, and not officially approved by those companies.

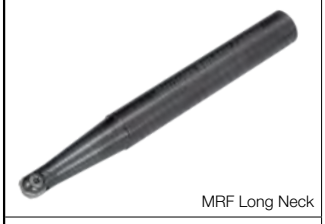
Ball-Nose Endmill
Radius Series

J

J1~J10

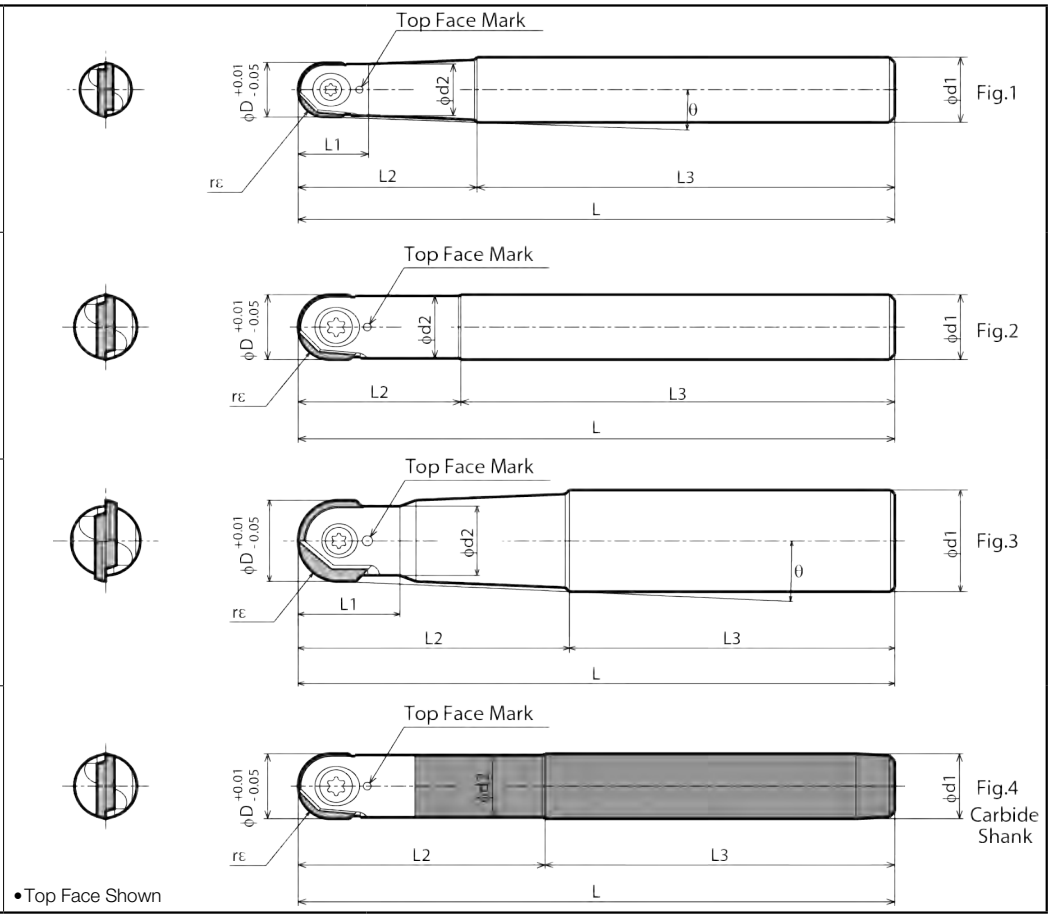
MRF / MRFW (Carbide Shank)


MRF Standard Neck


MRF Long Neck


MRFW Carbide Standard Neck


MRFW Carbide Long Neck

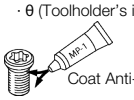


•Top Face Shown

●Toolholder Dimensions

Description			Stock	No. of Inserts	Dimension (mm) rε	ØD	Ød1	Ød2	L	L1	L2	L3	θ	Drawing	Spare Parts: Clamp Screw	Wrench	Anti-seize Compound	Applicable Inserts B23
Standard Neck	MRF	08-S12	○	1	4	8	12	7.5	100	10	22	78	6°20'	Fig.1	SC-30067	DT-8	MP-1	RDFG08FR
		10-S12	○		5	10		9.5		13	25	75	3°		SC-35085	DT-10		RDFG10FR
		12-S12	○		6	12		11.5	110	-	30	80	-	Fig.2	SC-40100	DT-15		RDFG12FR
		16-S20	○		8	16	20	14	130	20	50		2°50'	Fig.1	SC-50130	DT-20		RDFG16FR
		20-S25	○		10	20	25	17	140	25	60		3°	Fig.3	SC-60160	TT-25		RDFG20FR
		25-S32	○		12.5	25	32	22	150	31	70		3°30'		SC-60210	TT-30		RDFG25FR
Long Neck	MRF	08-S12-130	○	1	4	8	12	7.5	130	10	50	80	2°30'	Fig.1	SC-30067	DT-8	MP-1	RDFG08FR
		10-S16-150	○		5	10	16	9.5	150	15		100	3°50'		SC-35085	DT-10		RDFG10FR
		12-S16-160	○		6	12		11.5	160	16	60		2°10'		SC-40100	DT-15		RDFG12FR
		16-S20-160	○		8	16	20	14	160	20	65	95	2°		SC-50130	DT-20		RDFG16FR
		20-S25-180	○		10	20	25	17	180	25	80	100	2°10'	Fig.3	SC-60160	TT-25		RDFG20FR
		25-S32-200	○		12.5	25	32	22	200	31	90	110	2°40'		SC-60210	TT-30		RDFG25FR
Carbide Standard Neck	MRFW	08-S08		1	4	8	8	7.4	100	-	30	70	-	Fig.4	SC-30067	DT-8	MP-1	RDFG08FR
		10-S10			5	10	10	9.5	100	-	35	65	-		SC-35085	DT-10		RDFG10FR
		12-S12	○		6	12	12	11.5	110	-	45		-		SC-40100	DT-15		RDFG12FR
Carbide Long Neck	MRFW	08-S08-130		1	4	8	8	7.4	130	-	65	65	-	Fig.4	SC-30067	DT-8	MP-1	RDFG08FR
		10-S10-140			5	10	10	9.5	140	-	75		-		SC-35085	DT-10		RDFG10FR
		12-S12-150			6	12	12	11.5	150	-	85		-		SC-40100	DT-15		RDFG12FR

· θ (Toolholder's interference angle) is the angle formed by the tangential line from insert dia. to toolholder's shank dia.



Coat Anti-seize Compound (MP-1) thinly on clamp screw when insert is fixed.

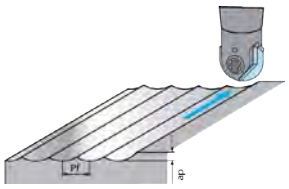
● : Stock Std. ○ : World Express

●Applicable Inserts

Shape	Description
	RDFG 08FR 10FR 12FR 16FR 20FR 25FR

· Check the Top Face Mark of both insert and toolholder.

●Recommended ap

Description		Depth of Cut (mm) ap	Depth of Cut (mm) Pf	Applications
Standard Neck	MRF08-S12	0.2Max0.3)	0.8	
	MRF10-S12	0.2	1	
	MRF12-S12	0.5	1.2	
	MRF16-S20	0.5	1.6	
	MRF20-S25	1	2	
	MRF25-S32	1	2.5	
Long Neck	MRF08-S12-130	0.2(Max0.3)	0.8	
	MRF10-S12-150	0.2	1	
	MRF12-S12-160	0.5	1.2	
	MRF16-S20-160	0.5	1.6	
	MRF20-S25-180	1	2	
	MRF25-S32-200	1	2.5	
Carbide Standard Neck	MRFW08-S08	0.2(Max0.3)	0.8	
	MRFW10-S10	0.2	1	
	MRFW12-S12	0.5	1.2	
Carbide Long Neck	MRFW08-S08-130	0.2(Max0.3)	0.8	
	MRFW10-S10-140	0.2	1	
	MRFW12-S12-150	0.5	1.2	

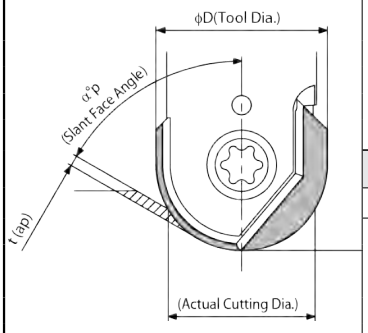
For Ø8, Holder may be broken due to overload if ap exceeds 0.3mm.

◆Recommended Cutting Conditions (At Cutting Dia. ØD)

Workpiece Material	Insert Grades	Vc (sfm)	fz (ipt)	Ø8 Vc(sfm) (n: min^{-1})	Ø8 fz(ipt) (Vf: ipm)	Ø10 Vc(sfm) (n: min^{-1})	Ø10 fz(ipt) (Vf: ipm)	Ø12 Vc(sfm) (n: min^{-1})	Ø12 fz(ipt) (Vf: ipm)
Stainless Steel	PR915	175~500	0.004~0.008	325 (3980)	0.006 (46.85)	325 (3180)	0.006 (37.40)	325 (2650)	0.006 (31.50)
Carbon Steel	PR915	325~650	0.004~0.012	500 (5970)	0.008 (115.35)	500 (4770)	0.008 (46.85)	500 (3980)	0.008 (62.60)
Alloy Steel	PR915	250~600	0.004~0.012	425 (5170)	0.008 (81.50)	425 (4140)	0.008 (65.35)	425 (3450)	0.008 (54.33)
Mold Steel	PR915	175~500	0.004~0.008	325 (3980)	0.006 (46.85)	325 (3180)	0.006 (37.40)	325 (2650)	0.006 (31.50)
Cast Iron	PR915	325~650	0.008~0.016	500 (5970)	0.012 (140.95)	500 (4770)	0.012 (112.60)	500 (3980)	0.012 (94.09)
Workpiece Material	Insert Grades	Vc (sfm)	fz (ipt)	Ø16 Vc(sfm) (n: min^{-1})	Ø16 fz(ipt) (Vf: ipm)	Ø20 Vc(sfm) (n: min^{-1})	Ø20 fz(ipt) (Vf: ipm)	Ø25 Vc(sfm) (n: min^{-1})	Ø25 fz(ipt) (Vf: ipm)
Stainless Steel	PR915	175~500	0.004~0.008	325 (1990)	0.006 (23.62)	325 (1590)	0.006 (18.90)	325 (1270)	0.006 (14.96)
Carbon Steel	PR915	325~650	0.004~0.012	500 (2980)	0.008 (46.85)	500 (2390)	0.008 (37.40)	500 (1910)	0.008 (29.92)
Alloy Steel	PR915	250~600	0.004~0.012	425 (2950)	0.008 (40.55)	425 (2070)	0.008 (32.68)	425 (1660)	0.008 (29.92)
Mold Steel	PR915	175~500	0.004~0.008	325 (1990)	0.006 (23.62)	325 (1590)	0.006 (18.90)	325 (1270)	0.006 (14.96)
Cast Iron	PR915	325~650	0.008~0.016	500 (2980)	0.012 (70.47)	500 (2390)	0.012 (56.30)	500 (1910)	0.012 (14.96)

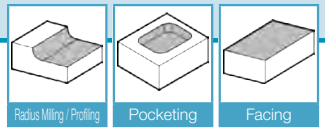
◆Actual Cutting Speed (Vd) Conversion Coefficient Table

The actual Vc varies depending on ap and slant face angle.
Vd can be obtained by dividing the conversion coefficient into the recommended cutting speed.

Model	Tool dia. (ØD)		Ø8		Ø10		Ø12	
	ap (t: mm)		0.1	0.2	0.1	0.2	0.2	0.5
	Slant Face Angle (α°)	15°	1.00	1.00	1.00	1.00	1.00	1.00
		30°	1.05	1.02	1.05	1.03	1.04	1.01
		45°	1.18	1.12	1.20	1.14	1.16	1.07
		60°	1.47	1.34	1.51	1.38	1.42	1.24
		75°	2.15	1.82	2.24	1.92	2.02	1.60
		90°(Horizontal Plane)	4.48	3.22	5.06	3.57	3.92	2.50
	Tool dia. (ØD)		Ø16		Ø20		Ø25	
	ap (t: mm)		0.2	0.5	0.5	1	0.5	1
	Slant Face Angle (α°)	15°	1.00	1.00	1.00	1.02	1.00	1.01
		30°	1.05	1.01	1.02	1.00	1.03	1.00
		45°	1.18	1.10	1.12	1.06	1.14	1.08
		60°	1.47	1.30	1.34	1.21	1.38	1.25
		75°	2.14	1.73	1.83	1.53	1.93	1.62
		90°(Horizontal Plane)	4.48	2.87	3.20	2.29	3.57	2.55

e.g.)Suppose tool dia. 8mm, ap=0.1mm, slant face angle 90°: The actual cutting speed Vd for carbon steel machining,
when Vc is 150m/mim at the biggest diameter, Vd can be obtained as Vd=150÷4.48=33.5 m/min

MRP Radius Mill



MRP-S Endmill


Standard


Long Shank

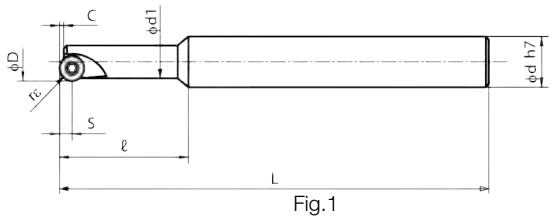


Fig.1

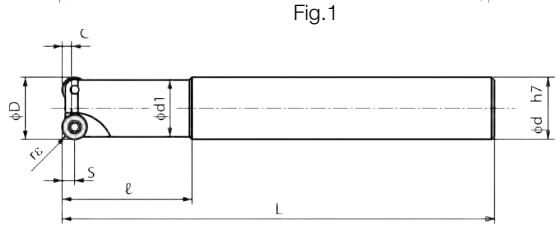


Fig.2

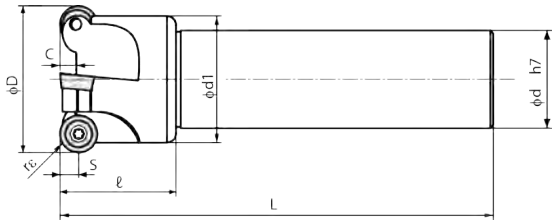


Fig.3

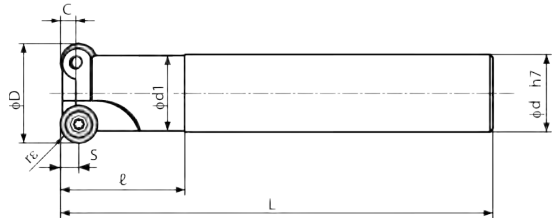


Fig.4

●Toolholder Dimensions

	Description	Stock	No. of Inserts	Dimension (mm) rε	ØD	Ød	Ød1	L	ℓ	C	Pd	S	Rake Angle (°) A.R.	R.R.	Drawing	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts B23
Standard	MRP 012-S16-08	○	1	4	12	16	10.4	110	40	3.0	N.A.	4	-8.5°	-5.5°	Fig.1	SB-3060TR	DT-10	RDMT08T2M0-H
	016-S16-08	○	2		16		14.4				0.5		0°		Fig.2			
	020-S20-08	○	2		20	20	17	120			2.0		+5°	-4°				
	MRP 025-S25-10-3T	○	3	5	25	25	21	120		3.5	2.5	5	+2°	-6°	Fig.2	SB-3080TR	DT-10	RPMT10T3M0
	032-S32-10-4T	○	4		32	32	28	140										
	MRP 032-S25-12	○	2	6	32	25	24.4	140		5.0	4.0	6	+5°	-4°	Fig.3	SB-4085TR	DT-15	RPMT1204M0-H RPMT1204M0
	040-S32-12	○	3		40	32	31.4	160						-5°				
	040-S32-12-4T	○	4					140		4.5	3.5							
	050-S42-12	○	4		50	42	41.4	170		5.0	4.0					SB-40115TR		
	MRP 040-S32-16	○	2	8	40	32	31.4	160		7.0	6.0	8		-3°	Fig.3	SB-50120TR	DT-20	RPMT1606M0-H
	050-S42-16	○	3		50	42	41.4	170										
	063-S42-16	○	4		63		54.4		50						Fig.4			
Long Shank	MRP 012-S16-08-160	○	1	4	12	16	10.4	160	40	3.0	N.A.	4	-8.5°	-5.5°	Fig.1	SB-3060TR	DT-10	RDMT08T2M0-H
	016-S16-08-160	○	2		16		14.4				0.5		0°		Fig.2			
	020-S20-08-180	○	2		20	20	17	180			2.0		+5°	-4°				
	MRP 025-S25-10-3T-180	○	3	5	25	25	21	180		3.5	2.5	5	+2°	-6°	Fig.2	SB-3080TR	DT-10	RPMT10T3M0
	032-S32-10-4T-200	○	4		32	32	28	200										
	MRP 032-S25-12-300	○	2	6	32	25	24.4	300		5.0	4.0	6	+5°	-4°	Fig.3	SB-4085TR	DT-15	RPMT1204M0-H RPMT1204M0
	040-S32-12-300	○	3		40	32	31.4							-5°				
	040-S32-12-4T-200	○	4					200		4.5	3.5							
	050-S42-12-300	○	4		50	42	41.4	300		5.0	4.0					SB-40115TR		
	MRP 040-S32-16-300	○	2	8	40	32	31.4			7.0	6.0	8		-3°	Fig.3	SB-50120TR	DT-20	RPMT1606M0-H
	050-S42-16-300	○	3		50	42	41.4											
	063-S42-16-300	○	4		63	42	54.4		50						Fig.4			

· Pd: Max. Plunging Depth

● : Stock Std. ○ : World Express

MRP Face Mill

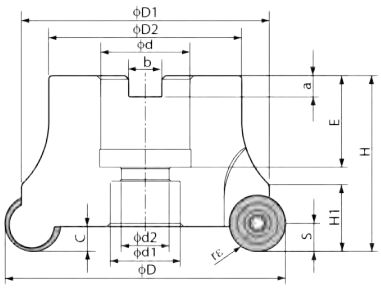


Fig.1

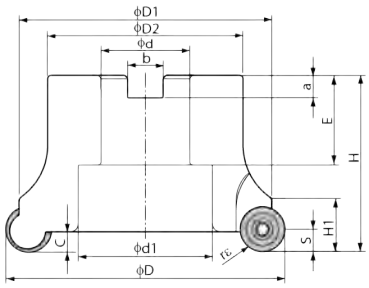


Fig.2

●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm)															Rake Angle (°)		Insert	Weight (kg)
				rε	ØD	ØD1	ØD2	Ød	Ød1	Ød2	H	H1	E	a	b	C	Pd	S	A.R.	R.R.		
MRP	050R-10-6T	○	6	5	50	45.0	38	22.0	18	12	50	13	20	6.3	10.4	3.5	2.5	5.0	+5°	-5°	Fig.1	0.4
	063R-10-7T	○	7		63	57.9	50	25.4	20	14			26	6.0	9.5							0.5
MRP	050R-12	○	4	6	50	41.4	38	22.0	18	12		15	20	6.3	10.4	5.0	4.0	6.0	+5°	-5°	Fig.1	0.4
	063R-12	○	5		63	54.4	50	25.4	20	14			26	6.0	9.5					-5°		0.5
	080R-12	○	6		80	71.4	55									4.5	3.5			-3°		0.7
	080R-12-7T	○	7			74.4	59													-5°		
MRP	080R-16	○	5	8	80	70.6	55	25.4	20	14	50	19	26	6.0	9.5	7.0	6.0	8.0	+5°	-3°	Fig.1	0.8
	100R-16	○	6		100	90.5	70	31.75	48	-	63		32	8.0	12.7					-5°	Fig.2	1.0
	100R-16-7T	○	7			93.0										6.0	5.0			-6°		
	125R-16	○	6		125	115.5	80	38.10	58				38	10.0	15.9	7.0	6.0			-5°		1.7
	125R-16-8T	○	8			118.0										6.0	5.0			-6°		
MRP	080R-20	○	4	10	80	67.3	55	25.4	20	14	50	23	24	6.0	9.5	8.5	N.A.	10.0	+5°	-3°	Fig.1	0.8
	100R-20	○	5		100	87.3	70	31.75	48	-	63		32	8.0	12.7					-5°	Fig.2	1.0

· Pd: Max. Plunging Depth
· Use BT○○-FMC22 (TMT Standard in the market) for MRP050R-10-6T and MRP050R-12.

●Spare Parts

Description		Clamp Screw	Wrench	Applicable Inserts B23
MRP	050R-10-6T	SB-3080TR	DT-10	RPMT10T3M0
	063R-10-7T			
MRP	050R-12	SB-40115TR	DT-15	RPMT1204M0-H RPMT1204M0
	063R-12			
	080R-12	SB-4085TR		
	080R-12-7T			
MRP	080R-16	SB-50120TR	DT-20	RPMT1606M0-H
	100R-16			
	100R-16-7T			
	125R-16			
	125R-16-8T			
MRP	080R-20	SB-60120TR	DT-25	RPMT2006M0-H
	100R-20			

· Mounting Bolt (HH10X25) is included for MRP050R.
· Mounting Bolt (HH12X35) is included for MRP063R.
· Mounting Bolt (HH12X35) is included for MRP080R.

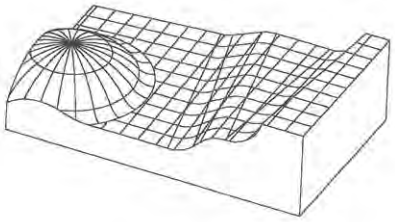
● : Stock Std. ○ : World Express

MRP Radius Mill

●Applicable Inserts

Description		Applicable Inserts B23		
		 Tough Edge	 Tough Edge	
MRP	...-08	RDMT08T2M0-H	-	-
	...-10	-		RPMT10T3M0
	...-12		RPMT1204M0-H	RPMT1204M0
	...-16		RPMT1606M0-H	-
	...-20		RPMT2006M0-H	

Flexible Curved Facing



Top Face

Low cutting force and good chip evacuation owing to new chipbreaker design.
"-H" type insert has a second cutting edge next to the first cutting adds edge strength.

New ratchet design prevents the insert's movement and holds the insert firmly in the insert pocket even during the heavy machining. (Only RPMT)

Bottom Face

Insert Description	Land at Edge	Applications	Remarks
RPMT10T3M0 **RPMT1204M0**	No	Low Cutting Force type	Even if the workpiece clamp is weak, or if the workpiece is thin, sharp cutting performance and less chattering is demonstrated.
RPMT08T2M0-H **RPMT1204M0-H** **RPMT1606M0-H** **RPMT2006M0-H**	Parallel Land 0.2mm Width	Tough Edge	Used for General Roughing.

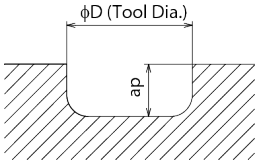
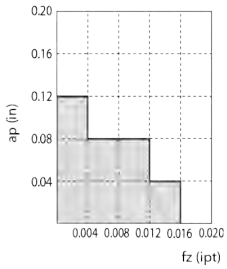
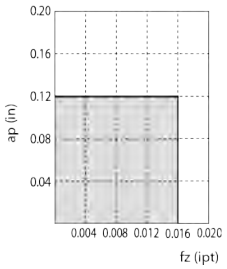
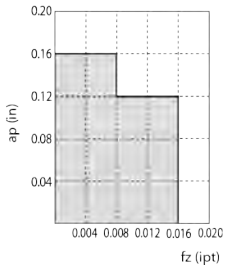
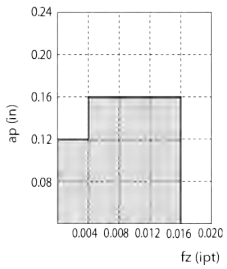
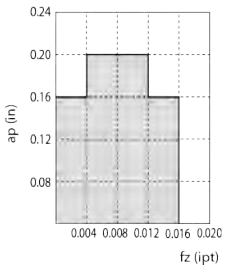
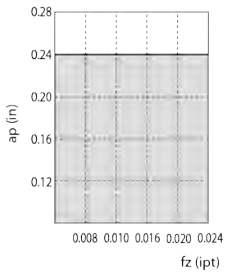
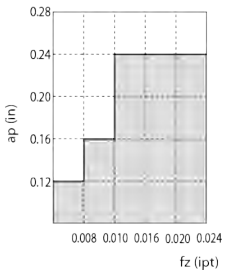
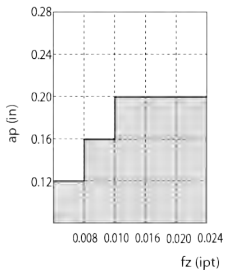
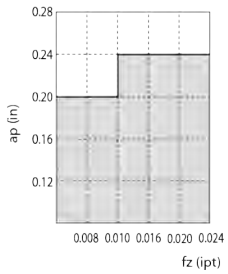
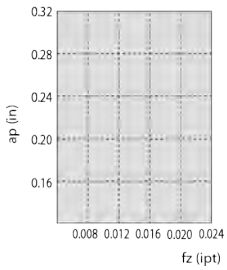
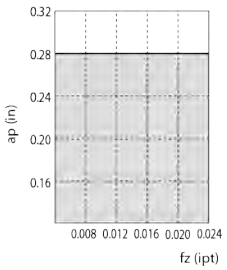
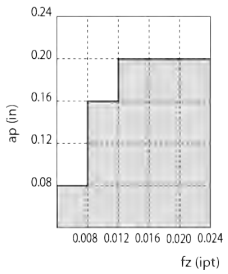
◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)											
		Cermet			MEGACOAT		PVD Coated Carbide					Carbide	
		TN60	TN100M	TC60	PR1230	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10
Stainless Steel	~0.016		☆ 400~650		★ 400~725	-		☆ 400~650		☆ 325~600	-		-
Carbon Steel	~0.024		★ 400~650		★ 400~825	-		☆ 400~650		☆ 325~600	-		-
Alloy Steel	~0.024		★ 325~600		★ 325~725	-		☆ 325~600		☆ 250~500	-		-
Mold Steel	~0.020		★ 325~600		★ 250~600	-		☆ 250~500		☆ 200~425	-		-
Cast Iron	~0.024		-		-	★ 325~725		-		-	☆ 325~600		☆ 250~500
Non-ferrous Metals	~0.024		-		-	-		-		-	-		★ 325~975

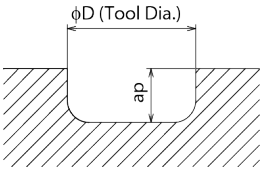
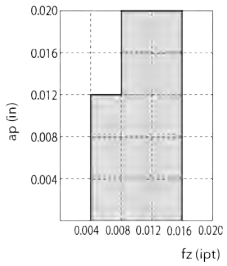
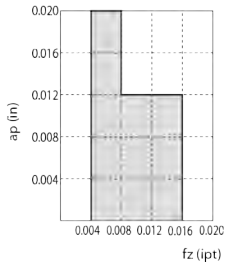
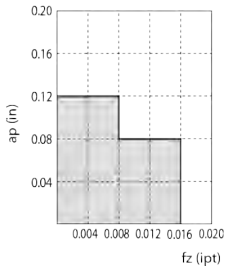
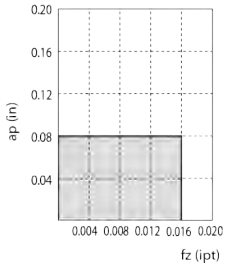
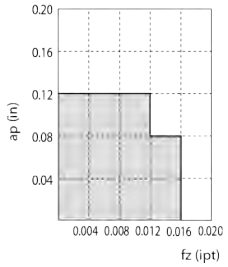
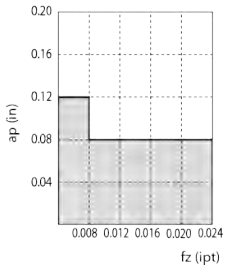
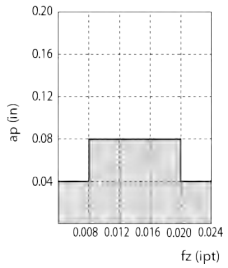
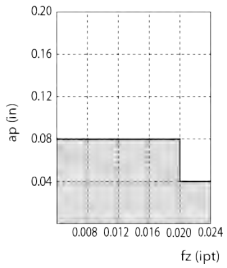
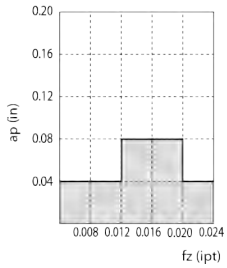
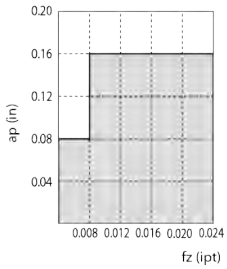
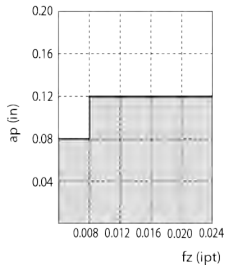
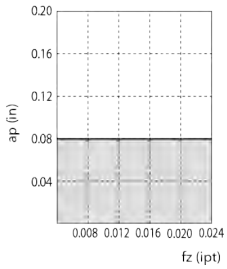
Notes)Reduce the ap by 20-50% when machining with long overhang length or using long shank types.

★: 1st Recommendation ☆: 2nd Recommendation

◆Cutting Performance of Radius Mill (Standard-type)

Workpiece Material	Slotting			
S50C	 ●Cutting Conditions Toolholder: Standard Vc=400~500sfm (Ref. to the table below) ap=varied fz= varied Dry Overhang Length=L_1			
Insert Description				
08 type (RDMT08T2M0-H)	MRP012-S16-08 n=3980min^{-1}(Vc=500sfm) L_1=1.65in 	MRP016-S16-08 n=2980min^{-1}(Vc=500sfm) L_1=1.65in 	MRP020-S20-08 n=2390min^{-1}(Vc=500) L_1=1.65in 	
10 type (RPMT10T3M0)	MRP025-S25-10-3T n=1910min^{-1}(Vc=500sfm) L_1=60mm 	MRP032-S32-10-4T n=1490min^{-1}(Vc=500sfm) L_1=3.15mm 		
12 type (RPMT1204M0-H)	MRP032-S25-12 n=1490min^{-1}(Vc=500sfm) L_1=3.15in 	MRP040-S32-12 n=1195min^{-1}(Vc=500sfm) L_1=3.15in 	MRP040-S32-12-4T n=1195min^{-1}(Vc=500sfm) L_1=3.15in 	MRP050-S42-12 n=765min^{-1}(Vc=400sfm) L_1=3.15in 
16 type (RPMT1606M0-H)	MRP040-S32-16 n=1195min^{-1}(Vc=500sfm) L_1=3.54in 	MRP050-S42-16 n=765min^{-1}(Vc=400sfm) L_1=3.54in 	MRP063-S42-16 n=605min^{-1}(Vc=400sfm) L_1=3.54in 	

◆Cutting Performance of Radius Mill (Long Shank type)

Workpiece Material	Slotting			
S50C	 ●Cutting Conditions Toolholder: Long Shank type Vc=400~500sfm (Ref. to the table below) ap=varied fz= varied Dry Overhang Length=L1			
Insert Description				
08 type (RDMT08T2M0-H)	MRP012-S16-08-160 n=3980min-1(Vc=500sfm) L1=3.15in 	MRP016-S16-08-160 n=2980min-1(Vc=500sfm) L1=3.15in 	MRP020-S20-08-180 n=2390min-1(Vc=500sfm) L1=3.54in 	
10 type (RPMT10T3M0)	MRP025-S25-10-3T-180 n=1910min-1(Vc=500sfm) L1=3.54in 	MRP032-S32-10-4T-200 n=1490min-1(Vc=500sfm) L1=3.94in 		
12 type (RPMT1204M0-H)	MRP032-S25-12-300 n=1490min-1(Vc=500sfm) L1=5.90in 	MRP040-S32-12-300 n=1195min-1(Vc=500sfm) L1=5.90in 	MRP040-S32-12-4T-200 n=1195min-1(Vc=500sfm) L1=3.94in 	MRP050-S42-12-300 n=765min-1(Vc=400sfm) L1=5.90in 
16 type (RPMT1606M0-H)	MRP040-S32-16-300 n=1195min-1(Vc=500sfm) L1=5.90in 	MRP050-S42-16-300 n=765min-1(Vc=400sfm) L1=5.90in 	MRP063-S42-16-300 n=605min-1(Vc=400sfm) L1=5.90in 	

Guide for Plunging

[Depth of Plunging]

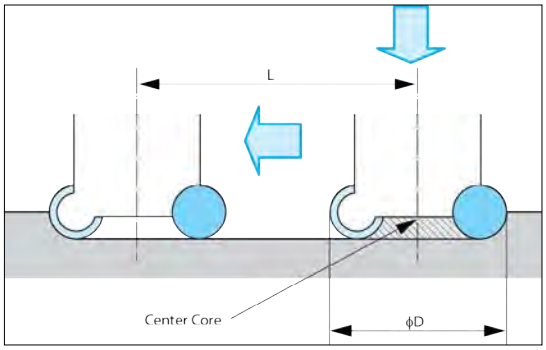
· Ref. to Pd value of Toolholder Dimension Table on page **J4**, **J5**.
(Pd Shows the maximum plunge depth.)

[Traversing after Plunging]

When Traversing after Drilling

(1) Reduce the table feed by 50% until the center core is completely removed.
(The internal cutting edge's radial rake angle is large in the negative direction)

(2) The Min. length "L" to make the face flat is as follows.



Insert Description	L (mm)
RDMT08T2M0-H	ØD-7
RPMT10T3M0	ØD-9
RPMT1204M0 **RPMT1204M0-H**	ØD-11
RPMT1606M0-H	ØD-15

Guide for Ramping (Slant Milling)

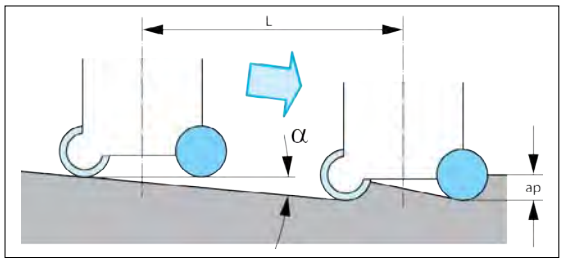
The transfer length "L" at the maximum slant angle a in the ramping operation depends on the ap.

Description		Angle a (°)	tan a
MRP	**012-S16-08(-160)**	Ramping is not available	
	016-S16-08(-160)	4°	0.070
	020-S20-08(-180)	14°	0.249
MRP	**025-S25-10-3T(-180)**	14°	0.249
	032-S32-10-4T(-200)	8°	0.141
MRP	**032-S25-12(-300)**	15°	0.268
	040-S32-12(-300)	10°	0.176
	040-S32-12-4T(-200)	9°	0.158
	050-S42-12(-300)	7°	0.123
MRP	**040-S32-16(-300)**	20°	0.364
	050-S42-16(-300)	13°	0.231
	063-S42-16(-300)	8°	0.141
MRP	**050R-10-6T**	4°	0.070
	063R-10-7T	3°	0.052
MRP	**050R-12**	7°	0.123
	063R-12	5°	0.087
	080R-12	3°	0.052
	080R-12-7T	3°	0.052
MRP	**080R-16**	6°	0.105
	100R-16	4°	0.070
	100R-16-7T	3°	0.052
	125R-16	3°	0.052
	125R-16-8T	2°	0.035
MRP	**080R-20**	8°	0.141
	100R-20	6°	0.105

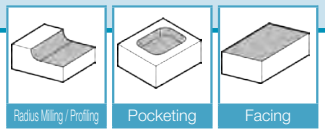
* Above is the value considering the clearance 1mm between the tool body and the workpiece.

Formula of the Transfer Length "L" at Max. Slant Angle

$$L = \frac{ap}{\tan \alpha}$$

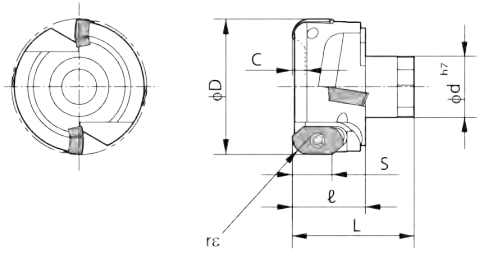


Radius Helical Endmill

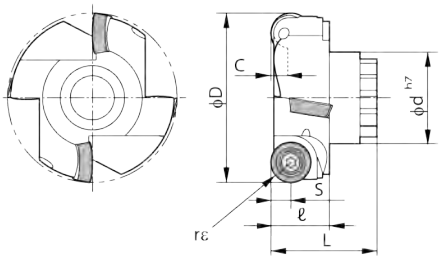


MHD-RF Radius Front Piece

MHD32-4RF



MHD40-5RF
50-6RF

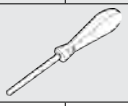


●Toolholder Dimensions

Description		Stock	No. of Inserts		No. of Flutes	Dimension (mm)							Rake Angle (°)			Applicable Inserts ➡B21~B23
			Bottom Edges	Middle Edges		rε	ØD	Ød	L	ℓ	C	S	A.R.	R.R. Bottom Edges	R.R. Middle Edges	
MHD	32-4RF	○	2	2	2	4	32	14.4	28.8	17.3	3	9.2	+9°	-5°	-7°	FPMT090340ER NDKT090304ER-V/N1/N2 NDKW090304ER
	40-5RF	○				5	40	19	29.3	16.3	4	5		-3°	-3°	RPMT10T3M0 NDMM12T308ER-T/N2/N3
	50-6RF	○				6	50	27	31.3	17.3	5	6		0°	-1°	RPMT1204M0(-H) NDMM12T308ER-T/N2/N3

· When using "-T" Insert, the finished diameter (ØD) will be approx. 0.2mm smaller.

●Spare Parts

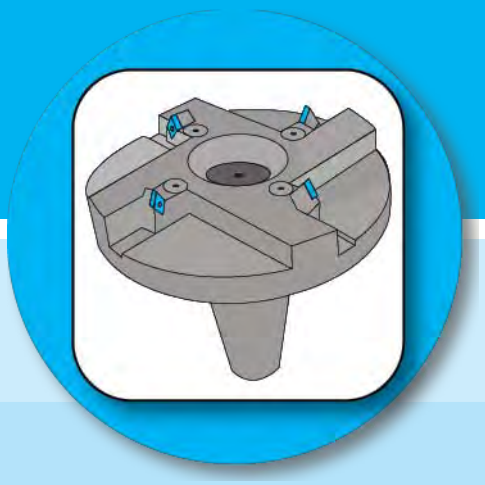
Description			Spare Parts			
			Clamp Screw		Wrench (sold separately)	
			For Bottom Insert	For Middle Insert	For Bottom Insert	For Middle Insert
						
Radius Front Piece	MHD	32-4RF	SB-2560TR	SB-2560TR	DT-8	DT-8
		40-5RF	SB-3080TR	SB-3080TR	DT-10	DT-10
		50-6RF	SB-4085TR	SB-3080TR	DT-15	DT-10

· When purchasing the front piece separately, the wrench (DT-8 or DT-10 or DT-15) is not included.
· When purchasing the base unit and front pieces separately, the clamp bolt and wrench are not included.
· Various clamp bolts for front pieces are available. ➡E69
· The clamp bolt for the front piece (MHD...-F) is included with separate-type (MHD...-SA/SB) and base unit (MHD...-A/-B).
If replacing the end with the radius-type front piece (MHD…-RF), a different type of clamp bolt may be required. ➡E69

●Applicable Inserts and Composition of Toolholder (Previous Description)

Unit Description (Previous Description)		Applicable Inserts ➡B21~B23	Base Unit ➡E63	Front Piece (Middle) ➡E65	Front Piece (End) ➡J10
MHD	32-S32-4RSA	FPMT090340ER, NDKT090304ER-V/N1/N2 NDKW090304ER	MHD32-S32-A	MHD32-F	MHD32-4RF
	40-S32-5RSA	RPMT10T3M0, NDMM12T308ER-T/N2/N3	MHD40-S32-A MHD40-S42-A	MHD40-F	MHD40-5RF
	40-S42-5RSA				
	50-S42-6RSA	RPMT1204M0(-H), NDMM12T308ER-T/N2/N3	MHD50-S42-A	MHD50-F	MHD50-6RF

● : Stock Std. ○ : World Express

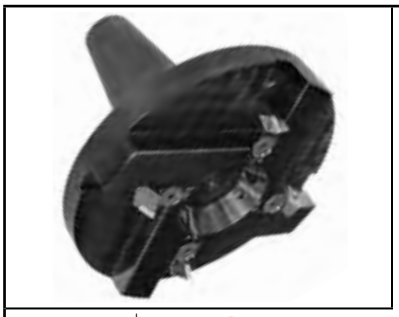


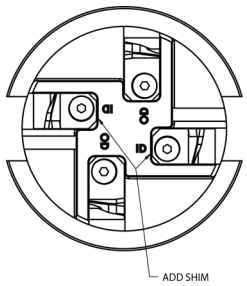
Other Applications

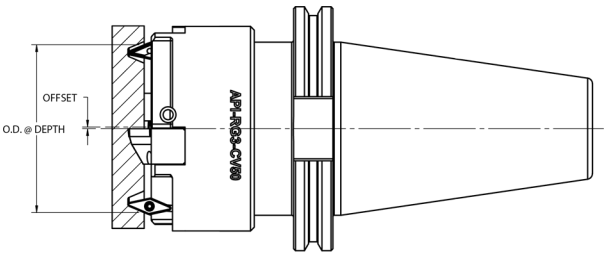
K1~K15

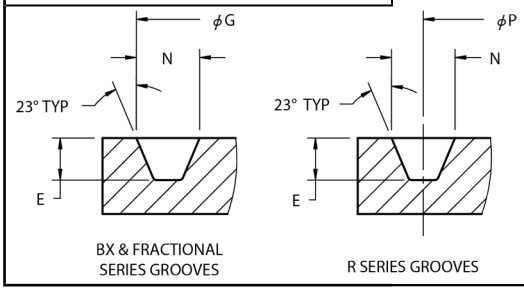
Other Applications K2~K15

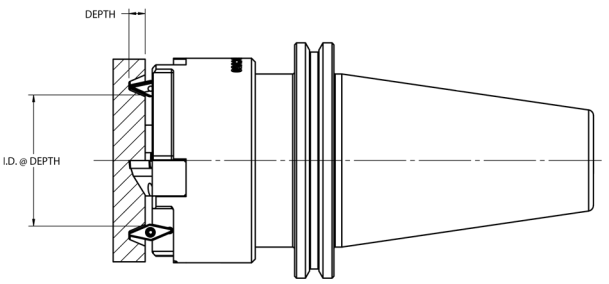
API Ring Groovers











Toolholder Dimensions

Ring Number	Description	Body	stock	No. of Insert	No. of Flutes	Dimension(inch)							"Roughout" cartridges.
						Offset	Pitch P	OD G	Width N	Depth E	OD DEPTH	ID DEPTH	
BX-150	BX150-SET	RG-3	●	4	2	.061	-	2.893	.450	.220	2.771	2.115	-
BX-150-R	BX150-R-SET		●		1	.097		3.341	.841	.485	3.147	1.853	YES
BX-151	BX151-SET	RG-1	●		2	.065		3.062	.466	.220	2.932	2.260	-
BX-151-R	BX151-R-SET	RG-3	●		1	.097		3.496	.846	.485	3.302	1.998	YES
BX-152	BX152-SET	RG-1	●		2	.069		3.395	.498	.230	3.257	2.537	-
BX-152-R	BX152-R-SET		●		1	.091		3.826	.876	.505	3.644	2.256	YES
BX-153	BX153-SET		●		2	.077		4.046	.554	.270	3.892	3.092	-
BX-153-R	BX153-R-SET		●		1	.110		4.486	.936	.535	4.266	2.834	YES
BX-154	BX154-SET		●		2	.083		4.685	.606	.300	4.519	3.369	-
BX-154-R	BX154-R-SET		●		1	.112		5.116	.971	.570	4.892	3.398	YES
BX-155	BX155-SET	RG-2	●		2	.100		5.930	.698	.330	5.730	4.734	-
BX-155-R	BX155-R-SET		●		1	.223		6.366	1.076	.595	5.920	4.660	YES
BX-156	BX156-SET	RG-4	●		2	.132		9.521	.921	.440	9.257	7.943	-
BX-156-R	BX156-R-SET		●		1	.166		9.956	1.306	.710	9.624	7.676	YES
BX-169	BX169-SET	RG-2	●		2	.081		6.955	.666	.380	6.793	5.785	-
R-16	R16-SET	RG-3	●			.026	2.000	-	.344	.250	2.292	1.708	
R-18	R18-SET		●			.026	2.375		.344	.250	2.667	2.083	
R-19	R19-SET		●			.026	2.563		.344	.250	2.855	2.271	
R-20	R20-SET		●			.026	2.688		.344	.250	2.980	2.396	
R-23	R23-SET	RG-1	●			.046	3.250		.469	.310	3.627	2.873	
R-23-R	R23-R-SET		●		1	.081	3.300		.856	.575	3.994	2.606	YES
R-24	R24-SET		●		2	.046	3.750		.469	.310	4.127	3.373	-
R-24-R	R24-R-SET		●		1	.077	3.800		.871	.590	4.517	3.083	YES
R-26	R26-SET		●		2	.046	4.000		.469	.310	4.377	3.623	-
R-27	R27-SET		●			.046	4.250		.469	.310	4.627	3.873	
R-31	R31-SET	RG-2	●			.044	4.875		.469	.310	5.256	4.494	
R-31-R	R31-R-SET		●		1	.072	4.920		.856	.575	5.632	4.208	YES
R-35	R35-SET		●		2	.046	5.375		.469	.310	5.752	4.998	-
R-35-R	R35-R-SET		●		1	.081	5.420		.856	.575	6.114	4.726	YES
R-37	R37-SET		●		2	.046	5.875		.469	.310	6.252	5.498	-
R-39	R39-SET		●			.046	6.375		.469	.310	6.752	5.998	
R-39-R	R39-R-SET		●		1	.081	6.420		.856	.575	7.114	5.726	YES
R-41	R41-SET		●		2	.046	7.125		.469	.310	7.502	6.748	-
R-44	R44-SET		●			.046	7.625		.469	.310	8.002	7.248	
R-44-R	R44-R-SET		●		1	.071	7.670		.856	.575	8.384	6.956	YES
R-45	R45-SET		●		2	.046	8.313		.469	.310	8.690	7.936	-
R-46	R46-SET		●			.048	8.313		.531	.380	8.748	7.878	
R-46-R	R46-R-SET		●		1	.082	8.360		.916	.645	9.112	7.608	YES

● : Stock Std. ○ : World Express

Toolholder Dimensions

Ring Number	Description	Body	stock	No. of Insert	No. of Flutes	Dimension(inch)							"Roughout" cartridges.
						Offset	Pitch	OD	Width	Depth	OD DEPTH	ID DEPTH	
							P	G	N	E			
1-13/16	**1-13/16-SET**	RG-1	●	4	2	.034		4.373	.377	.258	4.305	3.687	-
2-1/16-10K	**2-1/16-10K-SET**	RG-1	●			.034		4.623	.377	.258	4.555	3.937	
2-9/16-15K	**2-9/16-15K-SET**	RG-2	●			.034		5.873	.377	.258	5.805	5.187	
3-1/16-10K	**3-1/16-10K-SET**	RG-2	●			.034		5.748	.377	.258	5.680	5.062	
4-1/16-10K	**4-1/16-10K-SET**	RG-2	●			.034		7.123	.377	.258	7.055	6.437	
5-1/8-10K	**5-1/8-10K-SET**	RG-2	●			.034		8.748	.377	.258	8.680	8.062	

Spare Parts / Applicable Inserts

Ring Number	Spare Parts		Applicable Inserts K4
	Clamp Screw	Wrench	
			
BX-150	SCR-02	T15	DCMT3252
BX-150-R			DCMT3253
BX-151			DCMT3252
BX-151-R			DCMT3253
BX-152			DCMT3252
BX-152-R			DCMT3253
BX-153			DCMT3252
BX-153-R			DCMT3253
BX-154			DCMT3252
BX-154-R			DCMT3253
BX-155			DCMT3252
BX-155-R			VCMT333
BX-156			VCMT332
BX-156-R			VCMT333
BX-169			VCMT332
R-16	SCR-01	T7	VCMT222
R-18			
R-19			
R-20			
R-23	SCR-02	T15	DCMT3252
R-23-R			VCMT333
R-24			DCMT3252
R-24-R			VCMT333
R-26			DCMT3252
R-27			
R-31			
R-31-R			VCMT333
R-35			DCMT3252
R-35-R			VCMT333
R-37			DCMT3252
R-39			
R-39-R			VCMT333
R-41			DCMT3252
R-44			
R-44-R			VCMT333
R-45			DCMT3252
R-46			VCMT333
R-46-R			
1-13/16	SCR-01	T7	VCMT222
2-1/16-10K			
2-9/16-15K			
3-1/16-10K			
4-1/16-10K			
5-1/8-10K			

Body Part Numbers

Body Part Numbers	Shank
API-RG-1-BT40	BT40
API-RG-1-BT50	BT50
API-RG-1-CV40	CAT40
API-RG-1-CV50	CAT50
API-RG-1-DIN-69871	DIN69871
API-RG-1-NMTB50	NMTB50
API-RG-2-BT50	BT50
API-RG-2-CV50	CAT50
API-RG-2-DIN-69871	DIN69871
API-RG-3-BT50	BT50
API-RG-3-CV40	CAT40
API-RG-3-CV50	CAT50
API-RG-3-DIN-69871	DIN69871
API-RG-3-NMTB50	NMTB50
API-RG-4-BT50	BT50
API-RG-4-CV50	CAT50
API-RG-4-DIN-69871	DIN69871

Spare Parts for Body

Ring Groove Body	Mounting Bolts	Set Screws
RG-1	01-05	01-08
RG-2	01-05	01-08
RG-3	01-06	01-09
RG-4	01-07	01-10

Note

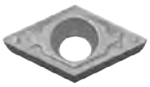
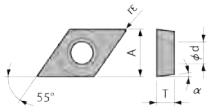
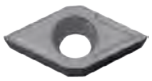
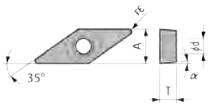
The OD and ID dimensions are to set the cut diameter of a given cartridge set using a presetter. The dimensions are the cut diameter of the tool at the depth of the ring groove. By setting zero at the nose radius then moving the presetter to the depth of the API groove the OD and ID can be preset to the dimensions shown.

See illustration on page **K2**.

● : Stock Std. ○ : World Express

API Ring Groover

Applicable Inserts

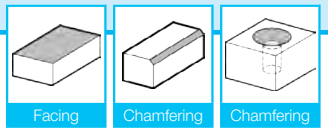
Insert		Description (ANSI)	Description (ISO)	Dimension (inch)				Angle (°)	Insert Grades						
				I.C. (A)	T	Ød	rε	α	Cermet	MEGACOAT Cermet	CVD Coated Carbide		MEGACOAT Coated carbide		PVD Coated Carbide
									TN60	PV7025	CA5525	CA6525	PR1225	PR1425	PR660
		DCMT 3252HQ	DCMT 11T308HQ	3/8	5/32	0.173	1/32	7°	●	●	●	●		●	●
		DCMT 3253CQ	DCMT 11T312CQ	3/8	5/32	0.173	1/16	7°	●		●	●			●
		VCMT 222HQ	VCMT 110308	1/4	1/8	0.110	1/32	7°					●		
		VCMT 332HQ	VCMT 160408HQ	3/8	3/16	0.173	1/32	7°	●		●	●	●		●
		333HQ	160412				1/16						●		

Sample CNC Program for the OTM API Ring Groover

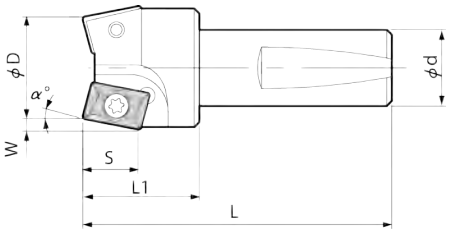
Sample is shown without cutter comp.
N10 (Incremental Program)
N20 G00 X(As required) Y(As required) Z.100 M03 S(As required)
N30 G01 Z0.0 F100
N40 G91 Y (Offset) Z-.100 F(As required)
N50 G03 J (Offset) Z-.100 F (As required)
N60 G03 J (Offset) Z-.100
Continue to Depth
Last Pass
N90 G03 J(Offset) Z0.00

● : Stock Std. ○ : World Express

Chamfering Endmill



CM / CM-AL (For Aluminum Cutting)



Description		Stock	No. of Insert	Unit	Dimension							Spare Parts		Applicable Inserts ➡B24
					ØD	Ød	L	L1	S	W	α	Clamp Screw	Wrench	
CM	0563-15-09	●	2	inch	0.563	0.500	2.78	1.00	0.340	0.089	15°	SCR-04	T7	XPMT 0902○○
	0563-20-09	●							0.330	0.116	20°			
	0563-25-09	●							0.310	0.143	25°			
	0563-30-09	●				0.625	2.91		0.300	0.169	30°			
	0563-35-09	●							0.280	0.194	35°			
	0563-45-09	●							0.240	0.239	45°	SCR-01	T7	
	0563-60-09	●							0.160	0.301	60°			
	0563-75-09	●							0.080	0.327	75°			
	1000-03	●	2	inch	1.000	0.750	3.15	1.25	0.589	0.031	3°	SCR-16	T10	XPMT 15T3○○
	1000-05	●							0.586	0.052	5°			
	1000-10	●							0.577	0.103	10°			
	1000-15	●							0.564	0.154	15°			
	1000-20	●							0.547	0.204	20°	SCR-30	T10	
	1000-25	●							0.526	0.252	25°			
	1000-30	●							0.501	0.298	30°			
	1000-35	●							0.472	0.343	35°			
	1000-37.5	●							0.456	0.372	37.5°	SCR-30	T10	
	1000-41	●							0.433	0.393	41°			
	1000-45	●							0.400	0.400	45°			
	1000-50	●							0.376	0.454	50°			
	1000-55	●							0.327	0.507	55°			
	1000-60	●							0.284	0.521	60°			
	1000-70	●							0.193	0.547	70°			
	1000-75	●							0.146	0.584	75°			
CM	1000-15-AL	●	2	inch	1.000	0.750	3.25	1.35	0.613	0.158	15°	SCR-02	T15	APET 1604○○
	1000-20-AL	●							0.595	0.208	20°			
	1000-30-AL	●							0.544	0.304	30°			
	0800-45-AL	●			0.800				0.440	0.430	45°			
	0800-60-AL	●							0.308	0.528	60°			
	0690-75-AL	●			0.690				0.158	0.591	75°			

● : Stock Std. ○ : World Express

CM / CM-AL (For Aluminum Cutting)

◆**Recommended Cutting Conditions**

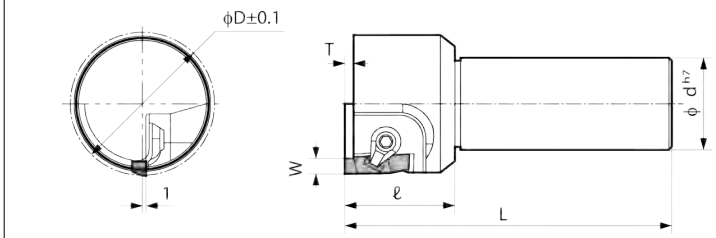
Work Material	Feed Rate (ipt)	Recommended Cutting Condition (Cutting Speed SFM)							
		Cermet			CVD Coated	PVD Coated			Carbide
		TN100M	**TC60**	**TN6020**	**CA2335**	**PR660**	**PR830**	**PR905**	**KW10**
Low Carbon Steel	.003-.006	☆ 800~1400	★ 800~1400		-	-	-		-
Carbon Steel	.003-.006	☆ 600~1200	★ 600~1200		-	-	-		-
Alloy Steel	.003-.006	☆ 400~700	★ 400~700		-	-	-		-
Tool Steel	.003-.006	☆ 400~700	★ 400~700		-	-	-		-
Stainless Steel (Austenitic)	.002-.006	☆ 300~800	☆ 300~800		★ 300~800	★ 300~800	☆ 300~800		-
Cast Iron	.003-.008	☆ 400~1200	★ 400~1200		★ 300~500	-	-		☆ 300~500
Non-ferrous Metal	.005-.007	☆ 1500~1800	☆ 1500~1800		-	-	-		★ 2000~4000

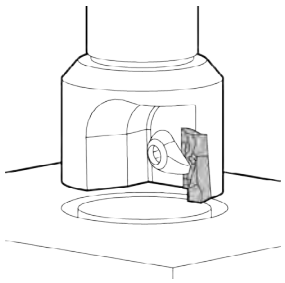
* Apply sufficient amount of coolant

★: 1st Recommendation ☆: 2nd Recommendation

MVG Ring Grooving Endmill

MVG



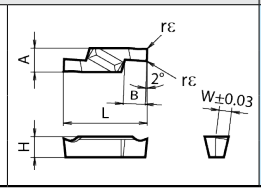


●Toolholder Dimensions

Description		Stock	Dimension (mm)					Edge Width	Spare Parts	
			ØD	Ød	L	ℓ	T	W	Clamp Set	Wrench
MVG	3032	○	30	32	120	40	5.2	4.00 ~ 4.90	CPS-6V	LW-3
	3532	○	35							
	4032	○	40							
	4532	○	45							
	5032	○	50							
	5532	○	55							
	6032	○	60							

· Dimension T shows available grooving depth.

●Applicable Inserts

Insert (Right-hand shown)		Description		(Previous Description)		Dimension (mm)						Insert Grades						
												Cermet			MEGA COAT		PVD	Carbide
						W	B	rε	A	L	H	TN90	TC40	TC60	PR1225		PR930	KW10
		GVFR	400-020B	GVFR	400B	4.00	5.3	0.2	5.8	20	5.0	○	○	○	●		○	○
			430-020B		430B	4.30							○	○	●		○	○
			460-020B		460B	4.60							○	○	●		○	○
			490-020B		490B	4.90							○	○	●		○	○

· GVFR430B is applicable for sealing groove of G-series
For other ring grooving, GVFR400B~490B are applicable.
· Only Right-hand insert is applicable.

◆Recommended Cutting Conditions

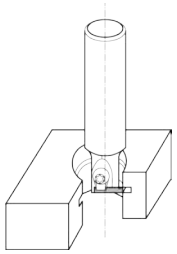
Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)					
		Cermet			MEGA	PVD	Carbide
		TN90	TC40	TC60	PR1225	PR930	KW10
Stainless Steel	0.001~0.005		☆ 325~600	☆ 250~500	★ 200~500	☆ 200~425	
Carbon Steel	0.002~0.006		★ 400~650	☆ 325~600	★ 250~550	☆ 250~500	
Alloy Steel	0.002~0.006		★ 400~650	☆ 325~600	★ 250~550	☆ 250~500	
Mold Steel	0.001~0.005		★ 325~600	☆ 250~500	★ 200~500	☆ 200~425	
Cast Iron	0.002~0.008						★ 250~500
Non-ferrous Metals	0.002~0.008						★ 325~975

★: 1st Recommendation ☆: 2nd Recommendation

● : Stock Std. ○ : World Express

MGI Grooving Endmill

MGI



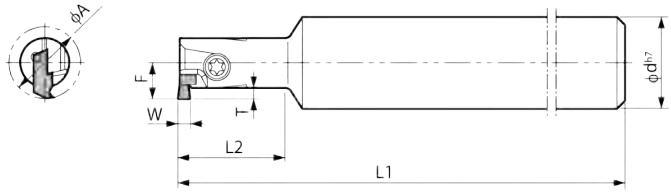


Fig.1

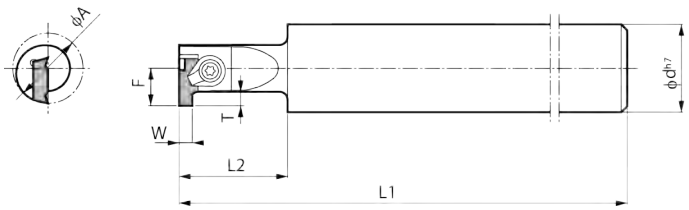


Fig.2

●Toolholder Dimensions

Description		Stock	Min. Bore Dia.	Dimension (mm)					Edge Width	Drawing	Spare Parts				Applicable Inserts K9
											Clamp Set		Clamp Screw	Wrench	
			ØA	Ød	L1	L2	F	T	W		5F	6F			
MGI	1420-1SS	○	14	20	100	20	6.8	2.2	1.0~3.0	Fig.1	-		SB-4065TR	FT-15	GVR100SS~GVR300SS
	1620-1S	○	16		110	25	7.8		1.0~3.4		-		SB-4085TR	FT-15	GVR100S~GVR340S
	2020-1A	○	20			30	9.8	2.2		Fig.2	CPS-5F		-	FT-15	GVR100A~GVR340A GVR100AR~150AR
	2220-1B	○	22				11	2.8	1.45~4.0						GVR145B~GVR400B GVR100BR~150BR
	3225-1C	○	32	25	120	35	16	5.5 (4.5)	2.8~4.0		CPS-6F		-	LW-3	GVR280C~GVR400C
	4025-1C	○	40			40	20								

· Dimension T shows available grooving depth.

· GVR280C, GVR300C is available to the groove depth up to 4.5mm.

· GVR430C~500C can be installed to MGI3225-1C and 4025-1C, but not recommended for steel cutting because of toolholder's rigidity.

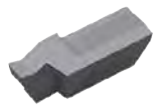
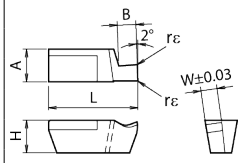
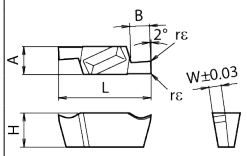
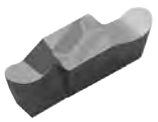
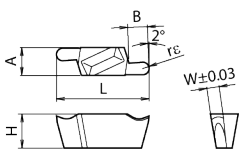
◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)					
		Cermet			MEGA	PVD	Carbide
		TN90	TC40	TC60	PR1225	PR930	KW10
Stainless Steel	0.001~0.005	☆ 325~600	☆ 325~600	★ 250~500	★ 200~425	☆ 200~425	-
Carbon Steel	0.002~0.006	★ 400~650	☆ 400~650	☆ 325~600	★ 250~500	☆ 250~500	-
Alloy Steel	0.002~0.006	★ 400~650	☆ 400~650	☆ 325~600	★ 250~500	☆ 250~500	-
Mold Steel	0.001~0.005	★ 325~600	☆ 325~600	☆ 250~500	★ 200~425	☆ 200~425	-
Cast Iron	0.002~0.008	★ 325~500	☆ 325~500	-	-	-	★ 250~500
Non-ferrous Metals	0.002~0.008	-	-	-	-	-	★ 325~975

★: 1st Recommendation ☆: 2nd Recommendation

● : Stock Std. ○ : World Express

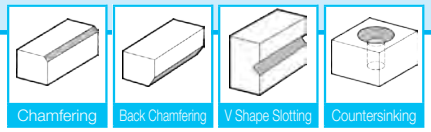
●Applicable Inserts

Insert (Right-hand shown)		Description	(Previous Description)	W	B	rε	A	L	H	Insert Grades: Cermet TN90	Cermet TC40	Cermet TC60	MEGA COAT PR1225		PVD PR930	Carbide KW10
 1-edge		GVR 100-020SS	GVR 100SS	1.00	2.3	0.2	3.6	9	3.0	○		○	●		○	○
		GVR 125-020SS	GVR 125SS	1.25						○		○	●		○	○
		GVR 145-020SS	GVR 145SS	1.45						○		○	●		○	○
		GVR 200-020SS	GVR 200SS	2.00						○		○	●		○	○
		GVR 250-020SS	GVR 250SS	2.50						○		○	●		○	○
		GVR 300-020SS	GVR 300SS	3.00						○		○	●		○	○
		GVR 100-020S	GVR 100S	1.00	2.3	0.2	4.0	11	4.0	○	○	○	●		○	○
		GVR 125-020S	GVR 125S	1.25						○	○	○	●		○	○
		GVR 145-020S	GVR 145S	1.45						○	○	○	●		○	○
		GVR 185-020S	GVR 185S	1.85						○	○	○	●		○	○
		GVR 200-020S	GVR 200S	2.00						○	○	○	●		○	○
		GVR 250-020S	GVR 250S	2.50						○	○	○	●		○	○
		GVR 340-020S	GVR 340S	3.40							○	○	●		○	○
 2-edge		GVR 100-020A	GVR 100A	1.00	2.3	0.2	4.0	12	5.0	○	○	○	●		●	○
		GVR 125-020A	GVR 125A	1.25						○	○	○	●		○	○
		GVR 145-020A	GVR 145A	1.45						○	○	○	●		○	○
		GVR 185-020A	GVR 185A	1.85						○	○	○	●		○	○
		GVR 200-020A	GVR 200A	2.00						○	○	○	●		○	○
		GVR 250-020A	GVR 250A	2.50						○	○	○	●		○	○
		GVR 300-020A	GVR 300A	3.00						○	○	○	●		○	○
		GVR 340-020A	GVR 340A	3.40						○	○	○	●		○	○
		GVR 145-020B	GVR 145B	1.45	2.8	0.2	4.5	15	5.5	○	○	○	●		○	○
		GVR 185-020B	GVR 185B	1.85						○	○	○	●		○	○
		GVR 200-020B	GVR 200B	2.00	3.2					○	○	○	●		○	○
		GVR 230-020B	GVR 230B	2.30						○	○	○	●		○	○
		GVR 250-020B	GVR 250B	2.50						○	○	○	●		○	○
		GVR 280-020B	GVR 280B	2.80						○	○	○	●		○	○
		GVR 300-020B	GVR 300B	3.00	4.2					○	○	○	●		○	○
		GVR 340-020B	GVR 340B	3.40						○	○	○	●		○	○
		GVR 400-020B	GVR 400B	4.00						○	○	○	●		○	○
		GVR 280-020C	GVR 280C	2.80	4.5	0.2	5.8	21	6.5	○	○	○	●		○	○
		GVR 300-020C	GVR 300C	3.00						○	○	○	●		○	○
		GVR 340-020C	GVR 340C	3.40	5.5					○	○	○	●		○	○
		GVR 400-020C	GVR 400C	4.00						○	○	○	●		○	○
		GVR (430-020C)	GVR (430C)	4.30	6.3					○	○	○	●		○	○
		GVR (460-020C)	GVR (460C)	4.60							○	○	●		○	○
		GVR (500-020C)	GVR (500C)	5.00						○	○	○	●		○	○
 2-edge Full-R		GVR 200-100AR	GVR 100AR	2.00	2.3	1.00	4.0	12	5.0			○	●		○	○
		GVR 250-125AR	GVR 125AR	2.50		1.25						○	●		○	○
		GVR 300-150AR	GVR 150AR	3.00		1.50						○	●		○	○
		GVR 200-100BR	GVR 100BR	2.00	3.2	1.00	4.5	15	5.5	○		○	●		○	○
		GVR 300-150BR	GVR 150BR	3.00	4.2	1.50				○		○	●		○	○

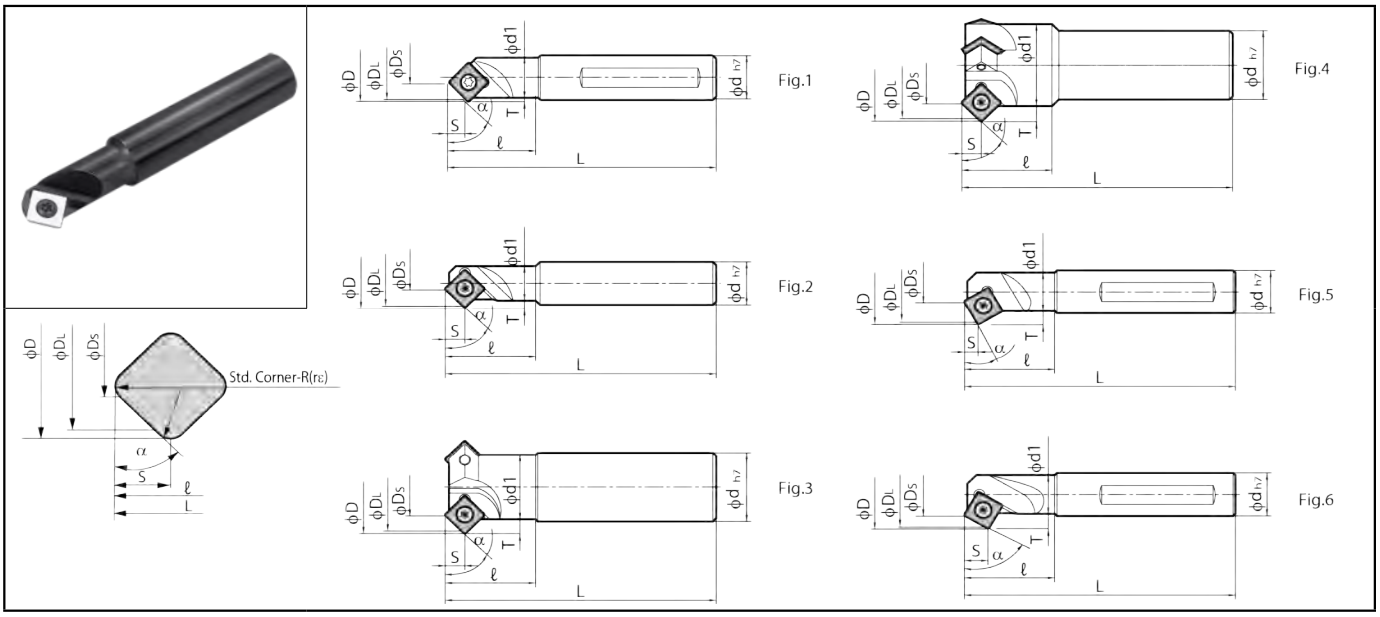
· Only R-hand insert is applicable.

● : Stock Std. ○ : World Express

MCSE Chamfering Endmill



MCSE



Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm) ØD	ØDL	ØDs	Ød	Ød1	L	ℓ	S	T	Std. Corner-R(rε)	Angle (°) a	Rake Angle (°) A.R.	R.R.	Insert	Spare Parts: Clamp Screw	Wrench
MCSE	104	○	1	16	15	4	16	15	85	30	6.5	0.5	0.4	45°	0°	-4.5°	Fig.1	SB-3060TR	DT-10
	106	○		22	21	6	20	16	120	40	8.6	3.0	0.8			-1°	Fig.2	SB-5090TR	LTW-20
	115	○		31	30	15	20	18				6.5				+5°			
	227	○	2	43	42	27	32	30				6.5				+8°	Fig.3		
	336	○	3	52	51	36	32	38				7.0				+10°	Fig.4		
MCSE	104-30D	○	1	19	18	4	16	15	85	30	4.7	2.0	0.4	30°	0°	-4°	Fig.5	SB-3060TR	DT-10
	108-30D	○		28	27	8	20	19	110	40	6.3	4.5	0.8			-2.5°		SB-5090TR	LTW-20
	110-30D	○		30	28	10		18	120			6.0				0°			
MCSE	108-60D	○		19.5	19	8	20	19	110	40	10	0.25	0.8	60°	0°	-3.5°	Fig.6	SB-5070TR	LTW-20
	120-60D	○		31	30	20		18	120			6.5				0°		SB-5090TR	

· Dimension T indicates available back chamfering dimension.

Applicable Inserts

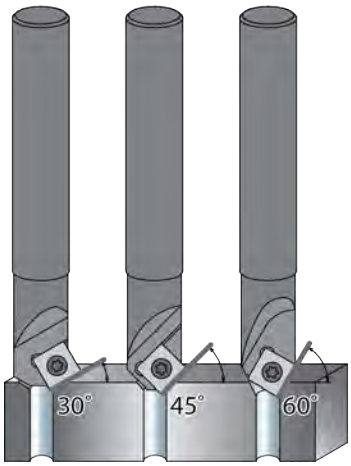
Description		Applicable Inserts ➡B17,B18		
				
MCSE	104 104-30D	SDKW 09T204TN	SDKW 09T204FN	SDMT 09T204C
MCSE	106 115 227 336	SEKW 421TN 422TN	SEKW 421FN 422FN	SEMT 421C
MCSE	108-30D 110-30D			
MCSE	108-60D 120-60D			

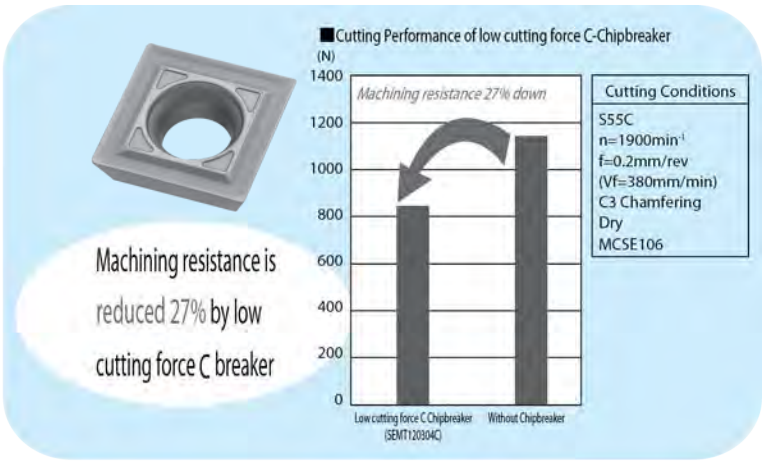
● : Stock Std. ○ : World Express

◆Recommended Cutting Conditions

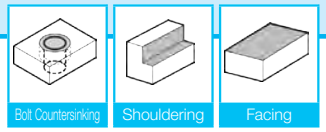
Workpiece Material	fz (ipt)		Recommended Insert Grades (Cutting Speed Vc: sfm)												
			Cermet			MEGACOAT		PVD Coated Carbide					Carbide	
	ØDs (Ø4~Ø20)	ØDs (Ø27~Ø36)	TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10
Stainless Steel	0.002~0.008	0.004~0.012		☆ 325~600	☆ 250~525	★ 400~725	-	☆ 325~600	☆ 325~600					-
Carbon Steel	0.002~0.010	0.008~0.016		★ 325~600	☆ 250~525	★ 400~825	-	☆ 325~600	☆ 325~600					-
Alloy Steel	0.002~0.010	0.008~0.016		★ 325~600	☆ 250~525	★ 325~725	-	☆ 250~500	☆ 250~500					-
Mold Steel	0.002~0.010	0.008~0.016		★ 325~500	☆ 250~450	★ 250~600	-	☆ 200~450	☆ 200~450					-
Cast Iron	0.004~0.012	0.012~0.020		-	-	-	★ 325~725	-	-					☆ 250~500
Non-ferrous Metals	0.004~0.012	0.012~0.020		-	-	-	-	-	-					★ 325~975

★: 1st Recommendation ☆: 2nd Recommendation

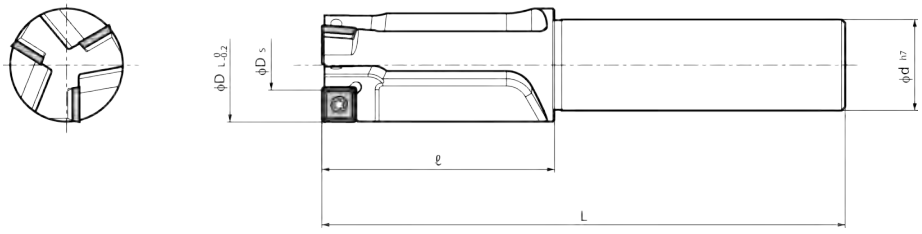




MEF Bolt Countersink Endmill



MEF

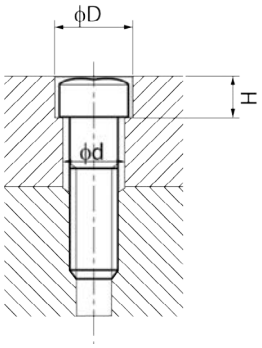


●Toolholder Dimensions

Description		Stock	No. of Inserts	Dimension (mm) ØDL	ØDs	Ød	L	ℓ	Std. Corner-R(rε)	Rake Angle (°) A.R.	R.R.	Objective Bolt Size	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts ➡B19
MEF	11-S10	○	1	11	3.0	10	103	23	0.4	+5°	-13°	M6	SB-2250TR	DT-7	SPMT060204E-Z SPMT060208E-Z
	14-S12	○		14	4.5	12	108	28				M8	SB-2260TR		
	17-S16	○	2	17.5	7.3	16	115	35				M10			
	18-S16	○		18	7.7		117	38				-			
	20-S16	○	3	20	9.5		120	40			-12°	M12			
	22-S20	○		22	11.4	20	124	44				-			
	23-S20	○		23	12.4		126	46				M14			
	24-S20	○		24	13.4		128	48				-			
	25-S20	○		25	14.4		130	50				-			
	26-S25	○		26	9.8	25	132	52	0.8		-13°	M16	SB-3080TR	DT-10	SPMT090304E-Z SPMT090308E-Z
	27-S25	○		27	10.6		134	54				-			
	28-S25	○		28	11.5		136	56				-			
	29-S25	○		29	12.6		138	58				M18			
	30-S25	○		30	13.5		140	60				-			
	32-S25	○		32	15.5		144	64				M20			
	35-S32	○		35	18.4	32	150	70				M22			
	39-S32	○	4	39	22.5		158	78				M24			
	43-S32	○		43	26.2		166	86			-12°	M27			
	48-S32	○		48	31.3		176	96				M30			

· Although Corner R(rε) pertains to MEF11-S10, ØDs=3.0mm.

◆Bolt Counter Sink (Socket Head Cap Screw)



Nominal Screw Size	M6	M8	M10	M12	M14	M16	M18	M20	M22	M24	M27	M30
ØD (mm)	11	14	17.5	20	23	26	29	32	35	39	43	48
H (mm)	6.5	8.6	10.8	13	15.2	17.5	19.5	21.5	23.5	25.5	29	32
Ød (mm)	6.6	9	11	14	16	18	20	22	24	26	30	33
Applicable Endmill	MEF11	MEF14	MEF17	MEF20	MEF23	MEF26	MEF29	MEF32	MEF35	MEF39	MEF43	MEF48

Diameter Adjustment using the Eccentric Sleeves (SHE / SHEM)

●When using with a MEF counterboring endmill

· Adjustment of counterbore diameter (if using MEF11-S10 or MEF140S12 (single flute), the diameter can be adjusted within the range of diameter allowed by the eccentric sleeve.)

· Broadening of counterbore diameter (If in use with 2 or more flutes, only broadening is possible for the diameter.) Although multiple blades are used, Feed should be input as 1 flute effective.

● : Stock Std. ○ : World Express

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)											
		Cermet			MEGACOAT		PVD Coated Carbide					Carbide	
		TN60	TN100M	TC60	PR1225	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10
Stainless Steel	0.002~0.004				★ 250~600	-		☆ 200~400		☆ 200~400	-		-
Carbon Steel	0.004~0.006				★ 400~725	-		☆ 250~500		☆ 200~450	-		-
Alloy Steel	0.004~0.006				★ 400~725	-		☆ 250~500		☆ 200~450	-		-
Mold Steel	0.002~0.004				★ 325~600	-		☆ 225~400		☆ 225~400	-		-
Cast Iron	0.004~0.008				-	★ 325~725		-		-	☆ 325~600		☆ 250~400
Non-ferrous Metals	0.004~0.008				-	-		-		-	-		★ 325~975

★: 1st Recommendation ☆: 2nd Recommendation

◆Counter Sink Milling Recommendation

(1) Carbon Steel

Increase the feed rate to **fz=0.004~0.006ipt** for preventing long chips at low feed rates.
Chip control is good when setting **Vc=250sfm** for **MEF11~MEF25**, and **Vc=400sfm** for **MEF26~MEF48**.

Description	Cutting Speed Vc (sfm)	fz (ipt)
MEF11~MEF25	250	0.004~0.006
MEF26~MEF48	400	0.004~0.006

(2) Sticky Materials

Step feed is recommended for good chip control
Increase the feed rate to **fz=0.1~0.15 mm/t** for preventing long chips at low feed rate **(fz=0.002ipt)**.
Use cover to prevent accidents or injury by thick chips at higher feed rates.

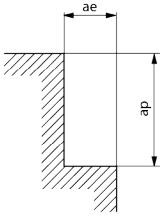
Description	Cutting Speed Vc (sfm)	fz (ipt)	Step Feed (in)
MEF11~MEF48	250~500	0.004~0.006	0.004~060

(3) Stainless Steel

Use a lower Cutting Speed. High Cutting Speeds cause chattering.

◆Cutting Performance when Shouldering

MEF Countersink Endmill is also recommended for shouldering.



Vc=250~400sfm
S55C
DRY
Overhang Length: Same as l in the dimension table

· When shouldering, both side edge and bottom edges are cutting.
Both edges wear at the same time depending on ap.
The insert uses 2 edges instead of 4. (Ref. to Fig.1)

· MEF type's side edge is designed to have a slight clearance for the countersink milling.
Therefore, the side wall angle is approx. 1° inclined against the vertical face. (Ref. to Fig.2)

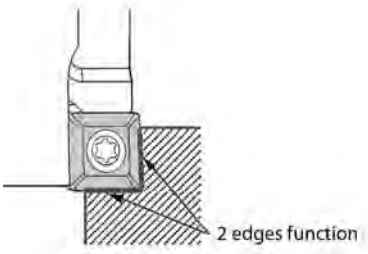


Fig.1

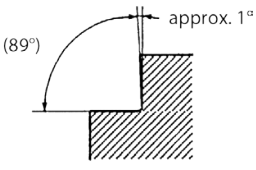
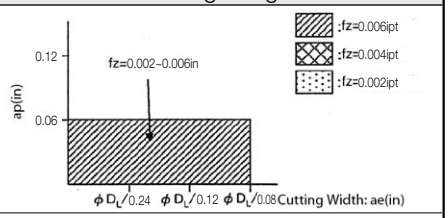
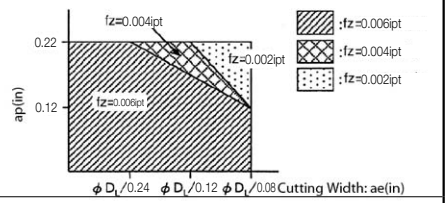
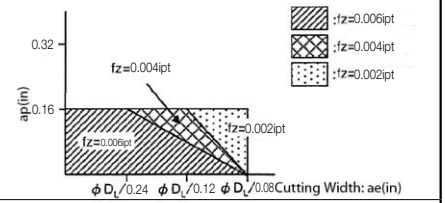
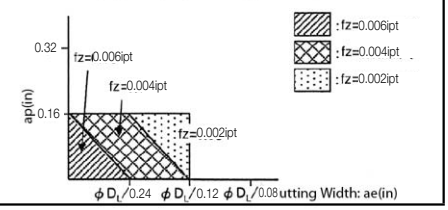


Fig.2

Description	Cutting Range
MEF11-S12 **MEF14-S12** **MEF17-S16** **MEF18-S16**	
MEF20-S16 **MEF22-S20** ≀ **MEF25-S20**	
MEF26-S25 ≀ **MEF32-S25** **MEF35-S32**	
MEF39-S32 **MEF43-S32** **MEF48-S32**	

METS Slot Mill

T-Slotting | Back side milling

METS

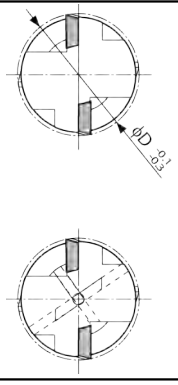


Fig.1

Fig.2

Toolholder Dimensions

Description		Stock	No. of Inserts	No. of Flutes	Dimension (mm) ØD	Ød	Ød1	ℓ	L1	L2	L3	L4	L5	Rake Angle (°) A.R.	R.R.	Insert	Spare Parts: Clamp Screw	Spare Parts: Wrench	Applicable Inserts B18
METS	21-S25	○	2	1	21	25	10.5	9	109	29	32	12	17	+9°	-10°	Fig. 1	SB-2560TR	DT-8	SDMT221E-K
	25-S25	○	4	2	25		12.5	11	112	32									
	32-S32	○			32	32	15.5	14	120	38	36	14	19				SB-3060TR	DT-10	SDMT080308E-K
	40-S32	○	4	2	40		20.5	18	130	50					-12°		SB-4085TR	DT-15	SDMT432E-K
	50-S32	○			50		26.5	22	140	60									
METS	21-S25-H	○	2	1	21	25	10.5	9	109	29	32	12	17	+9°	-10°	Fig. 2	SB-2560TR	DT-8	SDMT221E-K
	25-S25-H	○	4	2	25		12.5	11	112	32									
	32-S32-H	○			32	32	15.5	14	120	38	36	14	19				SB-3060TR	DT-10	SDMT080308E-K
	40-S32-H	○	4	2	40		20.5	18	130	50					-12°		SB-4085TR	DT-15	SDMT432E-K
	50-S32-H	○			50		26.5	22	140	60									

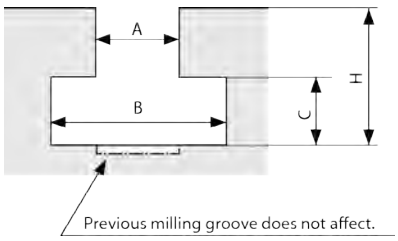
· METS…-H type has air holes

Applicable Inserts

Description		Applicable Inserts B18
METS	21-S25 21-S25-H 25-S25 25-S25-H	SDMT 221E-K
METS	32-S32 32-S32-H	SDMT 080308E-K
METS	40-S32 40-S32-H 50-S32 50-S32-H	SDMT 432E-K

JIS Standard of T-Slot (Extracted from B0952) (Unit:mm)

A (Nominal Size)	B	C	H Max.	H Min.
12	19 +2 0	8 +1 0	25	20
14	23 +2 0	9 +2 0	28	23
18	30 +2 0	12 +2 0	36	30
22	37 +3 0	16 +3 0	45	38
28	46 +4 0	20 +4 0	56	48



K

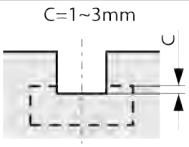
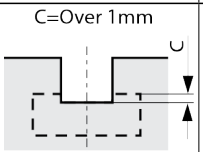
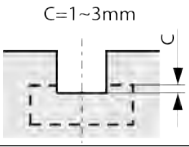
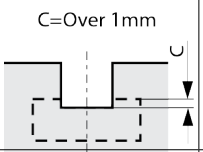
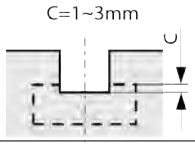
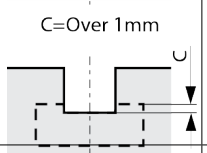
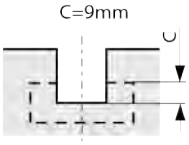
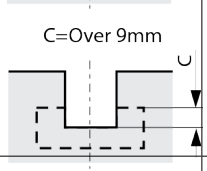
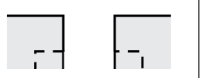
Other Applications

● : Stock Std. ○ : World Express

◆Recommended Cutting Conditions

Workpiece Material	fz (ipt)	Recommended Insert Grades (Cutting Speed Vc: sfm)											
		Cermet			MEGACOAT		PVD Coated Carbide					Carbide	
		TN60	TN100M	TC60	PR1230	PR1210	PR630	PR730	PR830	PR660	PR905	PW30	KW10
Stainless Steel	-				-	-		-		-	-		-
Carbon Steel	0.004~0.006				★ 325~650	-		☆ 250~500		☆ 200~450	-		-
Alloy Steel	0.003~0.005				★ 325~650	-		☆ 250~500		☆ 200~450	-		-
Mold Steel	0.002~0.004				★ 250~500	-		☆ 200~325		☆ 200~325	-		-
Cast Iron	0.004~0.006				-	★ 325~650		-		-	☆ 250~500		☆ 250~400
Non-ferrous Metals	0.004~0.006				-	-		-		-	-		★ 325~975

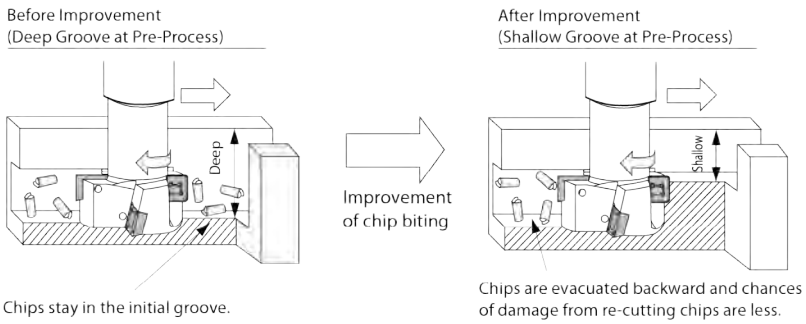
★: 1st Recommendation ☆: 2nd Recommendation

Description (T Slot Nominal Size)	Steel			Cast Iron		
	Initial Groove Shape	T-Slotting Conditions	Conditions to prevent chattering	Initial Groove Shape	T-Slotting Conditions	Conditions to prevent chattering
METS21-S25(-H) **(Nominal Size 12)**		Vc= 400 fz= 0.004 (n= 1820) (Vf= 7.17)	Vc= 200 fz= 0.006 (n= 920) (Vf= 5.39)		Vc= 400 fz= 0.005 (n= 1820) (Vf= 8.58)	Vc= 250 fz= 0.006 (n= 1210) (Vf= 7.17)
METS25-S25(-H) **(Nominal Size 14)**		Vc= 400 fz= 0.004 (n= 1530) (Vf= 12.04)	Vc= 200 fz= 0.006 (n= 760) (Vf= 8.98)		Vc= 400 fz= 0.005 (n= 1530) (Vf= 14.45)	Vc= 250 fz= 0.006 (n= 1020) (Vf= 12.05)
METS32-S32(-H) **(Nominal Size 18)**		Vc= 325 fz= 0.004 (n= 1000) (Vf= 7.87)	Vc= 200 fz= 0.006 (n= 600) (Vf= 7.09)		Vc= 400 fz= 0.005 (n= 1190) (Vf= 12.05)	Vc= 250 fz= 0.006 (n= 800) (Vf= 9.45)
METS40-S32(-H) **(Nominal Size 22)**		Vc= 250 fz= 0.006 Chattering is likely when set to shallower than C=0.354in.	Vc= 200 fz= 0.006 (n= 480) (Vf= 5.67)		Vc= 400 fz= 0.006 (n= 960) (Vf= 8.98)	Vc= 250 fz= 0.006 (n= 640) (Vf= 7.56)
METS50-S32(-H) **(Nominal Size 28)**	Not recommended for steel because of chattering				Vc= 400 fz= 0.006 (n= 760) (Vf= 8.98)	Vc= 250 fz= 0.006 (n= 510) (Vf= 6.02)

[Cutting Speed: Vc (sfm), Spindle Revolution: n (min⁻¹), Feed Rate fz (ipt), Table Feed Vf (ipm)]

· Chattering is likely when f is less than fz=0.1mm/t. Keep feed rate between fz=0.1~0.15mm/t.
For cast iron cutting, the bigger the C-dimension becomes, the less chattering occurs.

◆How to prevent damaging chips when cutting steel



Make initial groove shallower to prevent the tool damage from remaining chips.
Use compressed air to aid in chip evacuation.

Solid Endmill
Carbide Material

L

L1~L50

Application and selection

Ref. Page	Applications	Description	Features	Shape	Coating	No. of Flutes	Helix Angle	Outside Dia. ØDc (mm)
L10	Surface finish oriented	2FESS	2 flutes, sharp corner edge		MEGACOAT	2	30°	Ø1~Ø16
		2FESM				2		Ø0.2~Ø16
L11		2FESL				2		Ø1~Ø16
L12		2FEKS	2 flutes, tough corner edge			2		Ø3~Ø16
		2FEKM				2		
L13		4FESM	4 flutes, sharp corner edge			4		Ø1~Ø16
		4FEKM	4 flutes, tough corner edge			4		Ø3~Ø16
L15		2FESW	For Automatic Lathe			2	35°	Ø3~Ø13
		3FESW				3		
		4FESW				4		
L15	Multi-purpose	3UFSM	3 flutes, Multi-purpose		TiAlN	3	45°	Ø1~Ø20
L16		4PGSS	Slotting, Shouldering Multi-purpose High feed rate finishing			4	50°	Ø3~Ø25
		5PGSS				5		
		4PGSM				4		Ø6~Ø25
		5PGSM				5		
		6PGSM				6		
		4PGSL				4		Ø6~Ø25
		5PGSL				5		
		6PGSL				6		
L17		4PGRM (Radius)				4		Ø3~Ø20
L19	High efficiency chip evacuation	3ZFKS	Multi-functional, high efficiency		MEGACOAT	3	40°	Ø6~Ø12
		3ZFKM				3		Ø3~Ø12
L21		4MFK	NEW High feed, high efficiency		MEGACOAT	4	Variable Lead 42°, 44°	Ø3~Ø16
L22		4YEKM	4/5 flutes, High efficiency Difficult-to-cut Materials Varied interval flute design		TiAlN	4	38°	Ø4~Ø25
		4YECM				4		
		4YERM (Radius)				4		
L23		5DEKM			AlTiN	5		Ø4~Ø25
		5DERM (Radius)				5		
		4YFSM	Steel and Difficult-to-cut materials, Finishing		TiAlN	4	45°	Ø4~Ø20
		6YFSM				6		
L24		3RDSM	Roughing, serrated edge		TiAlN	3	20°	Ø4~Ø25
		4RDSM				4		
		5RDSM				5		
		3RDSL				3		Ø6~Ø25
		4RDSL				4		
		5RDSL				5		
L25		4RFSM	Roughing, Notched surface			4	45°	Ø6~Ø25
		6RFSM				6		
		3RFRS (Radius)				3		Ø4~Ø12
		4RFRS (Radius)				4		

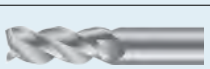
Carbide material

Substrate of all solid end mills is carbide

Ref. Page	Description	Workpiece Material								
		Steel		Hardened Steel		Stainless Steel	Titanium Alloys	Heat-resistant Alloys	Cast Iron	Aluminum & Non-ferrous metals
		~30HRC	~40HRC	~55HRC	~68HRC					
		P ~30HRC	P 30~40HRC	H ~55HRC	H ~68HRC	M Stainless steel	S Titanium Alloy	S Heat-resistant Alloy	K Cast Iron	N Aluminum & Non-Ferrous Material
L10	2FESS	★	☆	☆		★			☆	☆
	2FESM									
L11	2FESL									
L12	2FEKS									
	2FEKM									
L13	4FESM									
	4FEKM									
L14	2FESW									
	3FESW									
	4FESW									
L15	3UFSM	★	★	☆		★	☆		★	☆
L16	4PGSS	★	★	☆					☆	
	5PGSS									
	4PGSM									
	5PGSM									
	6PGSM									
	4PGSL									
	5PGSL									
	6PGSL									
L17	4PGRM (Radius)	★	★	☆					☆	
L19	3ZFKS	★	☆			★	☆		☆	☆
	3ZFKM									
L21	4MFK	★	☆	☆		★	☆		☆	☆
L22	4YEKM	★	★			★	★	★	☆	
	4YECM									
	4YERM (Radius)									
L23	5DEKM	★	★			★	★	★	☆	
	5DERM (Radius)									
	4YFSM	★	★			★	★	★	☆	
	6YFSM									
L24	3RDSM	★	★			☆			★	
	4RDSM									
	5RDSM									
	3RDSL									
	4RDSL									
	5RDSL									
L25	4RFSM	☆	★	★	☆	☆	★	☆	☆	
	6RFSM									
	3RFRS (Radius)	☆	★	★	☆	☆	★	☆	☆	
	4RFRS (Radius)									

★: 1st Choice
☆: 2nd Choice

Application and selection

Ref. Page	Applications	Description	Features	Shape	Coating	No. of Flutes	Helix Angle	Outside Dia. ØDc (mm)
L26	Ball-nose	2UEBS	Ball-nose Endmill with 2 flutes		TiAlN	2	30°	Ø1~Ø20
		3UEBS	Ball-nose Endmill with 3 flutes			3	30°	Ø3~Ø12
L27		4YEBM	Ball-nose Endmill with 4 flutes			4	38°	Ø5~Ø20
L28	Special corner-R shaped	6PDRS	6 flutes, High feed rate		AlTiN	6	20°	Ø6~Ø12
L30	Hard materials	4HFSS	Multi-edge type Negative rake angle Hard Materials Finishing		MEGACOAT Hard	4	45°	Ø1~Ø12
		5HFSS				5		
		6HFSS				6		
		7HFSS				7		
		4HFSM				4		Ø1~Ø25
		5HFSM				5		
		6HFSM				6		
		7HFSM				7		
		8HFSM				8		
L31		4UGSM			TiAlN	4	50°	Ø3~Ø16
		6UGSM				6		
L32	Aluminum & Non-ferrous Metals	3NESM	Varied interval flute design with wiper edge			3	38°	Ø3~Ø20
L33		2NFSM	Sharpness oriented, Smooth chip evacuation			2	45°	Ø1~Ø20
		3NFSM				3		Ø3~Ø20
		3NFSL				3		Ø3~Ø20
L34		3AESM	Roughing			3	30°	Ø6~Ø25
		3AESL				3		Ø6~Ø25

Solid Endmill Identification System (except 4MFK)

2	F	E	S	M	020	-	060	-	04	XXXXXXXX
(1)	(2)	(3)	(4)	(5)	(6)		(7)		(8)	(9)

(1) No. of Flutes	(2) Applications	(3) Helix Angle	(4) Series	(5) Length of cut	(6) Outside Dia.	(7) Length of cut	(8) Shank Dia.	(9) Others
2 3 4 5 6 7 8	F : Surface finish oriented U (UF) /P (PG): Multi-purpose Z : Multi-functional, high efficiency Y/D: High efficiency (Difficult-to-cut Material) R : Roughing H/U(UG): Hard materials N/A: Aluminum & Non-ferrous Metals,	D: 20-29° E: 30-39° F: 40-49° G: 50-59°	S: Square B: Ball-nose R: Radius K:Tough corner edge C: with Corner Chamfering	S: Short M: Medium L: Long W: For Automatic Lathe	020 ↓ 2.0mm	060 ↓ 6.0mm	04 ↓ 4.0mm	Corner Radius C width etc...

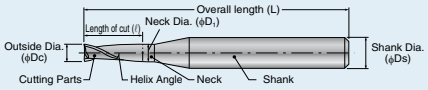
Solid Endmill Identification System (4MFK) NEW

4	M	F	K	030	-	045
(1)	(2)	(3)	(4)	(5)		(6)

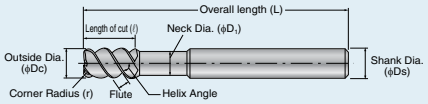
(1) No. of Flutes	(2) Applications	(3) Helix Angle	(4) Series	(5) Outside Dia.	(6) Length of cut
4	M: High feed, high efficiency	F: 40-49°	K: Tough corner edge	030 ↓ 3.0mm	045 ↓ 4.5mm

Name of parts

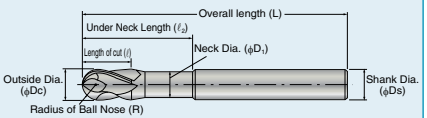
●Square Type



●Radius Type



●Ball-nosed Type



Carbide material

Substrate of all solid end mills is carbide

Description	Ref. Page	Workpiece Material								
		Steel		Hardened Steel		Stainless Steel	Titanium Alloys	Heat-resistant Alloys	Cast Iron	Aluminum & Non-ferrous metals
		~30HRC	~40HRC	~55HRC	~68HRC					
		P ~30HRC	P 30~40HRC	H ~55HRC	H ~68HRC	M Stainless steel	S Titanium Alloy	S Heat-resistant Alloy	K Cast Iron	N Aluminum & Non Ferrous Material
2UEBS	L26	★	★						★	
3UEBS		★	★			☆	☆		★	☆
4YEBM	L27	★	☆			★	★	☆	☆	
6PDRS	L28	★	★	★	★					
4HFSS 5HFSS 6HFSS 7HFSS 4HFSM 5HFSM 6HFSM 7HFSM 8HFSM	L30	★	★	★	★					
4UGSM 6UGSM	L31			★	★					
3NESM	L32									
2NFSM 3NFSM 3NFSL	L33									★
3AESM 3AESL	L34									

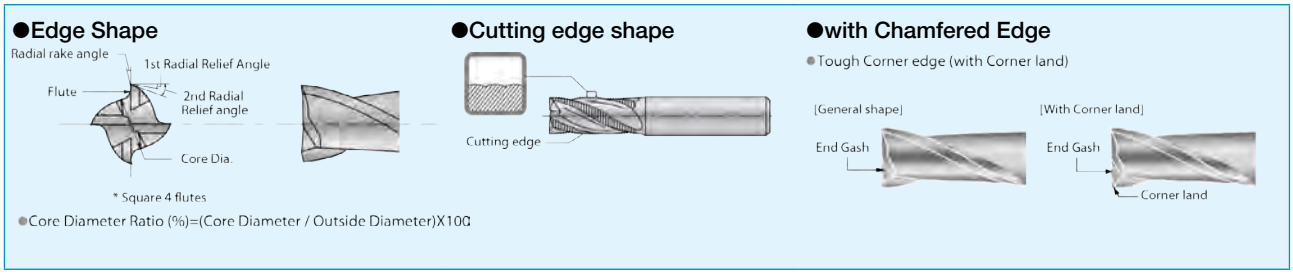
★: 1st Choice
☆: 2nd Choice

Icon Glossary

Super Micro-grain carbide

The products made from super micro-grain cemented carbide

Cutting parts shape



Tool Selection Guide

Introduction

Surface finish oriented

L10~L14

F Series

MEGACOAT is applied

(FES)

The MEGACOAT coating and a sharp cutting edge enable high precision finishing due to excellent wear resistance and heat-resistance.
Total lengths of 35mm and 45mm are available for automatic lathes.

L10~L14

Multi-purpose

L15~L17

P Series (PGS)

(PGS)

Multi-purpose endmill for slotting and shouldering.
Core diameter ratio is 60% for 1D distance from the bottom edge, and 80% for the longer distance. Smooth chip evacuation and high rigidity.

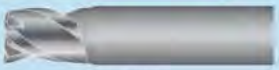
L16

High efficiency chip evacuation

L18~L25

Z Series

MEGACOAT is applied



(3ZEKS)

Multi-functional, high efficiency endmill
Applicable for plunge milling, slotting and finishing with one end mill.
Smooth chip evacuation resulting from the sub-groove on the gash breaks chips during plunge milling

L18

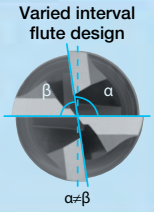
NEW

M Series

MEGACOAT is applied

(4MFK)

Superior anti vibration performance due to Kyocera's unique varied interval flute design and variable lead.
Achieves high rigidity and stable chip evacuation due to new Special Flute Design.
Achieves high feed, high efficiency cutting



L20

Y Series

(4YEKM, 4YECM, 4YERM)

Varied interval flute design reduces vibration and improves efficiency when slotting and shouldering.
Applicable for stainless steel and heat resistant steel with 3 types of cutting edges (corner land, chamfered, radius)

L22

D Series

(5DEKM, 5DERM)

Varied interval flute design with 5 flutes. For high efficiency slotting and shouldering.
Applicable for difficult-to-cut materials like stainless steel and heat resistant steel.

L23

R Series

(RDS)

(RFS)

RDS type is for general use with large flat surface edge with a 20 degrees helix angle.
RFS has notched surface edge of 45 degrees helix angle.

L24~L25

Ball-nose End Mill

L26~L29

U Series Y Series (UEB, YEB)

(3UEBS)

Boll-nose end mill with 2/3/4 flutes

L26~L27

P Series (PDR)

(6PDRS)

High efficiency radius. Enables large cutting volume and high efficiency cutting with special corner-radius shape.
Ramping and arc cutting are possible.

L28

Hard materials

L30~L31

H Series

"MEGACOAT Hard" is applied

(HFS)

Utilizes new PVD coating MEGACOAT Hard for hard materials.
Large core diameter and negative rake angle improves edge strength.
Helix angle is 45 degrees.
High efficiency cutting and long tool life with wide range of 4, 5, 6, 7 and 8 flute types.

L30

U Series (UGS)

(UGS)

For hard materials with negative rake angle.
Helix angle is 50 degrees.

L31

Aluminum & Non-ferrous Metals,

L32~L34

N Series (NES, NFS)

(3NESM)

(3NFSM)

NES type realizes good surface finish with wiper cutting edge.
Varied interval flute design prevents chattering and improves cutting efficiency and surface finish quality of side wall of workpiece.
NFS type improves chip evacuation due to special rake face design and 45 degrees helix angle.

L32~L33

A Series

(3AESM)

Roughing end mill for high efficiency cutting of aluminum and non-ferrous metals.

L34

New PVD technology, MEGACOAT

MEGACOAT for High Precision Finishing

MEGACOAT enables high precision finishing with a sharp cutting edge.

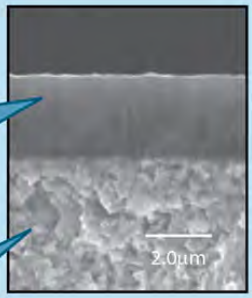
F Series
L10~L14

●Wear and high heat resistance

MEGACOAT
Nitride solid solution metal with a high melting point
High hardness with oxidation resistance
Smooth surface

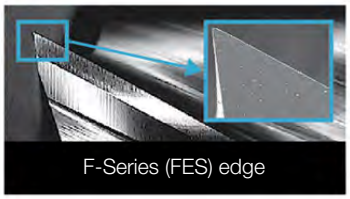
●Fracture resistance with stable cutting

Super Micro-grain cemented carbide

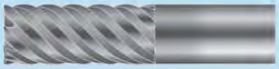


High Quality, Sharp Edge

●Smooth surface quality



MEGACOAT Hard - A New Coating for Hard Materials

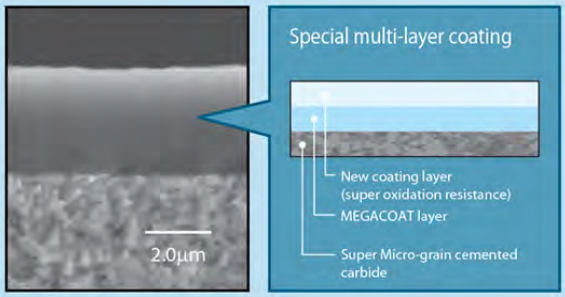


Enables longer tool life and stable cutting of hard materials with a special multi-layer coating

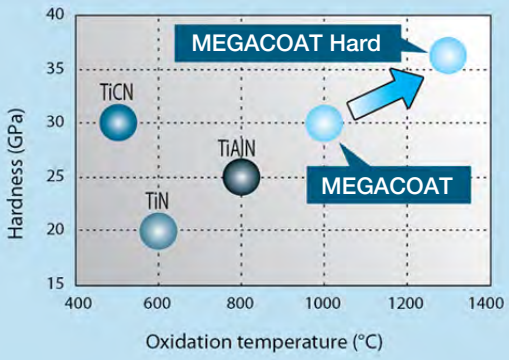
H Series
L30

Excellent Wear and Heat Resistance

● MEGACOAT Hard Structure



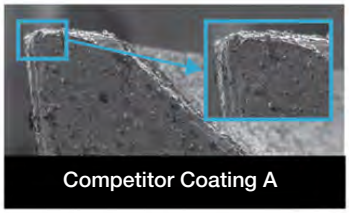
Provides extreme hardness to control abrasion of the edge coating



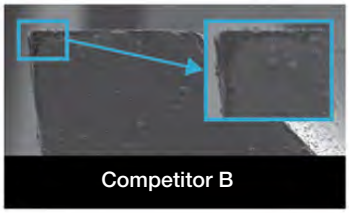
Smooth cutting edge quality with an advanced coating technology

● Smooth surface quality

Smooth and sharp to the tip of the cutting edge. Longer tool life and improved surface finish.



Coating surface is rough and there is much cutter abrasion. The cutting edge is rounded.



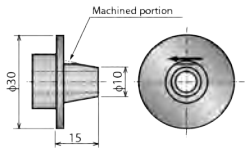
Major abrasion of cutting edge and exposed material is noticeable.

● Smooth endmill surface reduces welding and allows stable cutting

Case Studies

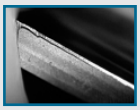
SUM24L

- OA parts
- Vc=88m/min (n=3,500min^{-1})
- ap=0.5mm
- fz=0.23mm/t (Vf=3200 mm/min)
- Wet
- 4FESM080-190-08



MEGACOAT	230 pcs/edge
Competitor Coated Carbide E	100 pcs/edge

- Kyocera showed 2.3 times longer tool life than Competitor E.
- Kyocera's new coating technology resolved edge fracturing and provided stability compared with Competitor E.
- Kyocera showed superior finished surface compared with Competitor E.



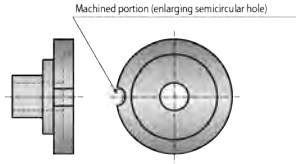
MEGACOAT
(Number of workpiece processed: 230 pcs/edge)

Competitor Coated Carbide E
(Number of workpiece processed: 100 pcs/edge)

(Customer Evaluation)

SCr420

- Automotive parts
- Vc=40m/min (n=3,200min^{-1})
- ap=0.1mm
- fz=0.01mm/t (Vf=70 mm/min)
- Wet
- 2FESM040-110-06



MEGACOAT	700 pcs/edge
Competitor Coated Carbide F	350 pcs/edge

- Kyocera processed twice as many workpieces compared to Competitor F.
- Competitor F is limited to 350 workpieces due to excessive wear.
- Kyocera prevents chipping there by enabling long-life and stabilized machining.

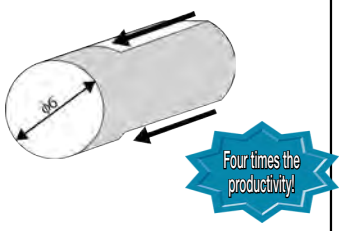
MEGACOAT
(Number of workpiece processed: 700 pcs/edge)

Competitor Coated Carbide F
(Number of workpiece processed: 350 pcs/edge)

(Customer Evaluation)

S45C

- Machine parts
- Vc=100m/min (n=3,980min^{-1})
- ap =0.45mm
- fz=0.05mm/t (Vf=800mm/min)
- Wet
- 4 flutes
- Tool life 4000 pcs/edge
- 4FESW080-080-08



4FESW080-080-08	Table feed Vf=800mm/min
Competitor Coated Carbide G	Table feed Vf=200mm/min

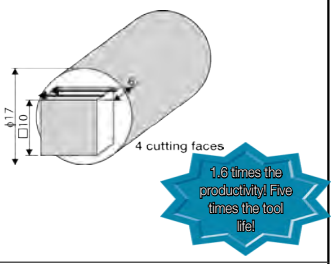
[Competitor Coated Carbide G]
Ø8·4 flutes
Vc=63m/min(n=2508min^{-1})
ap=0.45mm
Tool life 4000 pcs/edge
fz=0.02mm/t (Vf=200mm/min)

User comments:
- Was able to increase both cutting speed and table feed rate.
- Despite the increase in machining conditions, burr formation decreased.

(Customer Evaluation)

SUM

- Machine parts
- Vc=100m/min (n=3,200min^{-1})
- ap x ae=3.5 × 3.0mm
- fz=0.05mm/t (Vf=640mm/min)
- Wet
- 4 flutes
- 4FESW100-080-10



4FESW100-080-10	Table feed Vf=640mm/min
Competitor Coated Carbide H	Table feed Vf=400mm/min

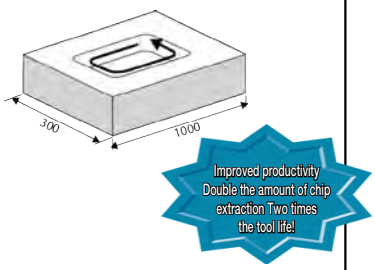
[Competitor Coated Carbide H]
Ø7·4 flutes
Vc=44m/min(n=2000min^{-1})
ap × ae=3.5 × 3.0mm
fz=0.05mm/t (Vf=400mm/min)

User comments:
- Automatic general purpose end mills have a shorter edge length with improved rigidity, which enabled an increase from conventional Ø7 to Ø10, thus improving machining conditions.
- Compared to conventional tools, tool life improved five times.

(Customer Evaluation)

Hardened steel (60HRC)

- Mold
- Vc=60m/min (n=1,194min^{-1})
- ap × ae=40 × 0.3mm
- fz=0.056mm/t (Vf=400mm/min)
- 6 flutes
- 6HFSM160-420-16



6HFSM160-420-16	Amount of chip extraction 4.8cc/min — Tool life: 10 pcs/ edge
Competitor Coated Carbide I	Amount of chip extraction 2.4cc/min — Tool life: 5pcs/ edge

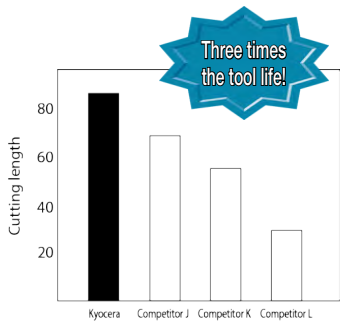
[Competitor Coated Carbide I]
Ø16·6 flutes
Vc=30m/min(n=597min^{-1})
ap × ae=40 × 0.3mm
fz=0.056mm/t (Vf=200mm/min)

User comments:
The cutting speed and table feed rate is doubled compared to competitor's coated carbide product I. The cutting edge conditions are excellent and the tool life is also doubled.

(Customer Evaluation)

SKD11 (63HRC)

- Block
- Vc=70m/min (n=3,700min^{-1})
- ap × ae=3 × 0.12mm
- fz=0.04mm/t (Vf=800mm/min)
- Dry
- 6 flutes
- 6HFSM060-170-06



6HFSM060-170-06
Competitor Coated Carbide J,K,L

[Competitor Coated Carbide J,K,L]
Ø6·6 flutes
Vc=70m/min(n=3700min^{-1})
ap × ae=3 × 0.12mm
fz=0.04mm/t (Vf=800mm/min)

Shouldering:
Compared to competitor's coated carbide products, the 6HFSM has three times longer tool life.

(Internal evaluation)

No. of Flutes: 2

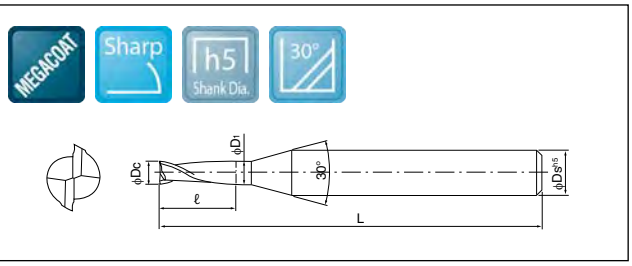
2FESS, 2FESM, 2FESL

2

MEGACOAT is applied

Super Micro-grain carbide

Workpiece Materials ★: 1st Choice



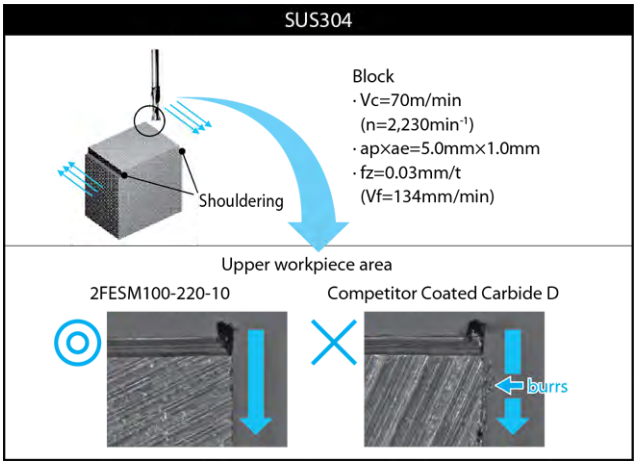
2FESS (Short)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FESS010-015-04	○	1.0	0 -0.015	1.5	1.1	4	45	2
2FESS015-023-04	○	1.5	0 -0.015	2.3	1.6	4	45	2
2FESS020-030-04	○	2.0	0 -0.015	3.0	2.1	4	45	2
2FESS025-037-04	○	2.5	0 -0.015	3.7	2.6	4	45	2
2FESS030-045-06	○	3.0	0 -0.015	4.5	3.2	6	50	2
2FESS035-052-06	○	3.5	0 -0.015	5.2	3.7	6	50	2
2FESS040-060-06	○	4.0	0 -0.015	6.0	4.2	6	50	2
2FESS045-067-06	○	4.5	0 -0.015	6.7	4.7	6	50	2
2FESS050-075-06	○	5.0	0 -0.015	7.5	5.2	6	50	2
2FESS055-082-06	○	5.5	0 -0.015	8.2	5.7	6	50	2
2FESS060-090-06	○	6.0	0 -0.020	9.0	-	6	50	2
2FESS080-120-08	○	8.0	-0.005 -0.025	12.0	-	8	60	2
2FESS100-150-10	○	10.0	-0.005 -0.025	15.0	-	10	70	2
2FESS120-180-12	○	12.0	-0.010 -0.030	18.0	-	12	75	2
2FESS140-210-16	○	14.0	-0.010 -0.030	21.0	14.2	16	75	2
2FESS150-230-16	○	15.0	-0.010 -0.030	23.0	15.2	16	90	2
2FESS160-240-16	○	16.0	-0.010 -0.030	24.0	-	16	90	2

Sharp Cutting Edge Reduced Burrs



2FESM (Medium)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FESM002-004-04	○	0.2	0 -0.015	0.4	0.22	4	45	2
2FESM003-006-04	○	0.3	0 -0.015	0.6	0.32	4	45	2
2FESM004-008-04	○	0.4	0 -0.015	0.8	0.42	4	45	2
2FESM005-010-04	○	0.5	0 -0.015	1.0	0.53	4	45	2
2FESM006-012-04	○	0.6	0 -0.015	1.2	0.63	4	45	2
2FESM007-014-04	○	0.7	0 -0.015	1.4	0.74	4	45	2
2FESM008-016-04	○	0.8	0 -0.015	1.6	0.84	4	45	2
2FESM009-020-04	○	0.9	0 -0.015	2.0	0.95	4	45	2
2FESM010-025-04	○	1.0	0 -0.015	2.5	1.1	4	45	2
2FESM011-025-04	○	1.1	0 -0.015	2.5	1.2	4	45	2
2FESM012-040-04	○	1.2	0 -0.015	4.0	1.3	4	45	2
2FESM013-040-04	○	1.3	0 -0.015	4.0	1.4	4	45	2
2FESM014-040-04	○	1.4	0 -0.015	4.0	1.5	4	45	2
2FESM015-040-04	○	1.5	0 -0.015	4.0	1.6	4	45	2
2FESM016-050-04	○	1.6	0 -0.015	5.0	1.7	4	45	2
2FESM017-050-04	○	1.7	0 -0.015	5.0	1.8	4	45	2
2FESM018-050-04	○	1.8	0 -0.015	5.0	1.9	4	45	2
2FESM019-050-04	○	1.9	0 -0.015	5.0	2.0	4	45	2
2FESM020-060-04	○	2.0	0 -0.015	6.0	2.1	4	45	2
2FESM021-060-04	○	2.1	0 -0.015	6.0	2.2	4	45	2
2FESM022-060-04	○	2.2	0 -0.015	6.0	2.3	4	45	2
2FESM023-060-04	○	2.3	0 -0.015	6.0	2.4	4	45	2
2FESM024-080-04	○	2.4	0 -0.015	8.0	2.5	4	45	2
2FESM025-080-04	○	2.5	0 -0.015	8.0	2.6	4	45	2
2FESM026-080-04	○	2.6	0 -0.015	8.0	2.7	4	45	2
2FESM027-080-04	○	2.7	0 -0.015	8.0	2.8	4	45	2
2FESM028-080-04	○	2.8	0 -0.015	8.0	2.9	4	45	2
2FESM029-080-04	○	2.9	0 -0.015	8.0	3.1	4	45	2
2FESM030-100-06	○	3.0	0 -0.015	10.0	3.2	6	50	2
2FESM031-100-06	○	3.1	0 -0.015	10.0	3.3	6	50	2
2FESM032-100-06	○	3.2	0 -0.015	10.0	3.4	6	50	2
2FESM033-100-06	○	3.3	0 -0.015	10.0	3.5	6	50	2

Recommended Cutting Conditions L35

● : Stock Std. ○ : World Express

2FESM (Medium)

Shouldering | Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FESM034-100-06	○	3.4	0 -0.015	10.0	3.6	6	50	2
2FESM035-100-06	○	3.5	0 -0.015	10.0	3.7	6	50	2
2FESM036-100-06	○	3.6	0 -0.015	10.0	3.8	6	50	2
2FESM037-100-06	○	3.7	0 -0.015	10.0	3.9	6	50	2
2FESM038-110-06	○	3.8	0 -0.015	11.0	4.0	6	50	2
2FESM039-110-06	○	3.9	0 -0.015	11.0	4.1	6	50	2
2FESM040-110-06	○	4.0	0 -0.015	11.0	4.2	6	50	2
2FESM041-110-06	○	4.1	0 -0.015	11.0	4.3	6	50	2
2FESM042-110-06	○	4.2	0 -0.015	11.0	4.4	6	50	2
2FESM043-110-06	○	4.3	0 -0.015	11.0	4.5	6	50	2
2FESM044-110-06	○	4.4	0 -0.015	11.0	4.6	6	50	2
2FESM045-110-06	○	4.5	0 -0.015	11.0	4.7	6	50	2
2FESM046-110-06	○	4.6	0 -0.015	11.0	4.8	6	50	2
2FESM047-110-06	○	4.7	0 -0.015	11.0	4.9	6	50	2
2FESM048-130-06	○	4.8	0 -0.015	13.0	5.0	6	50	2
2FESM049-130-06	○	4.9	0 -0.015	13.0	5.1	6	50	2
2FESM050-130-06	○	5.0	0 -0.015	13.0	5.2	6	50	2
2FESM051-130-06	○	5.1	0 -0.015	13.0	5.3	6	50	2
2FESM052-130-06	○	5.2	0 -0.015	13.0	5.4	6	50	2
2FESM053-130-06	○	5.3	0 -0.015	13.0	5.5	6	50	2
2FESM054-130-06	○	5.4	0 -0.015	13.0	5.6	6	50	2
2FESM055-130-06	○	5.5	0 -0.015	13.0	5.7	6	50	2
2FESM056-130-06	○	5.6	0 -0.015	13.0	5.8	6	50	2
2FESM057-130-06	○	5.7	0 -0.015	13.0	-	6	50	2
2FESM058-130-06	○	5.8	0 -0.015	13.0	-	6	50	2
2FESM059-130-06	○	5.9	0 -0.015	13.0	-	6	50	2
2FESM060-130-06	○	6.0	0 -0.020	13.0	-	6	50	2
2FESM061-160-08	○	6.1	0 -0.020	16.0	6.3	8	60	2
2FESM062-160-08	○	6.2	0 -0.020	16.0	6.4	8	60	2
2FESM063-160-08	○	6.3	0 -0.020	16.0	6.5	8	60	2
2FESM064-160-08	○	6.4	0 -0.020	16.0	6.6	8	60	2
2FESM065-160-08	○	6.5	0 -0.020	16.0	6.7	8	60	2
2FESM066-160-08	○	6.6	0 -0.020	16.0	6.8	8	60	2
2FESM067-160-08	○	6.7	0 -0.020	16.0	6.9	8	60	2
2FESM068-160-08	○	6.8	0 -0.020	16.0	7.0	8	60	2
2FESM069-160-08	○	6.9	0 -0.020	16.0	7.1	8	60	2
2FESM070-160-08	○	7.0	0 -0.020	16.0	7.2	8	60	2
2FESM071-160-08	○	7.1	0 -0.020	16.0	7.3	8	60	2
2FESM072-160-08	○	7.2	0 -0.020	16.0	7.4	8	60	2
2FESM073-160-08	○	7.3	0 -0.020	16.0	7.5	8	60	2
2FESM074-160-08	○	7.4	0 -0.020	16.0	7.6	8	60	2
2FESM075-190-08	○	7.5	0 -0.020	19.0	7.7	8	60	2
2FESM076-190-08	○	7.6	0 -0.020	19.0	-	8	60	2
2FESM077-190-08	○	7.7	0 -0.020	19.0	-	8	60	2
2FESM078-190-08	○	7.8	0 -0.020	19.0	-	8	60	2
2FESM079-190-08	○	7.9	0 -0.020	19.0	-	8	60	2

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FESM080-190-08	○	8.0	-0.005 -0.025	19.0	-	8	60	2
2FESM081-190-10	○	8.1	-0.005 -0.025	19.0	8.3	10	70	2
2FESM082-190-10	○	8.2	-0.005 -0.025	19.0	8.4	10	70	2
2FESM083-190-10	○	8.3	-0.005 -0.025	19.0	8.5	10	70	2
2FESM084-190-10	○	8.4	-0.005 -0.025	19.0	8.6	10	70	2
2FESM085-190-10	○	8.5	-0.005 -0.025	19.0	8.7	10	70	2
2FESM086-190-10	○	8.6	-0.005 -0.025	19.0	8.8	10	70	2
2FESM087-190-10	○	8.7	-0.005 -0.025	19.0	8.9	10	70	2
2FESM088-190-10	○	8.8	-0.005 -0.025	19.0	9.0	10	70	2
2FESM089-190-10	○	8.9	-0.005 -0.025	19.0	9.1	10	70	2
2FESM090-190-10	○	9.0	-0.005 -0.025	19.0	9.2	10	70	2
2FESM091-190-10	○	9.1	-0.005 -0.025	19.0	9.3	10	70	2
2FESM092-190-10	○	9.2	-0.005 -0.025	19.0	9.4	10	70	2
2FESM093-190-10	○	9.3	-0.005 -0.025	19.0	9.5	10	70	2
2FESM094-190-10	○	9.4	-0.005 -0.025	19.0	9.6	10	70	2
2FESM095-190-10	○	9.5	-0.005 -0.025	19.0	9.7	10	70	2
2FESM096-220-10	○	9.6	-0.005 -0.025	22.0	-	10	70	2
2FESM097-220-10	○	9.7	-0.005 -0.025	22.0	-	10	70	2
2FESM098-220-10	○	9.8	-0.005 -0.025	22.0	-	10	70	2
2FESM099-220-10	○	9.9	-0.005 -0.025	22.0	-	10	70	2
2FESM100-220-10	○	10.0	-0.005 -0.025	22.0	-	10	70	2
2FESM105-220-12	○	10.5	-0.005 -0.025	22.0	10.7	12	75	2
2FESM110-220-12	○	11.0	-0.005 -0.025	22.0	11.2	12	75	2
2FESM115-220-12	○	11.5	-0.005 -0.025	22.0	11.7	12	75	2
2FESM120-260-12	○	12.0	-0.010 -0.030	26.0	-	12	75	2
2FESM130-260-16	○	13.0	-0.010 -0.030	26.0	13.2	16	75	2
2FESM140-260-16	○	14.0	-0.010 -0.030	26.0	14.2	16	75	2
2FESM150-300-16	○	15.0	-0.010 -0.030	30.0	15.2	16	90	2
2FESM160-320-16	○	16.0	-0.010 -0.030	32.0	-	16	90	2

2FESL (Long)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FESL010-040-04	○	1.0	0 -0.015	4.0	1.1	4	45	2
2FESL015-060-04	○	1.5	0 -0.015	6.0	1.6	4	45	2
2FESL020-090-04	○	2.0	0 -0.015	9.0	2.1	4	45	2
2FESL025-120-04	○	2.5	0 -0.015	12.0	2.6	4	45	2
2FESL030-140-06	○	3.0	0 -0.015	14.0	3.2	6	50	2
2FESL040-170-06	○	4.0	0 -0.015	17.0	4.2	6	50	2
2FESL050-200-06	○	5.0	0 -0.015	20.0	5.2	6	60	2
2FESL060-240-06	○	6.0	-0.005 -0.025	24.0	-	6	60	2
2FESL080-280-08	○	8.0	-0.005 -0.025	28.0	-	8	70	2
2FESL100-340-10	○	10.0	-0.005 -0.025	34.0	-	10	90	2
2FESL120-400-12	○	12.0	-0.010 -0.030	40.0	-	12	90	2
2FESL160-480-16	○	16.0	-0.010 -0.030	48.0	-	16	115	2

Recommended Cutting Conditions ➡ L35~L36

● : Stock Std. ○ : World Express

Surface Finish Oriented, 2 Flutes, Sharp Corner Edge

No. of Flutes: 2

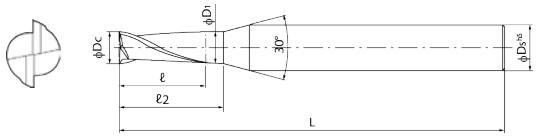
2FEKS, 2FEKM

2

MEGACOAT is applied

Super Micro-grain carbide

Workpiece Materials ★ 1st Choice



2FEKS (Short)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length l2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FEKS030-045-06	○	3.0	0 -0.015	4.5	3.15	6.5	6	50	2
2FEKS035-052-06	○	3.5	0 -0.015	5.2	3.68	7.2	6	50	2
2FEKS040-060-06	○	4.0	0 -0.015	6.0	4.2	8.2	6	50	2
2FEKS045-067-06	○	4.5	0 -0.015	6.7	4.7	8.9	6	50	2
2FEKS050-075-06	○	5.0	0 -0.015	7.5	5.2	10.1	6	50	2
2FEKS055-082-06	○	5.5	0 -0.015	8.2	5.7	10.8	6	50	2
2FEKS060-090-06	○	6.0	0 -0.020	9.0	-	-	6	50	2
2FEKS080-120-08	○	8.0	-0.005 -0.025	12.0	-	-	8	60	2
2FEKS100-150-10	○	10.0	-0.005 -0.025	15.0	-	-	10	70	2
2FEKS120-180-12	○	12.0	-0.010 -0.030	18.0	-	-	12	75	2
2FEKS140-210-16	○	14.0	-0.010 -0.030	21.0	14.2	31.4	16	75	2
2FEKS150-230-16	○	15.0	-0.010 -0.030	23.0	15.2	35	16	90	2
2FEKS160-240-16	○	16.0	-0.010 -0.030	24.0	-	-	16	90	2

2FEKM (Medium)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length l2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FEKM030-100-06	○	3.0	0 -0.015	10.0	3.15	12.0	6	50	2
2FEKM035-100-06	○	3.5	0 -0.015	10.0	3.68	12.0	6	50	2
2FEKM040-110-06	○	4.0	0 -0.015	11.0	4.2	13.2	6	50	2
2FEKM045-110-06	○	4.5	0 -0.015	11.0	4.7	13.2	6	50	2
2FEKM050-130-06	○	5.0	0 -0.015	13.0	5.2	15.6	6	50	2
2FEKM055-130-06	○	5.5	0 -0.015	13.0	5.7	15.6	6	50	2
2FEKM060-130-06	○	6.0	0 -0.020	13.0	-	-	6	50	2
2FEKM065-160-08	○	6.5	0 -0.020	16.0	6.7	22.4	8	60	2
2FEKM070-160-08	○	7.0	0 -0.020	16.0	7.2	22.4	8	60	2
2FEKM075-190-08	○	7.5	0 -0.020	19.0	7.7	26.6	8	60	2
2FEKM080-190-08	○	8.0	-0.005 -0.025	19.0	-	-	8	60	2
2FEKM085-190-10	○	8.5	-0.005 -0.025	19.0	8.7	26.6	10	70	2
2FEKM090-190-10	○	9.0	-0.005 -0.025	19.0	9.2	26.6	10	70	2
2FEKM095-190-10	○	9.5	-0.005 -0.025	19.0	9.7	26.6	10	70	2
2FEKM100-220-10	○	10.0	-0.005 -0.025	22.0	-	-	10	70	2
2FEKM110-220-12	○	11.0	-0.005 -0.025	22.0	11.2	30.8	12	75	2
2FEKM120-260-12	○	12.0	-0.010 -0.030	26.0	-	-	12	75	2
2FEKM130-260-16	○	13.0	-0.010 -0.030	26.0	13.2	36.4	16	75	2
2FEKM140-260-16	○	14.0	-0.010 -0.030	26.0	14.2	36.4	16	75	2
2FEKM150-300-16	○	15.0	-0.010 -0.030	30.0	15.2	42.0	16	90	2
2FEKM160-320-16	○	16.0	-0.010 -0.030	32.0	-	-	16	90	2

● MEGACOAT and sharp cutting edge enable high precision finishing due to excellent wear and heat resistance.

Recommended Cutting Conditions ➡L36

● : Stock Std. ○ : World Express

No. of Flutes: 4

4 flutes, Sharp corner edge

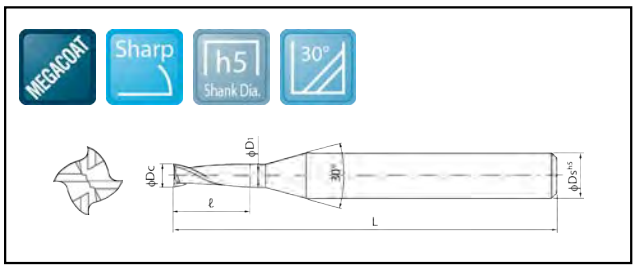
4FESM

Workpiece Materials ★: 1st Choice

4

MEGACOAT is applied

Super Micro-grain carbide



4 flutes, Tough corner edge

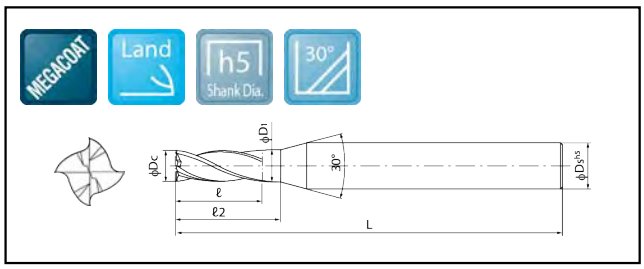
4FEKM

Workpiece Materials ★: 1st Choice

4

MEGACOAT is applied

Super Micro-grain carbide



4FESM

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4FESM010-025-04	○	1.0	0 -0.015	2.5	1.1	4	45	4
4FESM015-040-04	○	1.5	0 -0.015	4.0	1.6	4	45	4
4FESM020-060-04	○	2.0	0 -0.015	6.0	2.1	4	45	4
4FESM025-080-04	○	2.5	0 -0.015	8.0	2.6	4	45	4
4FESM030-100-06	○	3.0	0 -0.015	10.0	3.2	6	50	4
4FESM035-100-06	○	3.5	0 -0.015	10.0	3.7	6	50	4
4FESM040-110-06	○	4.0	0 -0.015	11.0	4.2	6	50	4
4FESM045-110-06	○	4.5	0 -0.015	11.0	4.7	6	50	4
4FESM050-130-06	○	5.0	0 -0.015	13.0	5.2	6	50	4
4FESM055-130-06	○	5.5	0 -0.015	13.0	5.7	6	50	4
4FESM060-130-06	○	6.0	0 -0.020	13.0	-	6	50	4
4FESM080-190-08	○	8.0	-0.005 -0.025	19.0	-	8	60	4
4FESM100-220-10	○	10.0	-0.005 -0.025	22.0	-	10	70	4
4FESM120-260-12	○	12.0	-0.010 -0.030	26.0	-	12	75	4
4FESM140-260-16	○	14.0	-0.010 -0.030	26.0	14.2	16	75	4
4FESM150-300-16	○	15.0	-0.010 -0.030	30.0	15.2	16	90	4
4FESM160-320-16	○	16.0	-0.010 -0.030	32.0	-	16	90	4

4FEKM

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length l2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4FEKM030-100-06	○	3.0	0 -0.015	10.0	3.15	12	6	50	4
4FEKM035-100-06	○	3.5	0 -0.015	10.0	3.68	12	6	50	4
4FEKM040-110-06	○	4.0	0 -0.015	11.0	4.2	13.2	6	50	4
4FEKM045-110-06	○	4.5	0 -0.015	11.0	4.7	13.2	6	50	4
4FEKM050-130-06	○	5.0	0 -0.015	13.0	5.2	15.6	6	50	4
4FEKM055-130-06	○	5.5	0 -0.015	13.0	5.7	15.6	6	50	4
4FEKM060-130-06	○	6.0	0 -0.020	13.0	-	-	6	50	4
4FEKM080-190-08	○	8.0	-0.005 -0.025	19.0	-	-	8	60	4
4FEKM100-220-10	○	10.0	-0.005 -0.025	22.0	-	-	10	70	4
4FEKM120-260-12	○	12.0	-0.010 -0.030	26.0	-	-	12	75	4
4FEKM140-260-16	○	14.0	-0.010 -0.030	26.0	14.2	36.4	16	75	4
4FEKM150-300-16	○	15.0	-0.010 -0.030	30.0	15.2	42	16	90	4
4FEKM160-320-16	○	16.0	-0.010 -0.030	32.0	-	-	16	90	4

Recommended Cutting Conditions L37

● : Stock Std. ○ : World Express

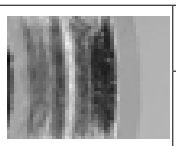
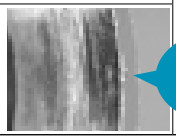
Surface Finish Oriented, for Automatic Lathe

No. of Flutes: 2,3,4

2FESW, 3FESW, 4FESW

(2FESW)

Workpiece Material: Kovar alloy

2FES (Ø3·2flutes) ○Smooth surface of shoulder wall		Facing of machine component · Vc=20m/min (n=2150min^{-1}) · fz=0.023mm/t (Vf=100mm/min)
Competitor C (Ø3·2flutes) ×Large burrs		Large burrs

Comparison with competitor's endmill after 600 passes

2 3 4

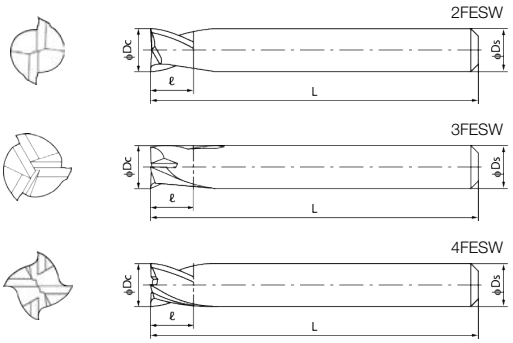
MEGACOAT is applied

Super Micro-grain carbide

Workpiece Materials ★: 1st Choice

★P ~30HRC | P 30~40HRC | H ~55HRC | ★M Stainless steel | K Cast Iron | N Aluminum & Non Ferrous Material

MEGACOAT | Sharp | h6 Shank Dia. | 35°



Sharp Cutting Edge Reduced Burrs

2FESW

Shouldering | Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2FESW050-050-05A	○	5	0 -0.020	5	5	35	2
2FESW060-060-05A	○	6	0 -0.020	6	5	35	2
2FESW030-030-04	○	3	0 -0.020	3	4	45	2
2FESW035-035-04	○	3.5	0 -0.020	3.5	4	45	2
2FESW040-040-04	○	4	0 -0.020	4	4	45	2
2FESW050-050-06	○	5	0 -0.020	5	6	45	2
2FESW060-060-06	○	6	0 -0.020	6	6	45	2
2FESW070-070-07	○	7	0 -0.025	7	7	45	2
2FESW080-080-07	○	8	0 -0.025	8	7	45	2
2FESW080-080-08	○	8	0 -0.025	8	8	45	2
2FESW100-080-07	○	10	0 -0.025	8	7	45	2
2FESW100-080-10	○	10	0 -0.025	8	10	45	2
2FESW120-080-10	○	12	0 -0.025	8	10	45	2
2FESW120-080-12	○	12	0 -0.030	8	12	45	2
2FESW130-080-13	○	13	0 -0.030	8	13	45	2

3FESW

Shouldering | Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
3FESW050-050-05A	○	5	0 -0.020	5	5	35	3
3FESW060-060-05A	○	6	0 -0.020	6	5	35	3
3FESW030-030-04	○	3	0 -0.020	3	4	45	3
3FESW035-035-04	○	3.5	0 -0.020	3.5	4	45	3
3FESW040-040-04	○	4	0 -0.020	4	4	45	3
3FESW050-050-06	○	5	0 -0.020	5	6	45	3
3FESW060-060-06	○	6	0 -0.020	6	6	45	3
3FESW070-070-07	○	7	0 -0.025	7	7	45	3
3FESW080-080-07	○	8	0 -0.025	8	7	45	3
3FESW080-080-08	○	8	0 -0.025	8	8	45	3
3FESW100-080-07	○	10	0 -0.025	8	7	45	3
3FESW100-080-10	○	10	0 -0.025	8	10	45	3
3FESW120-080-10	○	12	0 -0.025	8	10	45	3
3FESW120-080-12	○	12	0 -0.030	8	12	45	3
3FESW130-080-13	○	13	0 -0.030	8	13	45	3

4FESW

Shouldering | Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4FESW030-030-04	○	3	0 -0.020	3	4	45	4
4FESW035-035-04	○	3.5	0 -0.020	3.5	4	45	4
4FESW040-040-04	○	4	0 -0.020	4	4	45	4
4FESW050-050-06	○	5	0 -0.020	5	6	45	4
4FESW060-060-06	○	6	0 -0.020	6	6	45	4
4FESW070-070-07	○	7	0 -0.025	7	7	45	4
4FESW080-080-07	○	8	0 -0.025	8	7	45	4
4FESW080-080-08	○	8	0 -0.025	8	8	45	4
4FESW100-080-07	○	10	0 -0.025	8	7	45	4
4FESW100-080-10	○	10	0 -0.025	8	10	45	4
4FESW120-080-10	○	12	0 -0.025	8	10	45	4
4FESW120-080-12	○	12	0 -0.030	8	12	45	4
4FESW130-080-13	○	13	0 -0.030	8	13	45	4

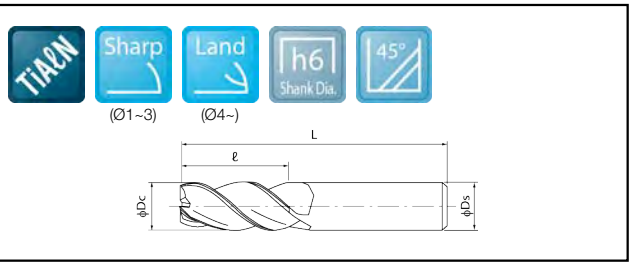
Recommended Cutting Conditions L38-L39

● : Stock Std. ○ : World Express

No. of Flutes: 3

3UFSM

Workpiece Materials ★: 1st Choice



3UFSM

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia.	Mill Dia. tolerance	Length of cut	Shank Dia.	Overall length	No. of Flutes
		ØDc		ℓ	ØDs	L	Z
3UFSM010-030-04	○	1	-0.014 -0.028	3	4	50	3
3UFSM015-030-04	○	1.5	-0.014 -0.028	3	4	50	3
3UFSM020-030-04	○	2	-0.014 -0.028	3	4	50	3
3UFSM025-040-04	○	2.5	-0.014 -0.028	4	4	50	3
3UFSM030-080-06	○	3	-0.014 -0.028	8	6	50	3
3UFSM040-120-06	○	4	-0.020 -0.038	12	6	50	3
3UFSM050-140-06	○	5	-0.020 -0.038	14	6	50	3
3UFSM060-160-06	○	6	-0.020 -0.038	16	6	50	3
3UFSM080-200-08	○	8	-0.025 -0.047	20	8	63	3
3UFSM100-220-10	○	10	-0.025 -0.047	22	10	76	3
3UFSM120-250-12	○	12	-0.032 -0.059	25	12	76	3
3UFSM160-320-16	○	16	-0.032 -0.059	32	16	89	3
3UFSM200-380-20	○	20	-0.040 -0.073	38	20	104	3

● Products emphasizing high efficiency cutting, three flute typeS for general semi finishing. It is available for slotting and shouldering of wide range of workpiece materials.

Recommended Cutting Conditions L39

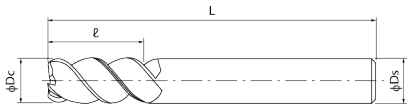
● : Stock Std. ○ : World Express

Multi-Edge for Slotting / Shouldering
Multi-Purpose (High Feed Finishing)

No. of Flutes: 4,5,6

4PGS, 5PGS, 6PGS

Workpiece Materials ★: 1st Choice



4PGSS, 5PGSS

(Short)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4PGSS030-045-06	○	3	-0.014 -0.028	4.5	6	57	4
4PGSS040-060-06	○	4	-0.020 -0.038	6	6	57	4
4PGSS050-075-06	○	5	-0.020 -0.038	7.5	6	76	4
4PGSS060-090-06	○	6	-0.020 -0.038	9	6	76	4
4PGSS080-120-08	○	8	-0.025 -0.047	12	8	100	4
4PGSS100-150-10	○	10	-0.025 -0.047	15	10	100	4
4PGSS120-180-12	○	12	-0.032 -0.059	18	12	125	4
4PGSS160-240-16	○	16	-0.032 -0.059	24	16	125	4
4PGSS200-300-20	○	20	-0.040 -0.073	30	20	150	4
5PGSS250-380-25	○	25	-0.040 -0.073	38	25	150	5

4PGSL, 5PGSL, 6PGSL

(Long)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4PGSL060-210-06	○	6	-0.020 -0.038	21	6	76	4
4PGSL080-280-08	○	8	-0.025 -0.047	28	8	100	4
5PGSL100-350-10	○	10	-0.025 -0.047	35	10	100	5
6PGSL120-420-12	○	12	-0.032 -0.059	42	12	125	6
6PGSL160-560-16	○	16	-0.032 -0.059	56	16	125	6
6PGSL200-700-20	○	20	-0.040 -0.073	70	20	150	6
6PGSL250-880-25	○	25	-0.040 -0.073	88	25	150	6

4PGSM, 5PGSM, 6PGSM

(Medium)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4PGSM060-150-06	○	6	-0.020 -0.038	15	6	76	4
4PGSM080-200-08	○	8	-0.025 -0.047	20	8	100	4
5PGSM100-250-10	○	10	-0.025 -0.047	25	10	100	5
6PGSM120-300-12	○	12	-0.032 -0.059	30	12	125	6
6PGSM160-400-16	○	16	-0.032 -0.059	40	16	125	6
6PGSM200-500-20	○	20	-0.040 -0.073	50	20	150	6
6PGSM250-630-25	○	25	-0.040 -0.073	63	25	150	6

- Web thickness ratio is 60% between the cutting edge and 1Dc and 80% for the rest. Good chip evacuation and high rigidity with Corner land.

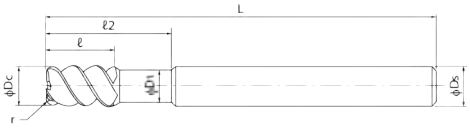
Recommended Cutting Conditions ➡L40-L41

● : Stock Std. ○ : World Express

4PGRM

No. of Flutes: 4

Workpiece Materials ★: 1st Choice



4PGRM

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia.	Mill Dia. tolerance	Length of cut	Neck Dia.	Under Neck Length	Shank Dia.	Overall length	Spec of Corners
		ØDc		ℓ	ØD1	l2	ØDs	L	r
4PGRM030-045-06-R025	○	3	-0.014 -0.028	4.5	2.7	9	6	57	R 0.25
4PGRM030-045-06-R050	○	3	-0.014 -0.028	4.5	2.7	9	6	57	R 0.5
4PGRM040-060-06-R025	○	4	-0.020 -0.038	6	3.7	12	6	57	R 0.25
4PGRM040-060-06-R050	○	4	-0.020 -0.038	6	3.7	12	6	57	R 0.5
4PGRM050-075-06-R025	○	5	-0.020 -0.038	7.5	4.6	15	6	76	R 0.25
4PGRM050-075-06-R050	○	5	-0.020 -0.038	7.5	4.6	15	6	76	R 0.5
4PGRM060-090-06-R025	○	6	-0.020 -0.038	9	5.5	18	6	76	R 0.25
4PGRM060-090-06-R050	○	6	-0.020 -0.038	9	5.5	18	6	76	R 0.5
4PGRM060-090-06-R075	○	6	-0.020 -0.038	9	5.5	18	6	76	R 0.75
4PGRM060-090-06-R100	○	6	-0.020 -0.038	9	5.5	18	6	76	R 1.0
4PGRM080-120-08-R050	○	8	-0.025 -0.047	12	7.4	24	8	100	R 0.5
4PGRM080-120-08-R100	○	8	-0.025 -0.047	12	7.4	24	8	100	R 1.0
4PGRM080-120-08-R150	○	8	-0.025 -0.047	12	7.4	24	8	100	R 1.5
4PGRM080-120-08-R200	○	8	-0.025 -0.047	12	7.4	24	8	100	R 2.0
4PGRM100-150-10-R050	○	10	-0.025 -0.047	15	9.2	30	10	100	R 0.5
4PGRM100-150-10-R100	○	10	-0.025 -0.047	15	9.2	30	10	100	R 1.0
4PGRM100-150-10-R150	○	10	-0.025 -0.047	15	9.2	30	10	100	R 1.5
4PGRM100-150-10-R200	○	10	-0.025 -0.047	15	9.2	30	10	100	R 2.0
4PGRM120-180-12-R050	○	12	-0.032 -0.059	18	11	36	12	125	R 0.5
4PGRM120-180-12-R100	○	12	-0.032 -0.059	18	11	36	12	125	R 1.0
4PGRM120-180-12-R150	○	12	-0.032 -0.059	18	11	36	12	125	R 1.5
4PGRM120-180-12-R200	○	12	-0.032 -0.059	18	11	36	12	125	R 2.0
4PGRM160-240-16-R050	○	16	-0.032 -0.059	24	15	48	16	125	R 0.5
4PGRM160-240-16-R150	○	16	-0.032 -0.059	24	15	48	16	125	R 1.5
4PGRM200-300-20-R050	○	20	-0.040 -0.073	30	19	60	20	150	R 0.5
4PGRM200-300-20-R200	○	20	-0.040 -0.073	30	19	60	20	150	R 2.0

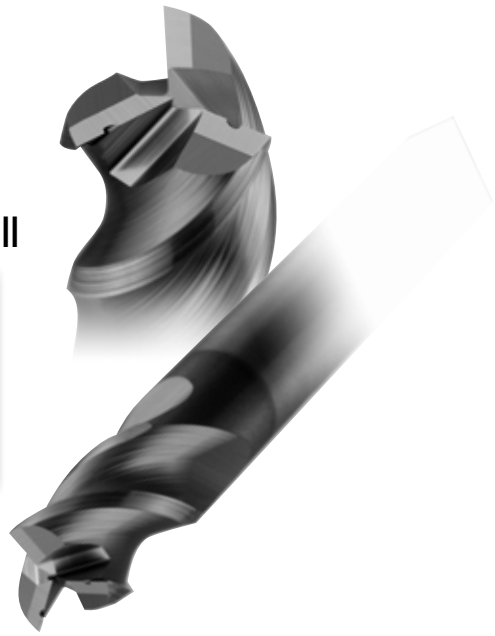
No. of Flutes Z=4

Recommended Cutting Conditions L41

- Radius type with 4 flutes. The diameter of the neck portion is thinner than the cutting diameter and it is suitable for deep slotting. Due to the corner-R on the cutting edge, it is applicable for finishing of sloped workpiece.

● : Stock Std. ○ : World Express

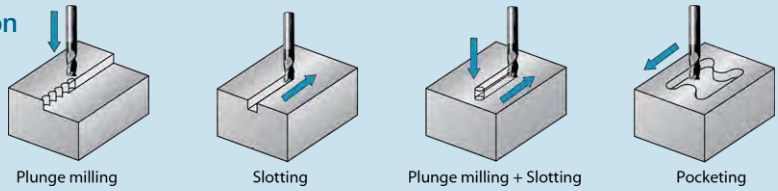
3ZFK



Triple function

Applicable for plunge milling, slotting and finishing with one endmill

●Application

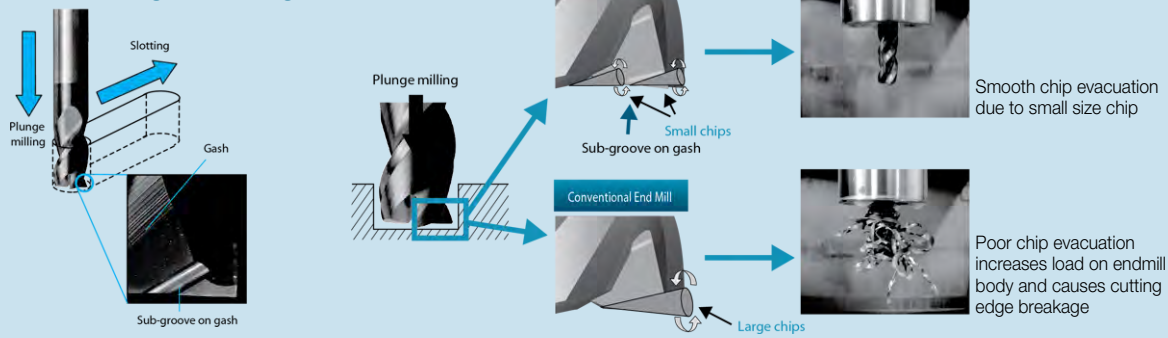


Triple Performance

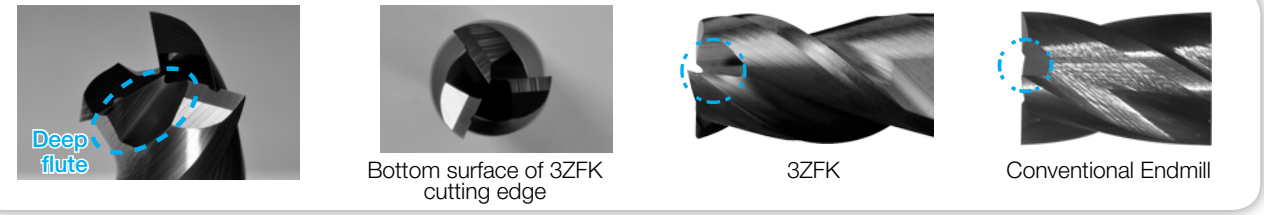
1. New design promotes high efficiency cutting

· Sub-groove on gash breaks chips during plunge milling resulting in smooth chip evacuation

●Effect of sub-groove on gash



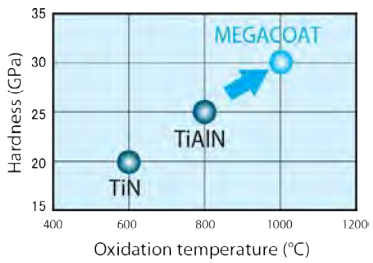
· Prevents **chip clogging** due to deep flute and gash design.



2. Longer tool life due to MEGACOAT

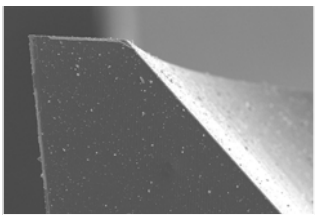
· Excellent wear resistance and heat-resistance

MEGACOAT (New PVD coat)



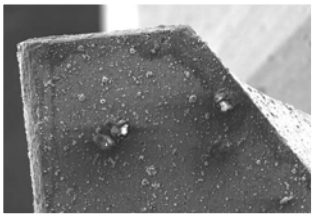
3. Better surface finish due to sharp cutting edge quality

· Smooth and sharp to the tip of the cutting edge
· Controls burr formation. Better surface roughness



MEGACOAT

Smooth and sharp to the tip of the cutting edge
Longer tool life and improved surface finish.



Competitor Coating A

Rough coating surface and round blunt cutting edge

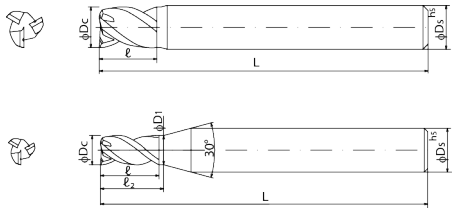
3ZFKS, 3ZFKM

3

MEGACOAT is applied

Super Micro-grain carbide

Workpiece Materials ★: 1st Choice



3ZFKS (Short)

Shouldering | Slotting | Plunge milling

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length l2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
3ZFKS060-090-06 fig.1	○	6.0	0 -0.02	9	-	-	6	50	3
3ZFKS070-105-08 fig.2	○	7.0	0 -0.02	10.5	7.2	11.3	8	60	3
3ZFKS080-120-08 fig.1	○	8.0	-0.005 -0.025	12	-	-	8	60	3
3ZFKS100-150-10 fig.1	○	10.0	-0.005 -0.025	15	-	-	10	70	3
3ZFKS120-180-12 fig.1	○	12.0	-0.01 -0.03	18	-	-	12	75	3

3ZFKM (Medium)

Shouldering | Slotting | Plunge milling

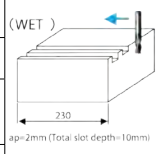
(Unit : mm)

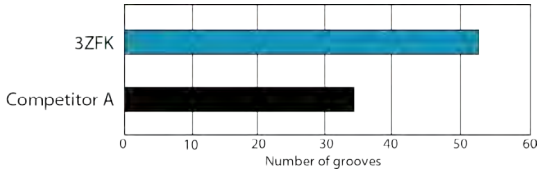
Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length ℓ2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
3ZFKM030-060-06 fig.2	○	3.0	0 -0.015	6.0	3.2	6.5	6	50	3
3ZFKM040-080-06 fig.2	○	4.0	0 -0.015	8.0	4.2	8.6	6	50	3
3ZFKM050-100-06 fig.2	○	5.0	0 -0.015	10.0	5.2	10.8	6	50	3
3ZFKM060-130-06 fig.1	○	6.0	0 -0.02	13.0	-	-	6	50	3
3ZFKM070-160-08 fig.2	○	7.0	0 -0.02	16.0	7.2	17.3	8	60	3
3ZFKM080-190-08 fig.1	○	8.0	-0.005 -0.025	19.0	-	-	8	60	3
3ZFKM100-220-10 fig.1	○	10.0	-0.005 -0.025	22.0	-	-	10	70	3
3ZFKM120-260-12 fig.1	○	12.0	-0.01 -0.03	26.0	-	-	12	75	3

Case Studies

●Slotting of Titanium Alloy

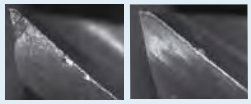
Outside Dia.	Ø10
Workpiece Material	Ti-6Al-4V
Spindle Revolution	3ZFK:n=1700min^{-1}
	Competitor A: n=1300min^{-1}
Feed Rate	Vf=460mm/min
Depth of Cut	ap×ae=2×10mm



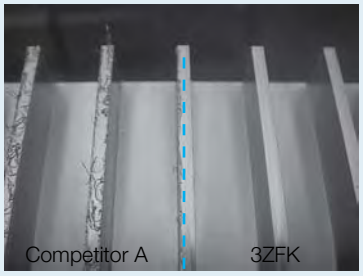


- Better surface finish and longer tool life with 3ZFK.
- Compared to competitor's coated products, the 3ZFK has a 1.4 times longer tool life.
- 3ZFK prevents burr formation due to sharp cutting edge.

◆Cutting edge after 35 passes



Competitor A 3ZFK



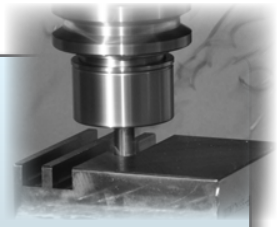
● : Stock Std. ○ : World Express

Recommended Cutting Conditions L42

4MFK NEW

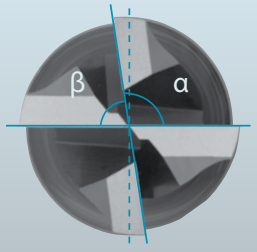
Innovative design for high efficiency stable milling

●Unequal spacing of teeth / Variable Lead



Superior anti vibration performance due to Kyocera's unique varied interval flute design / Variable Lead

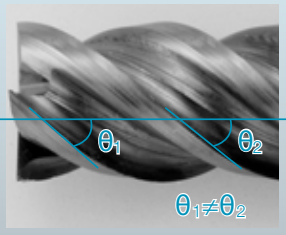
Varied interval flute design



Cutting force varies due to varied flute width, which prevents periodical vibration during milling.

α≠β

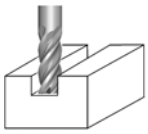
Variable Lead



Every flute has its optimum Helix Angle (Lead Angle θ), which enables excellent anti vibration effect. Prevents chattering, and superior surface finish

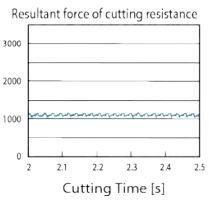
Helix Angle: θ_1=42°,θ_2=44°

Variable Lead: Prevents chattering

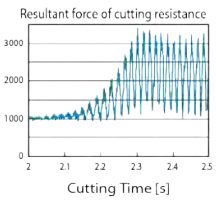


Workpiece Material	SCM440
Outside Dia.	Ø8
Spindle Revolution	n=2,650min^{-1}
Table feed	Vf=300mm/min
Depth of cut	ap×ae=10×8mm

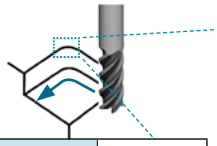
4MFK080-190



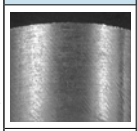
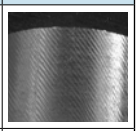
Competitor A (Equal lead angle)



Superior surface finish, compared to Competitor B (variable lead angle)



Workpiece Material	S45C
Outside Dia.	Ø8
Spindle Revolution	n=6,000min^{-1}
Table feed	Vf=1,500mm/min
Depth of cut	ap×ae=8×2mm

4MFK080-190	Competitor B Variable Lead Endmill
	
Prevents chattering	Chattering occurs

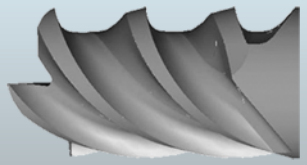
Minimum vibration when shouldering. Excellent surface finish.

●Special Flute Design

Stable Chip Evacuation due to New Special Flute Design

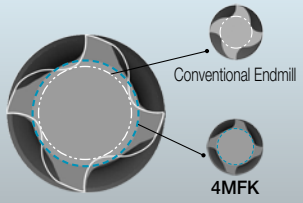
Wide chip pocket

Wide Chip Pocket Effects: Excellent chip evacuation in high feed grooving



High rigidity due to increased core thickness

Core thickness improves the rigidity, preventing vibration and inclination of tool during machining.

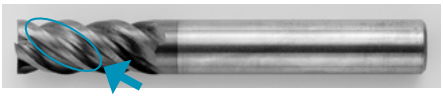


Wear comparison

Wear comparison (SUS304)

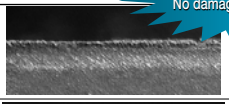
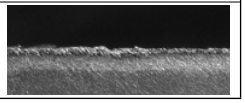
About 65% less wear, compared with the competitor (variable lead angle)

Workpiece Material	SUS304	Spindle Revolution	n=4,000min^{-1}
Outside Dia.	Ø8	Table feed	Vf=840mm/min
Depth of cut	ap×ae=8×0.8mm	Applications	Shouldering



Cutting edge comparison after cutting 50m

About 65% less wear, compared with the competitor. No damage on the cutting edge

4MFK080-190	
Competitor D Variable Lead Endmill	

MEGACOAT minimizes cutting edge wear of 4MFK endmill. Able to continue cutting.

4MFK NEW

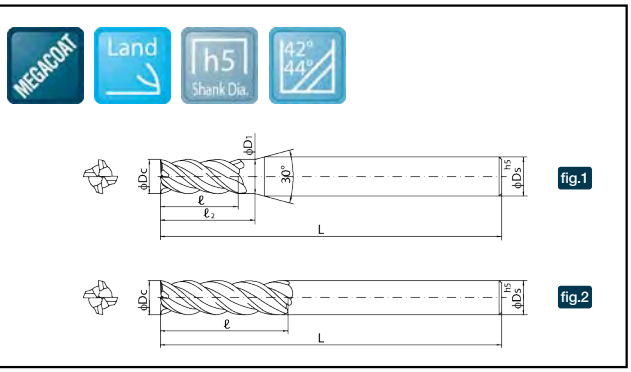
No. of Flutes: 4

4

MEGACOAT is applied

Super Micro-grain carbide

Workpiece Materials ★: 1st Choice



4MFK

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	* Length of cut	Neck Dia. ØD1	Under Neck Length ℓ2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4MFK030-045 fig.1	○	3.0	0 -0.015	4.5	S	3.15	5.4	6	60	4
4MFK030-080 fig.1	○			8	M		9.6			
4MFK030-120 fig.1	○			12	L		14.4			
4MFK040-060 fig.1	○	4.0	0 -0.015	6	S	4.2	7.2	6	60	4
4MFK040-110 fig.1	○			11	M		13.2			
4MFK040-160 fig.1	○			16	L		19.2			
4MFK050-075 fig.1	○	5.0	0 -0.015	7.5	S	5.2	9.0	6	60	4
4MFK050-130 fig.1	○			13	M		15.6			
4MFK050-200 fig.1	○			20	L		24.0			
4MFK060-090 fig.2	○	6.0	0 -0.020	9	S	-	-	6	60	4
4MFK060-130 fig.2	○			13	M					
4MFK060-220 fig.2	○			22	L					
4MFK070-105 fig.1	○	7.0	0 -0.020	10.5	S	7.2	12.6	8	70	4
4MFK070-160 fig.1	○			16	M		19.2			
4MFK070-250 fig.1	○			25	L		30.0			
4MFK080-120 fig.2	○	8.0	-0.005 -0.025	12	S	-	-	8	70	4
4MFK080-190 fig.2	○			19	M					
4MFK080-280 fig.2	○			28	L					
4MFK090-135 fig.1	○	9.0	-0.005 -0.025	13.5	S	9.2	16.2	10	80	4
4MFK090-205 fig.1	○			20.5	M		24.6			

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	* Length of cut	Neck Dia. ØD1	Under Neck Length ℓ2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4MFK100-150 fig.2	○	10.0	-0.005 -0.025	15	S	-	-	10	80	4
4MFK100-220 fig.2	○			22	M					
4MFK100-330 fig.2	○			33	L					
4MFK120-180 fig.2	○	12.0	-0.010 -0.030	18	S	-	-	12	100	4
4MFK120-260 fig.2	○			26	M					
4MFK120-360 fig.2	○			36	L					
4MFK160-240 fig.2	○	16.0	-0.010 -0.030	24	S	-	-	16	110	4
4MFK160-350 fig.2	○			35	M					
4MFK160-480 fig.2	○			48	L					

* Applications for each cutting edge length

S: Short, M: Medium } ····· Shouldering Slotting

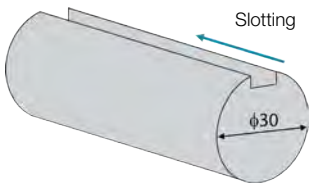
L : Long ····· Shouldering

Recommended Cutting Conditions L43

Case Studies

S45C

- Automotive parts
- n=3,500min⁻¹(Vc=77m/min)
- ap×ae=5x7mm
- Vf=1000mm/min (fz=0.071mm/t)
- Wet



4MFK070-160 — 255 pcs/edge

Competitor Coated Carbide E — 50 pcs/edge

6.6 times the productivity
5 times the tool life

[Competitor Coated Carbide E]
Ø7·4 flutes
n=2000min⁻¹(Vc=44m/min)
ap×ae=5×7mm
Vf=150mm/min (fz=0.019mm/t)
Wet

- 4MFK showed 5 times longer tool life than Competitor E.
- Compared to Competitor E, 4MFK increased the feed rate by 6.6 times.
- No vibration occurred. Stable milling.

(Evaluation by the user)

SCr415

- Machine parts
- n=1,400min⁻¹(Vc=53m/min)
- apxae=12x5mm
- Vf=280mm/min (fz=0.05mm/t)
- Wet

3.5 times the tool life

4MFK120-260 — 700 pcs/edge

Competitor Coated Carbide F — 200 pcs/edge

[Competitor Coated Carbide F]
Ø12·4flutes
n=1400min⁻¹(Vc=53m/min)
apxae=12x5mm
Vf=280mm/min (fz=0.05mm/t)
Wet

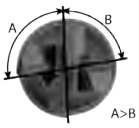
- Reduced load on the tool, even after cutting 700 pieces.
  Regular cutting sounds, no chattering.
- Compared to Competitor F, 4MFK showed 3.5 times longer tool life.

(Evaluation by the user)

● : Stock Std. ○ : World Express

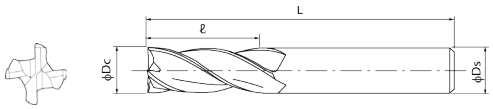
No. of Flutes: 4

4YEKM, 4YECM, 4YERM



4YECM's Varied interval flute design

Workpiece Materials ★: 1st Choice



4YEKM (With corner land)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners	No. of Flutes Z
4YEKM040-120-06	○	4	-0.020 -0.038	12	6	55	-	4
4YEKM050-130-06	○	5	-0.020 -0.038	13	6	57	-	4
4YEKM060-130-06	○	6	-0.020 -0.038	13	6	57	-	4
4YEKM080-160-08	○	8	-0.025 -0.047	16	8	63	-	4
4YEKM090-190-10	○	9	-0.025 -0.047	19	10	72	-	4
4YEKM100-220-10	○	10	-0.025 -0.047	22	10	72	-	4
4YEKM120-260-12	○	12	-0.032 -0.059	26	12	83	-	4
4YEKM160-320-16	○	16	-0.032 -0.059	32	16	92	-	4
4YEKM200-380-20	○	20	-0.040 -0.073	38	20	104	-	4
4YEKM250-450-25	○	25	-0.040 -0.073	45	25	121	-	4

4YECM (With corner chamfering)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners	No. of Flutes Z
4YECM040-120-06-C04	○	4	-0.020 -0.038	12	6	55	C 0.4	4
4YECM050-130-06-C04	○	5	-0.020 -0.038	13	6	57	C 0.4	4
4YECM060-130-06-C04	○	6	-0.020 -0.038	13	6	57	C 0.4	4
4YECM080-160-08-C04	○	8	-0.025 -0.047	16	8	63	C 0.4	4
4YECM090-190-10-C05	○	9	-0.025 -0.047	19	10	72	C 0.5	4
4YECM100-220-10-C05	○	10	-0.025 -0.047	22	10	72	C 0.5	4
4YECM120-260-12-C05	○	12	-0.032 -0.059	26	12	83	C 0.5	4
4YECM160-320-16-C05	○	16	-0.032 -0.059	32	16	92	C 0.5	4
4YECM200-380-20-C05	○	20	-0.040 -0.073	38	20	104	C 0.5	4
4YECM250-450-25-C05	○	25	-0.040 -0.073	45	25	121	C 0.5	4

4YERM (Radius)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners	No. of Flutes Z
4YERM040-120-06-R020	○	4	-0.020 -0.038	12	6	55	R 0.2	4
4YERM050-130-06-R020	○	5	-0.020 -0.038	13	6	57	R 0.2	4
4YERM060-130-06-R020	○	6	-0.020 -0.038	13	6	57	R 0.2	4
4YERM080-160-08-R020	○	8	-0.025 -0.047	16	8	63	R 0.2	4
4YERM090-190-10-R020	○	9	-0.025 -0.047	19	10	72	R 0.2	4
4YERM100-220-10-R030	○	10	-0.025 -0.047	22	10	72	R 0.3	4
4YERM120-260-12-R030	○	12	-0.032 -0.059	26	12	83	R 0.3	4
4YERM160-320-16-R030	○	16	-0.032 -0.059	32	16	92	R 0.3	4
4YERM200-380-20-R030	○	20	-0.040 -0.073	38	20	104	R 0.3	4
4YERM250-450-25-R030	○	25	-0.040 -0.073	45	25	121	R 0.3	4

- Varied interval flute design prevents vibration and reduces cutting force at slotting. This has led to the high speed and high feed cutting. We provide three types of edge shape for different application; Radius, Corner Land and Corner Chamfered type. There is Maximum 0.01mm back taper.

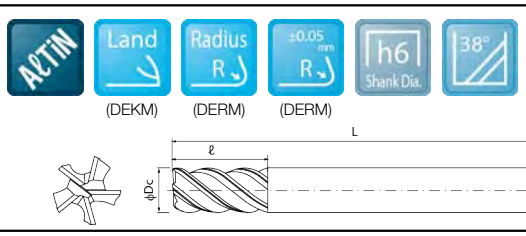
Recommended Cutting Conditions L43

● : Stock Std. ○ : World Express

No. of Flutes: 5

5DEKM, 5DERM

Workpiece Materials ★: 1st Choice



5

5DEKM (With corner land)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
5DEKM040-120-06	○	4	-0.020 -0.038	12	6	55	5
5DEKM050-130-06	○	5	-0.020 -0.038	13	6	57	5
5DEKM060-130-06	○	6	-0.020 -0.038	13	6	57	5
5DEKM080-160-08	○	8	-0.025 -0.047	16	8	63	5
5DEKM090-190-10	○	9	-0.025 -0.047	19	10	72	5
5DEKM100-220-10	○	10	-0.025 -0.047	22	10	72	5
5DEKM120-260-12	○	12	-0.032 -0.059	26	12	83	5
5DEKM160-320-16	○	16	-0.032 -0.059	32	16	92	5
5DEKM200-380-20	○	20	-0.040 -0.073	38	20	104	5
5DEKM250-450-25	○	25	-0.040 -0.073	45	25	121	5

5DERM (Radius)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners	No. of Flutes Z
5DERM040-120-06-R025	○	4	-0.020 -0.038	12	6	55	R0.25	5
5DERM050-130-06-R025	○	5	-0.020 -0.038	13	6	57	R0.25	5
5DERM060-130-06-R040	○	6	-0.020 -0.038	13	6	57	R0.4	5
5DERM080-160-08-R050	○	8	-0.025 -0.047	16	8	63	R0.5	5
5DERM090-190-10-R050	○	9	-0.025 -0.047	19	10	72	R0.5	5
5DERM100-220-10-R050	○	10	-0.025 -0.047	22	10	72	R0.5	5
5DERM120-260-12-R075	○	12	-0.032 -0.059	26	12	83	R0.75	5
5DERM160-320-16-R075	○	16	-0.032 -0.059	32	16	92	R0.75	5
5DERM200-380-20-R075	○	20	-0.040 -0.073	38	20	104	R0.75	5
5DERM250-450-25-R075	○	25	-0.040 -0.073	45	25	121	R0.75	5

- 5 edge design enables high feed rate cutting. Varied intervals prevent vibration. 5DERM is suitable for 0.8Dc slotting.

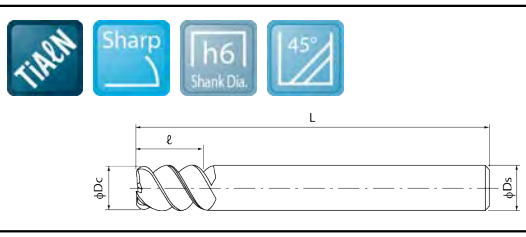
Recommended Cutting Conditions 23

Steel and Difficult-to-cut materials, Finishing

No. of Flutes: 4,6

4YFSM, 6YFSM

Workpiece Materials ★: 1st Choice



4 6

4YFSM

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4YFSM040-130-06	○	4	-0.020 -0.038	13	6	50	4
4YFSM050-130-06	○	5	-0.020 -0.038	13	6	50	4

- Multiple flutes type with excellent chip evacuation. (web thickness ratio: 60%) It has positive type rake angle and suitable for semi-finishing of difficult-to-cut materials such as stainless steel and inconel.

6YFSM

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
6YFSM060-130-06	○	6	-0.020 -0.038	13	6	50	6
6YFSM080-190-08	○	8	-0.025 -0.047	19	8	63	6
6YFSM100-220-10	○	10	-0.025 -0.047	22	10	76	6
6YFSM120-260-12	○	12	-0.032 -0.059	26	12	76	6
6YFSM160-320-16	○	16	-0.032 -0.059	32	16	89	6
6YFSM200-380-20	○	20	-0.040 -0.073	38	20	104	6

● : Stock Std. ○ : World Express

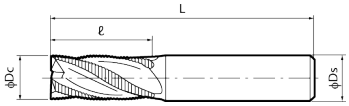
Recommended Cutting Conditions L45

High Efficiency Chip Evacuation Roughing, Large Flat Surface

No. of Flutes: 3,4,5

3RDS, 4RDS, 5RDS

Workpiece Materials ★: 1st Choice



3RDSM, 4RDSM, 5RDSM

Shouldering Slotting

(Medium)

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners C	No. of Flutes Z
3RDSM040-110-06	○	4	-0.030 -0.105	11	6	55	0.3	3
3RDSM050-130-06	○	5	-0.030 -0.105	13	6	57	0.3	3
3RDSM060-130-06	○	6	-0.030 -0.105	13	6	57	0.3	3
3RDSM080-160-08	○	8	-0.040 -0.130	16	8	63	0.3	3
4RDSM100-220-10	○	10	-0.040 -0.130	22	10	72	0.5	4
4RDSM120-260-12	○	12	-0.050 -0.160	26	12	83	0.5	4
4RDSM160-320-16	○	16	-0.050 -0.160	32	16	92	0.5	4
4RDSM200-380-20	○	20	-0.065 -0.195	38	20	104	0.5	4
5RDSM250-450-25	○	25	-0.065 -0.195	45	25	121	0.5	5

3RDSL, 4RDSL, 5RDSL

Shouldering

(Long)

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners C	No. of Flutes Z
3RDSL060-240-06	○	6	-0.030 -0.105	24	6	76	0.3	3
3RDSL080-280-08	○	8	-0.040 -0.130	28	8	76	0.3	3
4RDSL100-340-10	○	10	-0.040 -0.130	34	10	89	0.5	4
4RDSL120-450-12	○	12	-0.050 -0.160	45	12	100	0.5	4
4RDSL160-560-16	○	16	-0.050 -0.160	56	16	125	0.5	4
4RDSL200-600-20	○	20	-0.065 -0.195	60	20	125	0.5	4
5RDSL250-800-25	○	25	-0.065 -0.195	80	25	150	0.5	5

- Three, four and five flutes types are available for roughing. They reduce cutting force due to the edge design with s-curve pattern.

Recommended Cutting Conditions ➡L45-L46

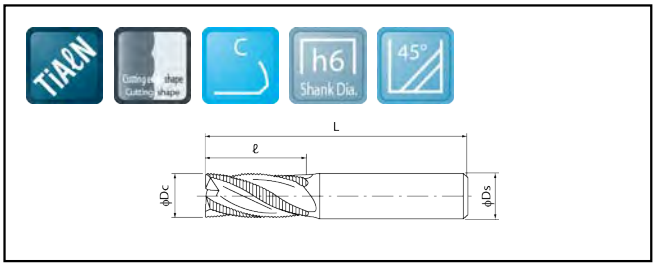
● : Stock Std. ○ : World Express

High Efficiency Chip Evacuation Roughing, Roughing Surface

No. of Flutes: 4,6

4RFSM, 6RFSM

Workpiece Materials ★: 1st Choice



4RFSM

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners C	No. of Flutes Z
4RFSM060-130-06	○	6	-0.030 -0.105	13	6	57	0.3	4
4RFSM080-160-08	○	8	-0.040 -0.130	16	8	63	0.4	4
4RFSM100-220-10	○	10	-0.040 -0.130	22	10	72	0.5	4
4RFSM120-260-12	○	12	-0.050 -0.160	26	12	83	0.6	4
4RFSM160-320-16	○	16	-0.050 -0.160	32	16	92	0.6	4
4RFSM200-380-20	○	20	-0.065 -0.195	38	20	104	1.0	4

6RFSM

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners C	No. of Flutes Z
6RFSM160-320-16	○	16	-0.050 -0.160	32	16	92	0.6	6
6RFSM200-380-20	○	20	-0.065 -0.195	38	20	104	1.0	6
6RFSM250-450-25	○	25	-0.065 -0.195	45	25	121	1.1	6

Recommended Cutting Conditions ➡ L46

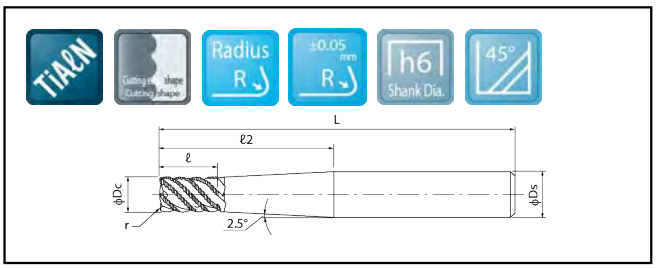
- RFS type is applicable for hard materials and titanium alloys due to strong cutting edge with notched surface and 45 degrees helix angle.

High efficiency chip evacuation, Roughing, Notched surface, Radius

No. of Flutes: 3,4

3RFRS, 4RFRS

Workpiece Materials ★: 1st Choice



3RFRS (Radius)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners r	Under Neck Length l2	No. of Flutes Z
3RFRS040-040-06-R075	○	4	-0.030 -0.105	4	6	75	R 0.75	27.5	3
3RFRS050-050-06-R075	○	5	-0.030 -0.105	5	6	75	R 0.75	17	3

- Due to the strong cutting edge with large flat surface, it is suitable for hard materials and titanium alloys. It can provide good surface roughness of 2.5 to 4.9 μmRa.

4RFRS (Radius)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners r	Under Neck Length l2	No. of Flutes Z
4RFRS060-060-10-R075	○	6	-0.030 -0.105	6	10	100	R 0.75	52.5	4
4RFRS080-080-10-R075	○	8	-0.040 -0.130	8	10	100	R 0.75	31.5	4
4RFRS100-100-12-R075	○	10	-0.040 -0.130	10	12	125	R 0.75	33.5	4
4RFRS120-120-16-R100	○	12	-0.050 -0.160	12	16	125	R 1.0	58.5	4

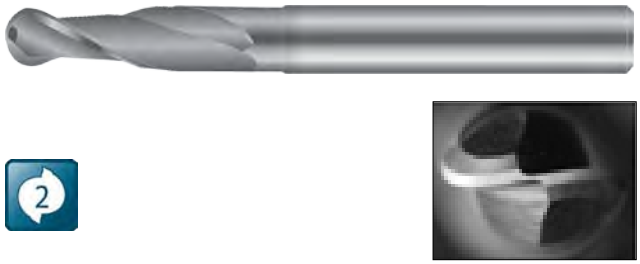
● : Stock Std. ○ : World Express

Recommended Cutting Conditions ➡ L47

No. of Flutes: 2,3

2UEBS (Ball-nose Endmill with 2 Flutes)

Workpiece Materials ★: 1st Choice



3UEBS (Ball-nose Endmill with 3 Flutes)

Workpiece Materials ★: 1st Choice

2UEBS (Ball-nose Endmill with 2 Flutes) Copying

(Unit : mm)

Description	Stock	*Radius of Ball-nose	Outside Dia.	Mill Dia. tolerance	Length of cut	Neck Dia.	Under Neck Length	Shank Dia.	Overall length
		R	ØDc		ℓ	ØD1	l2	ØDs	L
2UEBS010-030-04	○	R0.5	1	-0.014 -0.028	3	-	-	4	50
2UEBS020-030-04	○	R1	2	-0.014 -0.028	3	-	-	4	50
2UEBS030-095-06	○	R1.5	3	-0.014 -0.028	9.5	-	-	6	58
2UEBS040-120-06	○	R2	4	-0.020 -0.038	12	-	-	6	76
2UEBS050-140-06	○	R2.5	5	-0.020 -0.038	14	-	-	6	76
2UEBS060-160-06	○	R3	6	-0.020 -0.038	16	5.5	40	6	100
2UEBS080-200-08	○	R4	8	-0.025 -0.047	20	7.5	40	8	100
2UEBS100-220-10	○	R5	10	-0.025 -0.047	22	9.5	35	10	100
2UEBS120-250-12	○	R6	12	-0.032 -0.059	25	11.5	50	12	125
2UEBS160-320-16	○	R8	16	-0.032 -0.059	32	15.5	60	16	150
2UEBS200-380-20	○	R10	20	-0.040 -0.073	38	19.5	60	20	150

* Actual ball-nose radius will be half of actual measurement of outside diameter.

3UEBS (Ball-nose Endmill with 3 Flutes) Copying

(Unit : mm)

Description	Stock	*Radius of Ball-nose	Outside Dia.	Mill Dia. tolerance	Length of cut	Shank Dia.	Overall length
		R	ØDc		ℓ	ØDs	L
3UEBS030-070-06	○	R1.5	3	-0.014 -0.028	7	6	57
3UEBS040-080-06	○	R2	4	-0.020 -0.038	8	6	57
3UEBS050-100-06	○	R2.5	5	-0.020 -0.038	10	6	57
3UEBS060-100-06	○	R3	6	-0.020 -0.038	10	6	57
3UEBS080-160-08	○	R4	8	-0.025 -0.047	16	8	63
3UEBS100-190-10	○	R5	10	-0.025 -0.047	19	10	72
3UEBS120-220-12	○	R6	12	-0.032 -0.059	22	12	83

- Ball-nose endmill with three flutes for cutting of difficult-to-cut materials.

Recommended Cutting Conditions ➡L47

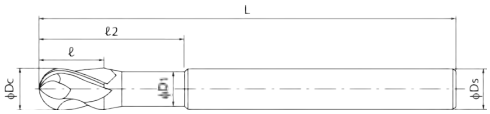
● : Stock Std. ○ : World Express

Ball-Nose Endmill with 4 Flutes

No. of Flutes: 4

4YEBM

Workpiece Materials ★: 1st Choice



4YEBM (Ball-nose Endmill with 4 Flutes)

Shouldering Slotting

(Unit : mm)

Description	Stock	*Radius of Ball-nose	Outside Dia.	Mill Dia. tolerance	Length of cut	Neck Dia.	Under Neck Length	Shank Dia.	Overall length
		R	ØDc		ℓ	ØD1	ℓ2	ØDs	L
4YEBM050-090-06	○	R2.5	5	-0.020 -0.038	9	4.5	15	6	57
4YEBM060-100-06	○	R3	6	-0.020 -0.038	10	5.5	15	6	57
4YEBM080-120-08	○	R4	8	-0.025 -0.047	12	7.4	20	8	63
4YEBM100-140-10	○	R5	10	-0.025 -0.047	14	9.2	25	10	72
4YEBM120-160-12	○	R6	12	-0.032 -0.059	16	11	30	12	83
4YEBM160-220-16	○	R8	16	-0.032 -0.059	22	15	38	16	92
4YEBM200-260-20	○	R10	20	-0.040 -0.073	26	19	50	20	104

No. of Flutes Z=4

* Actual ball-nose radius will be half of actual measurement of outside diameter.

● Ball-nose endmill for semi-finishing of difficult-to-cut materials.

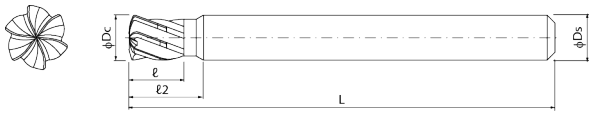
Recommended Cutting Conditions ➡L48

● : Stock Std. ○ : World Express

6PDRS

No. of Flutes: 6

Workpiece Materials ★: 1st Choice



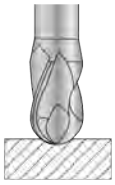
6PDRS

(Unit : mm)

Description	Stock	Outside Dia.	Mill Dia. tolerance	Length of cut	Under Neck Length	Shank Dia.	Overall length	No. of Flutes
		ØDc		ℓ	ℓ2	ØDs	L	Z
6PDRS060-045-06	○	6	-0.020 -0.038	4.5	9	6	57	6
6PDRS080-060-08	○	8	-0.025 -0.047	6	12	8	63	6
6PDRS100-075-10	○	10	-0.025 -0.047	7.5	15	10	72	6
6PDRS120-090-12	○	12	-0.032 -0.059	9	18	12	83	6

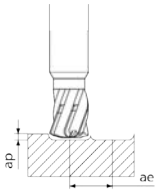
- Increased rigidity with large core diameter. 6 edged design enables high feed rate cutting. Achieves large cutting allowance and high efficiency cutting with special corner-R shaped.
  Ramping and arc cutting are possible.

PDR



General Purpose Ball-nose End Mi

Recommended Cutting Conditions



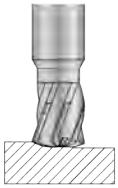
Copying

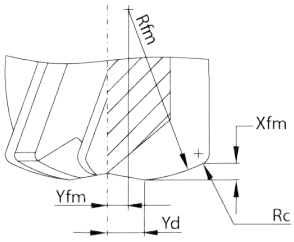
Workpiece Material		Depth of Cut (ap×ae) (mm)	Outside Dia. Dc(mm)	Ø6	Ø8	Ø10	Ø12
Pre-hardened steel	52HRC	Ø6: 0.32×3.3mm (0.32×0.55Dc) Ø8: 0.42×4.4mm (0.42×0.55Dc) Ø10: 0.53×5.5mm (0.53×0.55Dc) Ø12: 0.63×6.6mm (0.63×0.55Dc)	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200
			Feed Rate (mm/min)	7,600	7,200	6,900	7,600
Alloy steel	45HRC		Spindle Revolution (min^{-1})	8,500	6,400	5,100	4,200
			Feed Rate (mm/min)	15,300	15,300	15,300	12,700

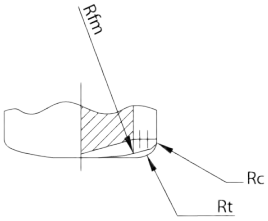
● : Stock Std. ○ : World Express

6PDRS Ramping / Arc Cutting

Details of 6PDRS cutting edge shape







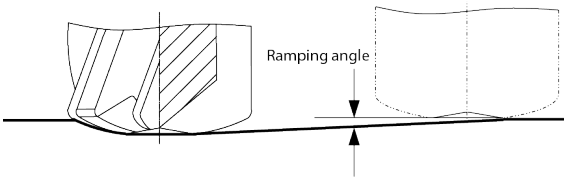
Xfm : Maximum Depth of Cut
Yfm : Distance between the center line of tool and the center of Rfm
Yd : Distance between the center line of tool and the start position of cutting edge
Rfm : Radius of tool tip
Rc : Corner-R
Rt : Virtual radius in program

Description	Outside Dia.	Depth of Cut	Radius of Tool Tip	Corner-R	Distance between the center line of tool and the center of Rfm	Distance between the center line of tool and the start position of cutting edge	Virtual radius in program
	ØDc	Xfm	Rfm	Rc	Yfm	Yd	Rt
6PDRS060-045-06	6	0.32	6	0.62	0.75	1.32	0.62
6PDRS080-060-08	8	0.42	8	0.83	1.00	1.76	0.83
6PDRS100-075-10	10	0.53	10	1.04	1.25	2.20	1.04
6PDRS120-090-12	12	0.63	12	1.24	1.50	2.64	1.24

- Cutting with cut amount exceeding the Xfm value is not recommended.

Ramping

During ramping, lower the feed rate to the ratio in the chart on the right.

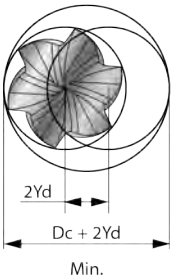


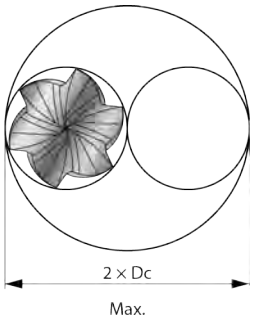
Ramping angle	1°	2°	3°	4°	5°
Ratio of feed rate	100%	70%	50%	30%	10%

- During pocket cutting, set the ramping angle at 0.5°.
- Vertical milling is not recommended.

Circular Interpolation

For arc cutting, hole diameter of each cut should be within the range in the chart on the right.





Description	Min.	Max.
6PDRS060-045-06	8.64	12.00
6PDRS080-060-08	11.52	16.00
6PDRS100-075-10	14.40	20.00
6PDRS120-090-12	17.28	24.00

No. of Flutes: 4,5,6,7,8

4HFS, 5HFS, 6HFS, 7HFS, 8HFS

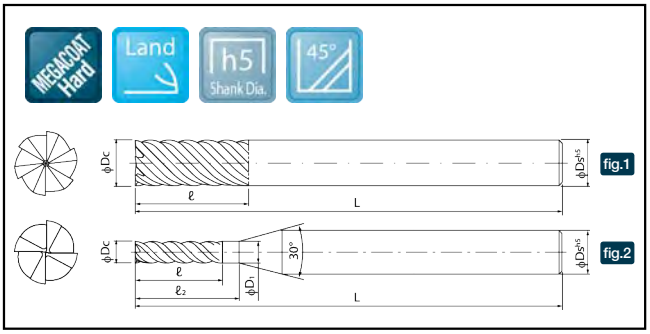
4 5 6 7 8 HFSM

"MEGACOAT Hard" is applied

Super Micro-grain carbide

Height efficiency cutting

Workpiece Materials ★: 1st Choice

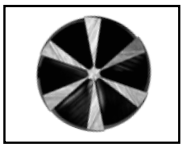


4HFSS, 5HFSS, 6HFSS, 7HFSS (Short)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length ℓ2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4HFSS010-040-06 fig.2	○	1	0 -0.015	4	1.05	4.8	6	60	4
4HFSS020-060-06 fig.2	○	2	0 -0.015	6	2.10	7.2	6	60	4
4HFSS030-080-06 fig.2	○	3	0 -0.015	8	3.15	9.6	6	60	4
4HFSS040-100-06 fig.2	○	4	0 -0.015	10	4.2	12.0	6	60	4
4HFSS050-120-06 fig.2	○	5	0 -0.015	12	5.2	14.4	6	60	4
5HFSS040-100-06 fig.2	○	4	0 -0.015	10	4.2	12.0	6	60	5
6HFSS060-140-06 fig.1	○	6	0 -0.020	14	-	-	6	60	6
6HFSS080-180-08 fig.1	○	8	-0.005 -0.025	18	-	-	8	70	6
6HFSS100-220-10 fig.1	○	10	-0.005 -0.025	22	-	-	10	80	6
6HFSS120-260-12 fig.1	○	12	-0.010 -0.030	26	-	-	12	90	6
7HFSS060-140-06 fig.1	○	6	0 -0.020	14	-	-	6	60	7
7HFSS080-180-08 fig.1	○	8	-0.005 -0.025	18	-	-	8	70	7
7HFSS100-220-10 fig.1	○	10	-0.005 -0.025	22	-	-	10	80	7
7HFSS120-260-12 fig.1	○	12	-0.010 -0.030	26	-	-	12	90	7



Bottom surface of 6HFSS cutting edge

4HFSM, 5HFSM, 6HFSM, 7HFSM, 8HFSM (Medium)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Neck Dia. ØD1	Under Neck Length ℓ2	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4HFSM010-050-06 fig.2	○	1	0 -0.015	5	1.05	6	6	60	4
4HFSM020-090-06 fig.2	○	2	0 -0.015	9	2.10	10.8	6	60	4
4HFSM030-120-06 fig.2	○	3	0 -0.015	12	3.15	14.4	6	60	4
4HFSM040-140-06 fig.2	○	4	0 -0.015	14	4.2	16.8	6	60	4
4HFSM050-170-06 fig.2	○	5	0 -0.015	17	5.2	20.4	6	60	4
5HFSM040-140-06 fig.2	○	4	0 -0.015	14	4.2	16.8	6	60	5
6HFSM060-170-06 fig.1	○	6	0 -0.020	17	-	-	6	60	6
6HFSM080-230-08 fig.1	○	8	-0.005 -0.025	23	-	-	8	70	6
6HFSM100-280-10 fig.1	○	10	-0.005 -0.025	28	-	-	10	80	6
6HFSM120-330-12 fig.1	○	12	-0.010 -0.030	33	-	-	12	90	6
6HFSM140-370-16 fig.2	○	14	-0.010 -0.030	37	14.2	44.4	16	105	6
6HFSM150-420-16 fig.2	○	15	-0.010 -0.030	42	15.2	50.4	16	105	6
6HFSM160-420-16 fig.1	○	16	-0.010 -0.030	42	-	-	16	105	6
6HFSM200-480-20 fig.1	○	20	-0.010 -0.030	48	-	-	20	110	6
7HFSM060-170-06 fig.1	○	6	0 -0.020	17	-	-	6	60	7
7HFSM080-230-08 fig.1	○	8	-0.005 -0.025	23	-	-	8	70	7
7HFSM100-280-10 fig.1	○	10	-0.005 -0.025	28	-	-	10	80	7
7HFSM120-330-12 fig.1	○	12	-0.010 -0.030	33	-	-	12	90	7
7HFSM160-420-16 fig.1	○	16	-0.010 -0.030	42	-	-	16	105	7
8HFSM250-530-25 fig.1	○	25	-0.010 -0.030	53	-	-	25	125	8

- New PVD coating "MEGACOAT Hard" for hard materials.
  Achieves high rigidity by ensuring a large core diameter, longer tool life and stable cutting.
  Also increases cutting edge strength and chip evacuation with a negative rake angle.

Recommended Cutting Conditions L48

● : Stock Std. ○ : World Express

No. of Flutes: 4,6

4UGSM, 6UGSM

Workpiece Materials

★: 1st Choice

4UGSM

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
4UGSM030-080-06	○	3	-0.014 -0.028	8	6	50	4
4UGSM040-120-06	○	4	-0.020 -0.038	12	6	57	4
4UGSM050-130-06	○	5	-0.020 -0.038	13	6	57	4

- In order to achieve stable cutting of hard materials, negative type rake angle is adopted. Also, for attaining high efficiency, we provide six flutes type for dia. larger than 6mm.

6UGSM

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
6UGSM060-150-06	○	6	-0.020 -0.038	15	6	60	6
6UGSM080-200-08	○	8	-0.025 -0.047	20	8	75	6
6UGSM100-250-10	○	10	-0.025 -0.047	25	10	80	6
6UGSM120-300-12	○	12	-0.032 -0.059	30	12	100	6
6UGSM160-400-16	○	16	-0.032 -0.059	40	16	110	6

Recommended Cutting Conditions L49

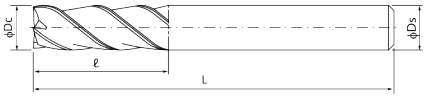
● : Stock Std. ○ : World Express

Aluminum & Non-ferrous Metals, Varied interval flute design, With wiper edge

No. of Flutes: 3

3NESM

Workpiece Materials ★: 1st Choice



3NESM

Shouldering | Slotting

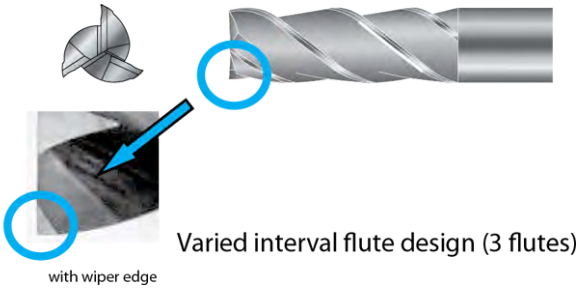
(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut l	Shank Dia. ØDs	Overall length L	No. of Flutes Z
3NESM030-120-06	○	3	-0.014 -0.028	12	6	50	3
3NESM040-120-06	○	4	-0.020 -0.038	12	6	50	3
3NESM050-140-06	○	5	-0.020 -0.038	14	6	50	3
3NESM060-160-06	○	6	0 -0.008	16	6	50	3
3NESM080-200-08	○	8	0 -0.009	20	8	63	3
3NESM100-220-10	○	10	0 -0.009	22	10	76	3
3NESM120-250-12	○	12	0 -0.011	25	12	76	3
3NESM160-320-16	○	16	0 -0.011	32	16	89	3
3NESM200-380-20	○	20	0 -0.013	38	20	104	3

* Cutting edge of over 6mm ØDc has margin.

- A wiper is attached at the lower edge for improving the bottom surface finish.
  Chattering is controlled with cutting edge slots at varied intervals, and finishing of lateral surfaces is improved.

Finished surface of aluminum alloy at high speed cutting.
Reached 0.25μmRa
(Bottom face/side face/corner)



Varied interval flute design (3 flutes)
with wiper edge

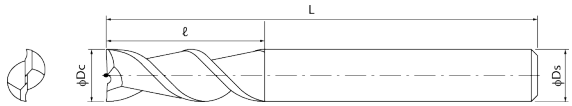
Recommended Cutting Conditions ➡L49

● : Stock Std. ○ : World Express

No. of Flutes: 2,3

2NFSM, 3NFSM, 3NFSL

Workpiece Materials ★: 1st Choice



2NFSM (Medium)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
2NFSM010-040-04	○	1	-0.014 -0.028	4	4	38	2
2NFSM015-060-04	○	1.5	-0.014 -0.028	6	4	38	2
2NFSM020-080-04	○	2	-0.014 -0.028	8	4	38	2
2NFSM025-080-04	○	2.5	-0.014 -0.028	8	4	38	2
2NFSM030-080-06	○	3	-0.014 -0.028	8	6	50	2
2NFSM040-080-06	○	4	-0.020 -0.038	8	6	50	2
2NFSM050-140-06	○	5	-0.020 -0.038	14	6	50	2
2NFSM060-160-06	○	6	0 -0.008	16	6	50	2
2NFSM080-200-08	○	8	0 -0.009	20	8	63	2
2NFSM100-220-10	○	10	0 -0.009	22	10	76	2
2NFSM120-250-12	○	12	0 -0.011	25	12	76	2
2NFSM160-320-16	○	16	0 -0.011	32	16	89	2
2NFSM200-380-20	○	20	0 -0.013	38	20	104	2

* Cutting edge of over 6mm ØDc has margin.

3NFSM (Medium)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
3NFSM030-120-06	○	3	-0.014 -0.028	12	6	50	3
3NFSM040-120-06	○	4	-0.020 -0.038	12	6	50	3
3NFSM050-140-06	○	5	-0.020 -0.038	14	6	50	3
3NFSM060-160-06	○	6	0 -0.00 8	16	6	50	3
3NFSM080-200-08	○	8	0 -0.009	20	8	63	3
3NFSM100-220-10	○	10	0 -0.009	22	10	76	3
3NFSM120-250-12	○	12	0 -0.011	25	12	76	3
3NFSM160-320-16	○	16	0 -0.011	32	16	89	3
3NFSM200-380-20	○	20	0 -0.013	38	20	104	3

* Cutting edge of over 6mm ØDc has margin.

- Sharpness oriented for aluminum cutting. Good chip evacuation from the 45 degrees helix angle.

● : Stock Std. ○ : World Express

3NFSL (Long)

Shouldering

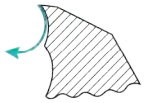
(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	No. of Flutes Z
3NFSL030-190-06	○	3	-0.014 -0.028	19	6	63	3
3NFSL040-190-06	○	4	-0.020 -0.038	19	6	63	3
3NFSL050-200-06	○	5	-0.020 -0.038	20	6	63	3
3NFSL060-280-06	○	6	0 -0.008	28	6	76	3
3NFSL080-300-08	○	8	0 -0.009	30	8	76	3
3NFSL100-340-10	○	10	0 -0.009	34	10	89	3
3NFSL120-450-12	○	12	0 -0.011	45	12	100	3
3NFSL160-560-16	○	16	0 -0.011	56	16	125	3
3NFSL200-600-20	○	20	0 -0.013	60	20	125	3

* Cutting edge of over 6mm ØDc has margin.

NFSM type
NFSL type rake angle

A convex shape in the slot improves chip evacuation.

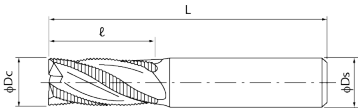


Recommended Cutting Conditions ➔L49-L50

No. of Flutes: 3

3AESM, 3AESL

Workpiece Materials ★: 1st Choice



3AESM (Medium)

Shouldering Slotting

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners C	No. of Flutes Z
3AESM060-130-06	○	6	-0.030 -0.105	13	6	57	0.6	3
3AESM080-160-08	○	8	-0.040 -0.130	16	8	63	0.6	3
3AESM100-220-10	○	10	-0.040 -0.130	22	10	72	0.6	3
3AESM120-260-12	○	12	-0.050 -0.160	26	12	83	1	3
3AESM160-320-16	○	16	-0.050 -0.160	32	16	92	1	3
3AESM200-380-20	○	20	-0.065 -0.195	38	20	104	1	3
3AESM250-450-25	○	25	-0.065 -0.195	45	25	121	1	3

3AESL (Long)

Shouldering

(Unit : mm)

Description	Stock	Outside Dia. ØDc	Mill Dia. tolerance	Length of cut ℓ	Shank Dia. ØDs	Overall length L	Spec of Corners C	No. of Flutes Z
3AESL060-240-06	○	6	-0.030 -0.105	24	6	76	0.6	3
3AESL080-280-08	○	8	-0.040 -0.130	28	8	76	0.6	3
3AESL100-340-10	○	10	-0.040 -0.130	34	10	89	0.6	3
3AESL120-450-12	○	12	-0.050 -0.160	45	12	100	1	3
3AESL160-560-16	○	16	-0.050 -0.160	56	16	125	1	3
3AESL200-600-20	○	20	-0.065 -0.195	60	20	125	1	3
3AESL250-800-25	○	25	-0.065 -0.195	80	25	150	1	3

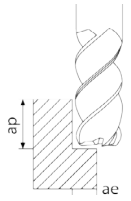
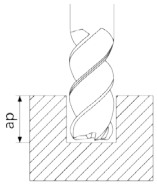
- Three flutes type for roughing of aluminum. With corner chamfering.

Recommended Cutting Conditions ➡L50

● : Stock Std. ○ : World Express

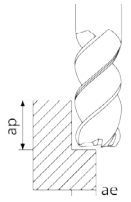
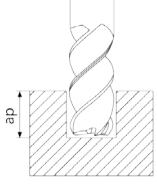
Recommended Cutting Conditions

2FESS

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø1	Ø2	Ø4	Ø6	Ø8	Ø12	Ø16
 Shouldering **Depth of Cut (ap×ae) (mm)** 1.2Dc×0.05Dc (Dc<Ø3) 1.2Dc×0.1Dc (Dc≥Ø3)  Slotting **Depth of Cut (ae) (mm)** 0.1Dc (Dc<Ø1) 0.3Dc (Ø1≤Dc<Ø3) 0.5Dc (Dc≥Ø3)	Carbon Steel	Shouldering	Spindle Revolution (min^{-1})	25,500	13,200	6,600	4,500	3,300	2,200	1,700
			Feed Rate (mm/min)	225	230	375	415	420	410	410
		Slotting	Spindle Revolution (min^{-1})	15,300	8,000	4,000	2,700	2,000	1,300	1,000
			Feed Rate (mm/min)	135	140	225	250	250	245	245
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	22,000	11,000	5,600	3,700	2,800	1,900	1,400
			Feed Rate (mm/min)	195	220	285	315	310	310	310
		Slotting	Spindle Revolution (min^{-1})	13,000	6,600	3,400	2,200	1,700	1,200	900
			Feed Rate (mm/min)	115	130	170	190	185	185	185
	Pre-hardened steel 30~45HRC	Shouldering	Spindle Revolution (min^{-1})	12,700	7,200	4,200	3,000	2,200	1,500	1,100
			Feed Rate (mm/min)	55	80	100	105	105	110	110
		Slotting	Spindle Revolution (min^{-1})	7,600	4,300	2,500	1,800	1,300	900	700
			Feed Rate (mm/min)	35	50	60	63	63	65	65
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	22,000	11,000	5,600	3,700	2,800	1,900	1,400
			Feed Rate (mm/min)	95	95	110	115	115	115	115
		Slotting	Spindle Revolution (min^{-1})	13,000	6,600	3,400	2,200	1,700	1,200	900
			Feed Rate (mm/min)	60	60	65	70	70	70	70

* Cutting with coolant is recommended for stainless steel.

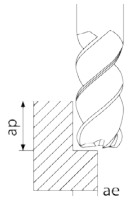
2FESM

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø0.5	Ø1	Ø2	Ø4	Ø6	Ø8	Ø12	Ø16
 Shouldering **Depth of Cut (ap×ae) (mm)** 1.5Dc×0.05Dc (Dc<Ø3) 1.5Dc×0.1Dc (Dc≥Ø3)  Slotting **Depth of Cut (ae) (mm)** 0.1Dc (Dc<Ø1) 0.3Dc (Ø1≤Dc<Ø3) 0.5Dc (Dc≥Ø3)	Carbon Steel	Shouldering	Spindle Revolution (min^{-1})	32,000	25,500	13,200	6,600	4,500	3,300	2,200	1,700
			Feed Rate (mm/min)	210	225	230	375	415	420	410	410
		Slotting	Spindle Revolution (min^{-1})	19,000	15,300	8,000	4,000	2,700	2,000	1,300	1,000
			Feed Rate (mm/min)	130	135	140	225	250	250	245	245
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	27,000	22,000	11,000	5,600	3,700	2,800	1,900	1,400
			Feed Rate (mm/min)	180	195	220	285	315	310	310	310
		Slotting	Spindle Revolution (min^{-1})	16,000	13,000	6,600	3,400	2,200	1,700	1,200	900
			Feed Rate (mm/min)	105	115	130	170	190	185	185	185
	Pre-hardened steel 30~45HRC	Shouldering	Spindle Revolution (min^{-1})	22,500	12,700	7,200	4,200	3,000	2,200	1,500	1,100
			Feed Rate (mm/min)	50	55	80	100	105	105	110	110
		Slotting	Spindle Revolution (min^{-1})	13,500	7,600	4,300	2,500	1,800	1,300	900	700
			Feed Rate (mm/min)	30	35	50	60	63	63	65	65
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	27,000	22,000	11,000	5,600	3,700	2,800	1,900	1,400
			Feed Rate (mm/min)	60	95	95	110	115	115	115	115
		Slotting	Spindle Revolution (min^{-1})	16,000	13,000	6,600	3,400	2,200	1,700	1,200	900
			Feed Rate (mm/min)	35	60	60	65	70	70	70	70

* Cutting with coolant is recommended for stainless steel.

Recommended Cutting Conditions

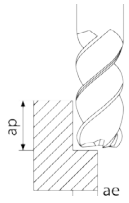
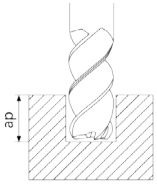
2FESL (Shouldering)

Applications	Workpiece Material	Outside Dia. Dc (mm)	Ø1	Ø2	Ø4	Ø6	Ø8	Ø12	Ø16
 Shouldering **Depth of Cut (ap×ae) (mm)** 2.5Dc×0.05Dc (Dc<Ø3) 2.5Dc×0.1Dc (Dc≥Ø3)	Carbon Steel	Spindle Revolution (min^{-1})	19,000	9,500	4,800	3,200	2,400	1,600	1,200
		Feed Rate (mm/min)	210	210	210	210	210	210	210
	Alloy Steel	Spindle Revolution (min^{-1})	14,300	7,200	3,600	2,400	2,000	1,300	1,000
		Feed Rate (mm/min)	155	160	160	160	170	170	150
	Pre-hardened steel 30~45HRC	Spindle Revolution (min^{-1})	11,200	5,600	2,800	1,900	1,600	1,000	800
		Feed Rate (mm/min)	85	85	90	90	100	95	80
	Stainless Steel	Spindle Revolution (min^{-1})	14,300	7,200	3,600	2,400	2,000	1,300	1,000
		Feed Rate (mm/min)	95	95	95	95	105	105	80

* Cutting with coolant is recommended for stainless steel.

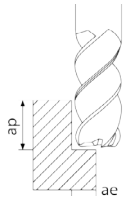
Slotting is not recommended.

2FEKS, 2FEKM

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
 Shouldering Depth of Cut (ap×ae) (mm) 1.2Dc×0.1Dc  Slotting Depth of Cut (ae) (mm) 0.5Dc	Carbon Steel	Shouldering	Spindle Revolution (min^{-1})	9,300	7,000	4,600	3,500	3,000	2,700	2,200
			Feed Rate (mm/min)	450	450	470	470	470	470	440
		Slotting	Spindle Revolution (min^{-1})	7,500	6,000	4,400	3,300	2,700	2,300	1,900
			Feed Rate (mm/min)	240	260	340	340	340	340	320
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	8,800	6,600	4,400	3,300	2,600	2,200	1,800
			Feed Rate (mm/min)	370	370	380	380	380	380	360
		Slotting	Spindle Revolution (min^{-1})	7,200	5,400	3,600	2,700	2,200	1,800	1,500
			Feed Rate (mm/min)	270	270	270	270	270	270	270
	Pre-hardened steel 30~45HRC	Shouldering	Spindle Revolution (min^{-1})	6,400	4,800	3,200	2,400	1,900	1,600	1,200
			Feed Rate (mm/min)	130	130	130	140	140	140	140
		Slotting	Spindle Revolution (min^{-1})	5,300	4,000	2,600	2,000	1,600	1,300	1,000
			Feed Rate (mm/min)	120	120	120	120	120	120	120
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	8,000	6,000	4,000	3,000	2,400	2,000	1,500
			Feed Rate (mm/min)	140	140	140	140	140	140	140
		Slotting	Spindle Revolution (min^{-1})	5,300	4,000	2,600	2,000	1,600	1,300	1,000
			Feed Rate (mm/min)	80	90	100	100	100	90	90

* Cutting with coolant is recommended for stainless steel.

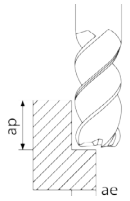
4FESM (Shouldering)

Applications	Workpiece Material	Outside Dia. Dc (mm)	Ø1	Ø2	Ø4	Ø6	Ø8	Ø12	Ø16
 Shouldering Depth of Cut (ap×ae) (mm) 1.5Dc×0.05Dc (Dc<Ø3) 1.5Dc×0.1Dc (Dc³Ø3)	Carbon Steel	Spindle Revolution (min^{-1})	25,500	13,000	6,600	4,400	3,300	2,200	1,700
		Feed Rate (mm/min)	335	345	580	620	625	630	600
	Alloy Steel	Spindle Revolution (min^{-1})	22,000	11,000	5,600	3,700	2,800	1,900	1,400
		Feed Rate (mm/min)	290	290	395	455	455	470	460
	Pre-hardened steel 30~45HRC	Spindle Revolution (min^{-1})	12,000	7,200	4,200	3,000	2,200	1,500	1,100
		Feed Rate (mm/min)	105	125	150	160	160	165	140
	Stainless Steel	Spindle Revolution (min^{-1})	22,000	11,000	5,600	3,700	2,800	1,900	1,400
		Feed Rate (mm/min)	130	145	165	165	170	175	155

* Cutting with coolant is recommended for stainless steel.

Slotting is not recommended.

4FEKM (Tough corner edge) (Shouldering)

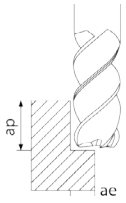
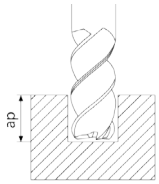
Applications	Workpiece Material	Outside Dia. Dc (mm)	Ø3	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
 Shouldering Depth of Cut (ap×ae) (mm) 1.5Dc×0.1Dc	Carbon Steel	Spindle Revolution (min^{-1})	10,600	8,000	5,300	4,000	3,200	2,700	2,100
		Feed Rate (mm/min)	680	690	770	770	770	770	770
	Alloy Steel	Spindle Revolution (min^{-1})	8,800	6,600	4,400	3,300	2,600	2,200	2,000
		Feed Rate (mm/min)	500	550	620	630	630	630	610
	Pre-hardened steel 30~45HRC	Spindle Revolution (min^{-1})	6,400	4,800	3,200	2,400	1,900	1,600	1,200
		Feed Rate (mm/min)	180	180	180	190	190	190	190
	Stainless Steel	Spindle Revolution (min^{-1})	8,000	6,000	4,000	3,000	2,300	2,000	1,500
		Feed Rate (mm/min)	190	200	200	200	210	210	210

* Cutting with coolant is recommended for stainless steel.

Slotting is not recommended.

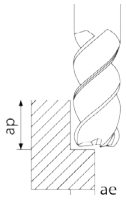
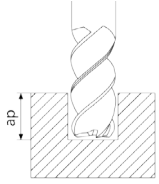
Recommended Cutting Conditions

2FESW

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø13
 Shouldering Depth of Cut (ap×ae) (mm) 1Dc×0.2Dc  Slotting Depth of Cut (ae) (mm) 0.2Dc	Carbon Steel	Shouldering	Spindle Revolution (min^{-1})	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed Rate (mm/min)	660	640	640	640	520	450	410	350
		Slotting	Spindle Revolution (min^{-1})	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed Rate (mm/min)	660	640	640	640	520	450	410	350
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	420	430	430	430	350	300	270	230
		Slotting	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	420	430	430	430	350	300	270	230
	Pre-hardened steel 30~45HRC	Shouldering	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	420	430	430	430	350	300	270	230
		Slotting	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	420	430	430	430	350	300	270	230
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,500
			Feed Rate (mm/min)	320	320	320	320	260	230	210	180
		Slotting	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,500
			Feed Rate (mm/min)	320	320	320	320	260	230	210	180

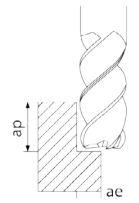
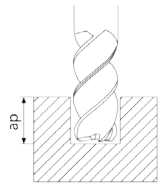
* Cutting with coolant is recommended for stainless steel.

3FESW

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø13
 Shouldering Depth of Cut (ap×ae) (mm) 1Dc×0.2Dc  Slotting Depth of Cut (ae) (mm) 0.2Dc	Carbon Steel	Shouldering	Spindle Revolution (min^{-1})	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed Rate (mm/min)	810	800	800	800	650	560	510	450
		Slotting	Spindle Revolution (min^{-1})	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed Rate (mm/min)	810	800	800	800	650	560	510	450
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	530	530	530	530	430	370	340	300
		Slotting	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	530	530	530	530	430	370	340	300
	Pre-hardened steel 30~45HRC	Shouldering	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	530	530	530	530	430	370	340	300
		Slotting	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	530	530	530	530	430	370	340	300
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,500
			Feed Rate (mm/min)	400	400	400	400	320	280	260	230
		Slotting	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,500
			Feed Rate (mm/min)	400	400	400	400	320	280	260	230

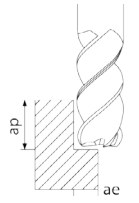
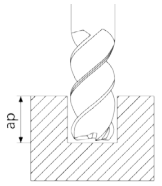
* Cutting with coolant is recommended for stainless steel.

4FESW

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	0.4369	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø13
 Shouldering Depth of Cut (ap×ae) (mm) 1Dc×0.2Dc  Slotting Depth of Cut (ae) (mm) 0.2Dc	Carbon Steel	Shouldering	Spindle Revolution (min^{-1})	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed Rate (mm/min)	960	960	960	960	780	680	620	570
		Slotting	Spindle Revolution (min^{-1})	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,500
			Feed Rate (mm/min)	960	960	960	960	780	680	620	570
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	640	640	640	640	520	450	410	370
		Slotting	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	640	640	640	640	520	450	410	370
	Pre-hardened steel 30~45HRC	Shouldering	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	640	640	640	640	520	450	410	370
		Slotting	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,700
			Feed Rate (mm/min)	640	640	640	640	520	450	410	370
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,500
			Feed Rate (mm/min)	480	480	480	480	390	340	310	290
		Slotting	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,500
			Feed Rate (mm/min)	480	480	480	480	390	340	310	290

* Cutting with coolant is recommended for stainless steel.

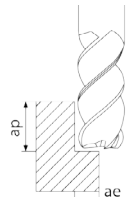
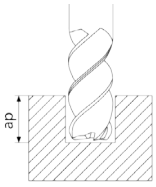
3UFSM

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø2	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering Depth of Cut (ap×ae) (mm) 1.5Dc×0.1Dc  Slotting Depth of Cut (ae) (mm) 0.25Dc (Carbon steel/Cast iron) 0.5Dc	Carbon steel /Cast iron	Shouldering	Spindle Revolution (min^{-1})	18,000	12,000	9,200	7,300	6,100	4,600	3,700	3,100	2,300	1,800
			Feed Rate (mm/min)	380	430	440	500	510	500	560	560	590	590
		Slotting	Spindle Revolution (min^{-1})	16,000	11,000	8,000	6,400	5,300	4,000	3,200	2,700	2,000	1,600
			Feed Rate (mm/min)	190	230	240	290	300	290	280	290	310	350
	Alloy Steel	Shouldering	Spindle Revolution (min^{-1})	14,000	9,000	6,800	5,400	4,500	3,400	2,700	2,300	1,700	1,400
			Feed Rate (mm/min)	250	270	270	320	350	340	360	350	390	420
		Slotting	Spindle Revolution (min^{-1})	11,000	7,400	5,600	4,500	3,700	2,800	2,200	1,900	1,400	1,100
			Feed Rate (mm/min)	130	130	150	180	190	180	170	180	190	210
	Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	10,000	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,200	1,000
			Feed Rate (mm/min)	180	170	170	210	230	220	230	220	220	230
		Slotting	Spindle Revolution (min^{-1})	10,000	6,400	4,800	3,800	3,200	2,400	1,900	1,600	1,200	1,000
			Feed Rate (mm/min)	120	120	120	140	150	140	140	140	150	180
	Titanium Alloys Heat-resistant Alloys (40~50HRC)	Shouldering	Spindle Revolution (min^{-1})	6,000	4,200	3,200	2,500	2,100	1,600	1,300	1,100	800	600
			Feed Rate (mm/min)	60	90	100	120	110	110	120	110	120	130
		Slotting	Spindle Revolution (min^{-1})	6,000	4,200	3,200	2,500	2,100	1,600	1,300	1,100	800	600
			Feed Rate (mm/min)	50	60	70	80	90	90	90	80	90	100
	Aluminum Alloys	Shouldering	Spindle Revolution (min^{-1})	32,000	21,000	16,000	13,000	11,000	8,000	6,400	5,300	4,000	3,200
			Feed Rate (mm/min)	670	760	770	900	920	860	1,000	1,100	1,100	1,200
		Slotting	Spindle Revolution (min^{-1})	32,000	21,000	16,000	13,000	11,000	8,000	6,400	5,300	4,000	3,200
			Feed Rate (mm/min)	480	440	480	590	630	580	670	730	860	960

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

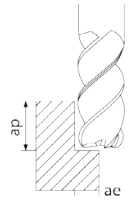
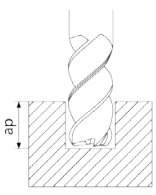
Recommended Cutting Conditions

4PGSS, 5PGSS

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Carbon Steel	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	13,300	10,000	8,000	6,600	5,000	4,000	3,300	2,500	2,000	1,600
				Feed Rate (mm/min)	1,860	1,600	1,440	1,320	1,200	1,360	1,320	1,200	1,200	1,360
		Slotting	1Dc	Spindle Revolution (min^{-1})				6,600	5,000	4,000	3,300	2,500	2,000	1,600
				Feed Rate (mm/min)				660	600	680	660	600	600	680
	Alloy Steel	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	10,600	8,000	6,400	5,300	4,000	3,200	2,700	2,000	1,600	1,300
				Feed Rate (mm/min)	1,180	1,020	920	840	880	890	860	880	830	1,040
		Slotting	0.75Dc	Spindle Revolution (min^{-1})				5,300	4,000	3,200	2,700	2,000	1,600	1,300
				Feed Rate (mm/min)				420	440	440	430	440	410	520
	Pre-hardened steel 30~45HRC	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	8,500	6,400	5,100	4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	710	610	550	500	570	550	580	570	570	700
		Slotting	0.5Dc	Spindle Revolution (min^{-1})				4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)				250	290	280	290	280	280	350
 Slotting	Stainless Steel	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	290	250	230	210	240	250	230	240	240	270
		Slotting	0.4Dc	Spindle Revolution (min^{-1})				2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)				100	120	120	120	120	120	130
	Titanium Alloys Heat-resistant Alloys (40~50HRC)	Shouldering	1Dc×0.2Dc	Spindle Revolution (min^{-1})	3,700	2,800	2,200	1,900	1,400	1,100	900	700	550	450
				Feed Rate (mm/min)	160	130	110	110	110	130	120	140	130	150
		Slotting	0.3Dc	Spindle Revolution (min^{-1})				1,900	1,400	1,100	900	700	550	450
				Feed Rate (mm/min)				60	60	60	60	70	70	80

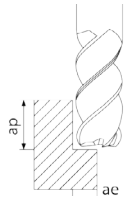
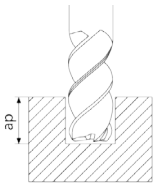
* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

4PGSM, 5PGSM, 6PGSM

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Carbon Steel	Shouldering	1.5Dc×0.3Dc	Spindle Revolution (min^{-1})	6,600	5,000	4,000	3,300	2,500	2,000	1,600
				Feed Rate (mm/min)	1,030	980	1,260	1,520	1,570	1,510	1,340
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	6,600	5,000	4,000	3,300	2,500	2,000	1,600
				Feed Rate (mm/min)	520	500	640	770	790	750	670
	Alloy Steel	Shouldering	1.5Dc×0.3Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,700	2,000	1,600	1,300
				Feed Rate (mm/min)	740	670	940	1,130	1,170	1,140	1,030
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,700	2,000	1,600	1,300
				Feed Rate (mm/min)	380	330	480	560	580	570	520
	Pre-hardened steel 30~45HRC	Shouldering	1.5Dc×0.2Dc	Spindle Revolution (min^{-1})	4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	470	490	610	700	730	710	710
		Slotting	0.4Dc	Spindle Revolution (min^{-1})	4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	230	250	310	350	370	350	360
 Slotting	Stainless Steel	Shouldering	1.5Dc×0.2Dc	Spindle Revolution (min^{-1})	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	170	190	250	280	280	280	250
		Slotting	0.4Dc	Spindle Revolution (min^{-1})	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	80	90	120	140	140	140	130
	Titanium Alloys Heat-resistant Alloys (40~50HRC)	Shouldering	1.5Dc×0.2Dc	Spindle Revolution (min^{-1})	1,900	1,400	1,100	900	700	550	450
				Feed Rate (mm/min)	90	90	130	150	160	150	150
		Slotting	0.3Dc	Spindle Revolution (min^{-1})	1,900	1,400	1,100	900	700	550	450
				Feed Rate (mm/min)	40	40	60	70	80	70	70

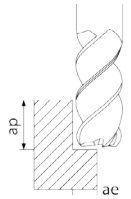
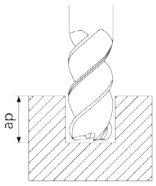
* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

4PGSL, 5PGSL, 6PGSL

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Carbon Steel	Shouldering	1.5Dc×0.3Dc	Spindle Revolution (min^{-1})	6,600	5,000	4,000	3,300	2,500	2,000	1,600
				Feed Rate (mm/min)	1,030	980	1,260	1,520	1,570	1,510	1,340
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	6,600	5,000	4,000	3,300	2,500	2,000	1,600
				Feed Rate (mm/min)	520	500	640	770	790	750	670
	Alloy Steel	Shouldering	1.5Dc×0.3Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,700	2,000	1,600	1,300
				Feed Rate (mm/min)	740	670	940	1,130	1,170	1,140	1,030
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,700	2,000	1,600	1,300
				Feed Rate (mm/min)	380	330	480	560	580	570	520
	Pre-hardened steel 30~45HRC	Shouldering	1.5Dc×0.2Dc	Spindle Revolution (min^{-1})	4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	470	490	610	700	730	710	710
		Slotting	0.4Dc	Spindle Revolution (min^{-1})	4,200	3,200	2,500	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	230	250	310	350	370	350	360
 Slotting	Stainless Steel	Shouldering	1.5Dc×0.2Dc	Spindle Revolution (min^{-1})	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	170	190	250	280	280	280	250
		Slotting	0.4Dc	Spindle Revolution (min^{-1})	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	80	90	120	140	140	140	130
	Titanium Alloys Heat-resistant Alloys (40~50HRC)	Shouldering	1.5Dc×0.2Dc	Spindle Revolution (min^{-1})	1,900	1,400	1,100	900	700	550	450
				Feed Rate (mm/min)	90	90	130	150	160	150	150
		Slotting	0.3Dc	Spindle Revolution (min^{-1})	1,900	1,400	1,100	900	700	550	450
				Feed Rate (mm/min)	40	40	60	70	80	70	70

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

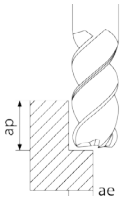
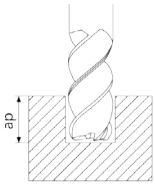
4PGRM

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering	Carbon Steel	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	13,300	10,000	8,000	6,600	5,000	4,000	3,300	2,500	2,000
				Feed Rate (mm/min)	1,860	1,600	1,440	1,320	1,200	1,360	1,320	1,200	1,200
		Slotting	1Dc	Spindle Revolution (min^{-1})				6,600	5,000	4,000	3,300	2,500	2,000
				Feed Rate (mm/min)				660	600	680	660	600	600
	Alloy Steel	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	10,600	8,000	6,400	5,300	4,000	3,200	2,700	2,000	1,600
				Feed Rate (mm/min)	1,180	1,020	920	840	880	890	860	880	830
		Slotting	0.75Dc	Spindle Revolution (min^{-1})				5,300	4,000	3,200	2,700	2,000	1,600
				Feed Rate (mm/min)				420	440	440	430	440	410
	Pre-hardened steel 30~45HRC	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	8,500	6,400	5,100	4,200	3,200	2,500	2,100	1,600	1,300
				Feed Rate (mm/min)	710	610	550	500	570	550	580	570	570
		Slotting	0.5Dc	Spindle Revolution (min^{-1})				4,200	3,200	2,500	2,100	1,600	1,300
				Feed Rate (mm/min)				250	290	280	290	280	280
 Slotting	Stainless Steel	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,700	2,000	1,600	1,300	1,000	800
				Feed Rate (mm/min)	290	250	230	210	240	250	230	240	240
		Slotting	0.4Dc	Spindle Revolution (min^{-1})				2,700	2,000	1,600	1,300	1,000	800
				Feed Rate (mm/min)				100	120	120	120	120	120
	Titanium Alloys Heat-resistant Alloys (40~50HRC)	Shouldering	1Dc×0.2Dc	Spindle Revolution (min^{-1})	3,700	2,800	2,200	1,900	1,400	1,100	900	700	550
				Feed Rate (mm/min)	160	130	110	110	110	130	120	140	130
		Slotting	0.3Dc	Spindle Revolution (min^{-1})				1,900	1,400	1,100	900	700	550
				Feed Rate (mm/min)				60	60	60	60	70	70

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

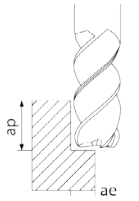
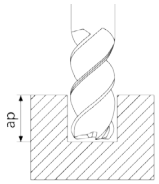
Recommended Cutting Conditions

3ZFKS (Short), 3ZFKM (Medium)

Applications	Workpiece Material	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)		Ø3	Ø4	Ø5	Ø6	Ø7	Ø8	Ø10	Ø12
 Shouldering	Carbon Steel	**Shouldering** Short 1.2Dc×0.3Dc Medium 1.5Dc×0.3Dc **Plunge milling** **Slotting** 1Dc	Spindle Revolution (min^{-1})		13,800	10,700	8,800	7,500	6,600	6,000	4,800	4,000
			Feed Rate (mm/min)	Shouldering	850	950	1,100	1,200	1,100	1,000	910	850
				Plunge milling	180	170	170	170	160	150	120	100
				Slotting	570	650	700	730	750	780	800	750
	Alloy Steel	**Shouldering** Short 1.2Dc×0.3Dc Medium 1.5Dc×0.3Dc **Plunge milling** **Slotting** 0.5Dc	Spindle Revolution (min^{-1})		10,600	9,300	8,300	7,400	6,500	6,000	4,700	3,500
			Feed Rate (mm/min)	Shouldering	700	780	900	980	900	850	750	700
				Plunge milling	120	120	130	140	130	130	120	100
				Slotting	500	540	570	590	610	600	580	500
	Pre-hardened steel 30~45HRC		Spindle Revolution (min^{-1})		5,200	4,000	3,200	2,600	2,300	2,000	1,600	1,400
			Feed Rate (mm/min)	Shouldering	440	440	490	490	490	440	400	370
				Plunge milling	90	110	110	130	110	100	80	70
				Slotting	220	270	270	320	330	330	230	200
 Plunge milling Slotting	Stainless Steel	**Shouldering** Short 1.2Dc×0.2Dc Medium 1.5Dc×0.2Dc **Plunge milling** **Slotting** 0.5Dc	Spindle Revolution (min^{-1})		3,300	2,500	2,000	1,700	1,400	1,300	1,100	900
			Feed Rate (mm/min)	Shouldering	280	270	330	340	330	330	350	320
				Plunge milling	20	30	40	40	40	30	20	20
				Slotting	110	110	130	140	130	130	120	120
	Titanium Alloys		Spindle Revolution (min^{-1})		3,300	2,500	2,000	1,700	1,400	1,300	1,100	900
			Feed Rate (mm/min)	Shouldering	280	270	330	340	330	330	350	320
				Plunge milling	20	30	40	40	40	30	20	20
				Slotting	110	110	130	140	130	130	120	120

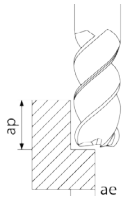
· Compressed air is recommended for cutting steel.
· Water soluble coolant is recommended for machining stainless steel and titanium alloys.
· Adjust depth of cut (ap) to suit machine rigidity

4MFK (Short, Medium)

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16
 Shouldering  Slotting	Carbon Steel	Shouldering	Short:1.2Dc×0.15Dc Medium:1.5Dc×0.15Dc	Spindle Revolution (min^{-1})	13,800	10,700	8,800	7,500	6,000	4,800	4,000	3,300
				Feed Rate (mm/min)	1,400	1,400	1,400	1,500	1,500	1,400	1,400	1,300
		Slotting	ap≤1Dc	Spindle Revolution (min^{-1})	13,800	10,700	8,800	7,500	6,000	4,800	4,000	3,300
				Feed Rate (mm/min)	620	700	750	780	830	850	800	750
	Alloy Steel	Shouldering	Short:1.2Dc×0.1Dc Medium:1.5Dc×0.1Dc	Spindle Revolution (min^{-1})	10,600	9,300	8,300	7,400	6,000	4,700	3,800	2,800
				Feed Rate (mm/min)	1,000	1,000	1,000	1,100	1,100	1,000	1,000	900
		Slotting	ap≤1Dc	Spindle Revolution (min^{-1})	10,600	9,300	8,300	7,400	6,000	4,700	3,800	2,800
				Feed Rate (mm/min)	500	510	520	530	550	570	530	450
	Pre-hardened steel 30~45HRC	Shouldering	Short:1.2Dc×0.07Dc Medium:1.5Dc×0.07Dc	Spindle Revolution (min^{-1})	8,700	6,800	5,500	4,600	3,500	2,800	2,300	1,700
				Feed Rate (mm/min)	670	730	790	840	900	810	770	630
		Slotting	ap≤1Dc	Spindle Revolution (min^{-1})	6,700	5,800	4,800	4,000	3,000	2,300	1,900	1,400
				Feed Rate (mm/min)	320	330	360	370	400	420	380	300
	Stainless Steel	Shouldering	Short:1.2Dc×0.1Dc Medium:1.5Dc×0.1Dc	Spindle Revolution (min^{-1})	8,700	7,000	6,000	5,200	4,000	3,000	2,500	1,700
				Feed Rate (mm/min)	670	720	780	830	840	760	710	520
		Slotting	ap≤0.5Dc	Spindle Revolution (min^{-1})	6,800	6,000	5,100	4,300	3,400	2,600	2,000	1,400
				Feed Rate (mm/min)	390	440	480	500	510	480	460	380

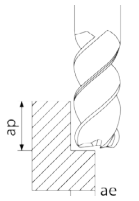
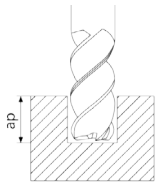
* Cutting with coolant is recommended for stainless steel.

4MFK (Long)

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16
 Shouldering	Carbon Steel	Shouldering	3Dc×0.02Dc	Spindle Revolution (min^{-1})	11,000	8,500	7,000	6,000	4,800	3,800	3,200	2,600
				Feed Rate (mm/min)	910	910	910	970	970	910	910	840
	Alloy Steel	Shouldering	3Dc×0.02Dc	Spindle Revolution (min^{-1})	6,500	5,700	5,100	4,500	3,700	2,900	2,300	1,700
				Feed Rate (mm/min)	540	540	540	600	600	540	540	490
	Pre-hardened steel 30~45HRC	Shouldering	3Dc×0.02Dc	Spindle Revolution (min^{-1})	4,900	3,900	3,100	2,600	2,000	1,600	1,300	1,000
				Feed Rate (mm/min)	330	360	400	420	450	400	380	310
	Stainless Steel	Shouldering	3Dc×0.02Dc	Spindle Revolution (min^{-1})	4,300	3,500	3,000	2,600	2,000	1,500	1,300	900
				Feed Rate (mm/min)	330	360	390	410	420	380	350	260

* Cutting with coolant is recommended for stainless steel.

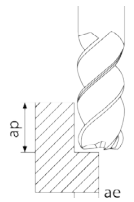
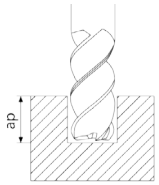
4YEKM, 4YECM, 4YERM

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering  Slotting	Carbon Steel / Alloy Steel ~HRC30	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	8,400	6,700	5,600	4,200	3,300	2,800	2,100	1,700	1,300
				Feed Rate (mm/min)	840	800	890	840	790	720	580	510	390
		Slotting	1Dc	Spindle Revolution (min^{-1})	8,400	6,700	5,600	4,200	3,300	2,800	2,100	1,700	1,300
				Feed Rate (mm/min)	840	800	890	840	790	720	580	510	390
	Carbon Steel / Alloy Steel 30~40HRC	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	6,800	5,400	4,500	3,400	2,700	2,300	1,700	1,400	1,100
				Feed Rate (mm/min)	540	540	630	610	540	500	400	360	300
		Slotting	1Dc	Spindle Revolution (min^{-1})	6,800	5,400	4,500	3,400	2,700	2,300	1,700	1,400	1,100
				Feed Rate (mm/min)	540	540	630	610	540	500	400	360	300
	Stainless Steel	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	6,400	5,100	4,200	3,200	2,600	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	510	510	580	570	520	460	380	330	280
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	6,400	5,100	4,200	3,200	2,600	2,100	1,600	1,300	1,000
				Feed Rate (mm/min)	510	510	580	570	520	460	380	330	280
	Titanium Alloys	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	4,000	3,200	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	190	190	210	240	190	200	180	190	160
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	4,000	3,200	2,700	2,000	1,600	1,300	1,000	800	600
				Feed Rate (mm/min)	190	190	210	240	190	200	180	190	160
	Heat-resistant Alloys	Shouldering	1Dc×0.25Dc	Spindle Revolution (min^{-1})	2,400	1,900	1,600	1,200	1,000	800	600	500	400
				Feed Rate (mm/min)	100	80	100	130	100	120	110	110	80
		Slotting	0.3Dc	Spindle Revolution (min^{-1})	2,400	1,900	1,600	1,200	1,000	800	600	500	400
				Feed Rate (mm/min)	100	80	100	130	100	120	110	110	80

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

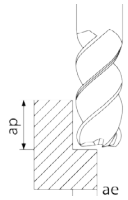
Recommended Cutting Conditions

5DEKM, 5DERM

Applications	Workpiece Material	Application	Outside Dia. Dc (mm)	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering **Depth of Cut (ap×ae) (mm)** 5DEKM: 1.5Dc×0.25Dc 5DERM: 1.5Dc×0.5Dc	Medium Carbon Steel High Carbon Steel > 0.3%C	Shouldering	Spindle Revolution (min^{-1})	16,000	12,700	10,600	8,000	6,400	5,300	4,000	3,200	2,500
			Feed Rate (mm/min)	2,400	2,500	2,700	2,400	2,200	1,900	1,600	1,600	1,400
		Slotting	Spindle Revolution (min^{-1})	16,000	12,700	10,600	8,000	6,400	5,300	4,000	3,200	2,500
			Feed Rate (mm/min)	2,400	2,500	2,700	2,400	2,200	1,900	1,600	1,600	1,400
	Alloy Steel Alloy Tool Steel < 330HB < 35HRC	Shouldering	Spindle Revolution (min^{-1})	14,300	11,500	9,600	7,200	5,700	4,800	3,600	2,900	2,300
			Feed Rate (mm/min)	2,100	1,700	1,900	1,800	1,700	1,700	1,400	1,300	1,100
		Slotting	Spindle Revolution (min^{-1})	14,300	11,500	9,600	7,200	5,700	4,800	3,600	2,900	2,300
			Feed Rate (mm/min)	2,100	1,700	1,900	1,800	1,700	1,700	1,400	1,300	1,100
	Alloy Steel Alloy Tool Steel 340~450HB 36~48HRC	Shouldering	Spindle Revolution (min^{-1})	13,000	10,000	8,500	6,400	5,100	4,200	3,200	2,500	2,000
			Feed Rate (mm/min)	1,300	1,500	1,700	1,300	1,300	1,300	1,100	1,000	1,000
		Slotting	Spindle Revolution (min^{-1})	13,000	10,000	8,500	6,400	5,100	4,200	3,200	2,500	2,000
			Feed Rate (mm/min)	1,300	1,500	1,700	1,300	1,300	1,300	1,100	1,000	1,000
	Austenitic Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	9,200	7,300	6,100	4,600	3,700	3,100	2,300	1,800	1,500
			Feed Rate (mm/min)	1,400	1,100	1,200	1,100	1,100	1,100	920	820	730
		Slotting	Spindle Revolution (min^{-1})	9,200	7,300	6,100	4,600	3,700	3,100	2,300	1,800	1,500
			Feed Rate (mm/min)	1,400	1,100	1,200	1,100	1,100	1,100	920	820	730
 Slotting **Depth of Cut (ae) (mm)** 5DEKM: 0.25Dc 5DERM: 0.8Dc	Austenitic Stainless Steel	Shouldering	Spindle Revolution (min^{-1})	6,400	5,100	4,200	3,200	2,500	2,100	1,600	1,300	1,000
			Feed Rate (mm/min)	640	760	640	640	640	640	560	510	410
		Slotting	Spindle Revolution (min^{-1})	6,400	5,100	4,200	3,200	2,500	2,100	1,600	1,300	1,000
			Feed Rate (mm/min)	640	760	640	640	640	640	560	510	410
	Titanium Alloys	Shouldering	Spindle Revolution (min^{-1})	4,800	3,800	3,200	2,400	1,900	1,600	1,200	960	760
			Feed Rate (mm/min)	480	380	480	480	380	400	360	380	340
		Slotting	Spindle Revolution (min^{-1})	4,800	3,800	3,200	2,400	1,900	1,600	1,200	960	760
			Feed Rate (mm/min)	480	380	480	480	380	400	360	380	340
	Heat-resistant Alloys	Shouldering	Spindle Revolution (min^{-1})	3,200	2,500	2,100	1,600	1,300	1,100	800	640	510
			Feed Rate (mm/min)	160	130	210	240	190	210	200	190	180
		Slotting	Spindle Revolution (min^{-1})	3,200	2,500	2,100	1,600	1,300	1,100	800	640	510
			Feed Rate (mm/min)	160	130	210	240	190	210	200	190	180
	Gray Cast Iron	Shouldering	Spindle Revolution (min^{-1})	14,000	11,000	9,000	6,800	5,400	4,500	3,400	2,700	2,200
			Feed Rate (mm/min)	2,000	2,200	2,300	2,000	2,200	1,800	1,700	1,600	1,400
		Slotting	Spindle Revolution (min^{-1})	14,000	11,000	9,000	6,800	5,400	4,500	3,400	2,700	2,200
			Feed Rate (mm/min)	2,000	2,200	2,300	2,000	2,200	1,800	1,700	1,600	1,400
	Nodular Cast Iron CGI Malleable Cast Iron	Shouldering	Spindle Revolution (min^{-1})	10,000	8,300	6,900	5,200	4,100	3,500	2,600	2,100	1,700
			Feed Rate (mm/min)	1,000	1,200	1,000	1,300	1,000	1,000	910	830	830
		Slotting	Spindle Revolution (min^{-1})	10,000	8,300	6,900	5,200	4,100	3,500	2,600	2,100	1,700
			Feed Rate (mm/min)	1,000	1,200	1,000	1,300	1,000	1,000	910	830	830

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

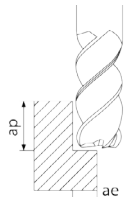
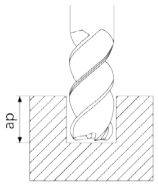
4YFSM, 6YFSM (Shouldering)

Applications	Workpiece Material	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering	Carbon Steel < 20HRC	1.5Dc×0.1Dc	Spindle Revolution (min^{-1})	10,000	8,000	6,600	5,000	4,000	3,300	2,500	2,000
			Feed Rate (mm/min)	800	800	1,340	1,340	1,340	1,350	1,490	1,610
	Alloy Steel < 30HRC		Spindle Revolution (min^{-1})	8,000	6,400	5,300	4,000	3,200	2,700	2,000	1,600
			Feed Rate (mm/min)	570	570	960	960	960	960	1,080	1,150
	Pre-hardened steel 30~45HRC		Spindle Revolution (min^{-1})	6,000	4,800	4,000	3,000	2,400	2,000	1,500	1,200
			Feed Rate (mm/min)	360	360	620	660	660	660	740	790
	Stainless Steel		Spindle Revolution (min^{-1})	5,200	4,100	3,500	2,600	2,100	1,700	1,300	1,000
			Feed Rate (mm/min)	270	280	520	540	550	550	620	650
	Titanium Alloys	1Dc×0.05Dc	Spindle Revolution (min^{-1})	3,600	2,900	2,400	1,800	1,400	1,200	900	700
			Feed Rate (mm/min)	160	170	340	360	360	360	410	410
	Heat-resistant Alloys		Spindle Revolution (min^{-1})	3,600	2,900	2,400	1,800	1,400	1,200	900	700
			Feed Rate (mm/min)	160	170	340	360	360	360	410	410

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

Slotting is not recommended.

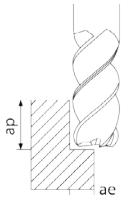
3RDSM, 4RDSM, 5RDSM

Applications	Workpiece Material		Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Steel	< 22HRC	Shouldering	1.5Dc×0.5Dc	Spindle Revolution (min^{-1})	11,100	8,400	6,700	5,600	4,200	3,300	2,700
					Feed Rate (mm/min)	1,000	1,000	1,320	1,340	1,340	1,340	1,380
			Slotting	1Dc	Spindle Revolution (min^{-1})	9,300	6,900	5,600	4,600	3,500	2,800	2,200
					Feed Rate (mm/min)	800	800	1,000	1,030	1,040	1,050	1,110
		22~32HRC	Shouldering	1.5Dc×0.4Dc	Spindle Revolution (min^{-1})	9,600	7,200	5,700	4,800	3,600	2,900	2,300
					Feed Rate (mm/min)	720	720	860	860	860	920	1,030
			Slotting	0.75Dc	Spindle Revolution (min^{-1})	7,900	5,900	4,800	4,000	3,000	2,400	1,900
					Feed Rate (mm/min)	550	550	740	740	740	760	860
		32~40HRC	Shouldering	1.5Dc×0.4Dc	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,500
					Feed Rate (mm/min)	320	320	410	410	400	400	400
			Slotting	0.6Dc	Spindle Revolution (min^{-1})	5,300	4,000	3,200	2,600	2,000	1,600	1,300
					Feed Rate (mm/min)	260	260	340	340	330	330	330
		40~45HRC	Shouldering	1Dc×0.4Dc	Spindle Revolution (min^{-1})	4,800	3,600	2,900	2,400	1,800	1,400	1,100
					Feed Rate (mm/min)	220	220	260	260	250	250	250
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	4,300	3,200	2,600	2,200	1,600	1,300	1,000
					Feed Rate (mm/min)	180	180	240	230	230	220	220
 Slotting		45~50HRC	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	4,200	3,200	2,500	2,100	1,600	1,300	1,000
					Feed Rate (mm/min)	150	150	180	180	170	170	170
			Slotting	0.4Dc	Spindle Revolution (min^{-1})	3,800	2,900	2,300	1,900	1,400	1,100	900
					Feed Rate (mm/min)	140	140	170	160	160	150	150
	Stainless Steel		Shouldering	1.5Dc×0.4Dc	Spindle Revolution (min^{-1})	3,700	2,800	2,200	1,900	1,400	1,100	900
					Feed Rate (mm/min)	190	230	310	300	340	310	360
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	2,700	2,000	1,600	1,300	1,000	800	600
					Feed Rate (mm/min)	110	130	180	170	190	180	190
	Cast Iron		Shouldering	1.5Dc×0.5Dc	Spindle Revolution (min^{-1})	9,600	7,200	5,700	4,800	3,600	2,900	2,300
					Feed Rate (mm/min)	850	850	1,030	1,030	1,030	1,100	1,380
			Slotting	1Dc	Spindle Revolution (min^{-1})	7,900	5,900	4,800	4,000	3,000	2,400	1,900
					Feed Rate (mm/min)	700	700	900	900	900	910	1,140

* Cutting with coolant is recommended for stainless steel.

Recommended Cutting Conditions

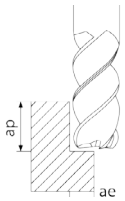
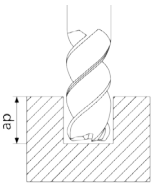
3RDSL, 4RDSL, 5RDSL (Shouldering)

Applications	Workpiece Material		Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Steel	< 22HRC	2.5Dc×0.5Dc	Spindle Revolution (min^{-1})	7,800	5,900	4,700	3,900	2,900	2,300	1,900
				Feed Rate (mm/min)	700	700	770	780	840	840	940
		22~32HRC	2.5Dc×0.4Dc	Spindle Revolution (min^{-1})	6,700	5,000	4,000	3,400	2,500	2,000	1,600
				Feed Rate (mm/min)	500	500	600	600	600	640	720
		32~40HRC		Spindle Revolution (min^{-1})	4,500	3,400	2,700	2,200	1,700	1,300	1,100
				Feed Rate (mm/min)	220	220	290	290	280	280	280
		40~45HRC		Spindle Revolution (min^{-1})	3,400	2,500	2,000	1,700	1,300	1,000	800
				Feed Rate (mm/min)	150	150	180	180	180	180	180
		45~50HRC	2.5Dc×0.3Dc	Spindle Revolution (min^{-1})	2,900	2,200	1,800	1,500	1,100	900	700
				Feed Rate (mm/min)	110	110	130	130	120	120	120
	Stainless Steel		1.5Dc×0.1Dc	Spindle Revolution (min^{-1})	3,700	2,800	2,200	1,900	1,400	1,100	900
				Feed Rate (mm/min)	120	150	200	200	220	200	230
	Cast Iron		2.5Dc×0.5Dc	Spindle Revolution (min^{-1})	6,700	5,000	4,000	3,400	2,500	2,000	1,600
				Feed Rate (mm/min)	600	600	720	720	720	770	970

* Cutting with coolant is recommended for stainless steel.

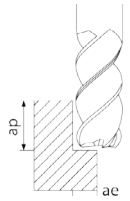
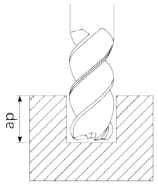
Slotting is not recommended.

4RFSM, 6RFSM

Applications	Workpiece Material		Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16		Ø20		Ø25
										4 flutes	6 flutes	4 flutes	6 flutes	
 Shouldering	Steel	35~45HRC	Shouldering	1.5Dc×0.4Dc	Spindle Revolution (min^{-1})	8,000	6,000	4,800	4,000	3,000	3,000	2,400	2,400	1,900
					Feed Rate (mm/min)	630	630	630	640	640	900	640	930	800
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	2,400	1,900	1,900	1,500
					Feed Rate (mm/min)	480	480	490	500	500	720	500	750	640
		45~55HRC	Shouldering	1.5Dc×0.33Dc	Spindle Revolution (min^{-1})	5,800	4,400	3,500	2,900	2,200	2,200	1,800	1,800	1,400
					Feed Rate (mm/min)	350	350	350	350	350	530	350	530	460
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	4,700	3,500	2,800	2,300	1,800	1,800	1,400	1,400	1,100
					Feed Rate (mm/min)	280	280	280	280	280	420	280	420	370
		55~60HRC	Shouldering	1.5Dc×0.25Dc	Spindle Revolution (min^{-1})	4,800	3,600	2,900	2,400	1,800	1,800	1,400	1,400	1,100
					Feed Rate (mm/min)	190	220	230	240	220	320	230	340	310
			Slotting	0.3Dc	Spindle Revolution (min^{-1})	3,800	2,900	2,300	1,900	1,400	1,400	1,100	1,100	900
					Feed Rate (mm/min)	150	170	180	180	180	260	180	280	250
	Stainless Steel		Shouldering	1.5Dc×0.4Dc	Spindle Revolution (min^{-1})	3,700	2,800	2,200	1,900	1,400	1,400	1,100	1,100	900
					Feed Rate (mm/min)	300	280	260	300	280	420	290	430	380
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	3,200	2,400	1,900	1,600	1,200	1,200	1,000	1,000	800
					Feed Rate (mm/min)	200	190	180	200	190	290	210	310	270
 Slotting	Titanium Alloys	< 40HRC	Shouldering	2Dc×0.4Dc	Spindle Revolution (min^{-1})	3,700	2,800	2,200	1,900	1,400	1,400	1,100	1,100	900
					Feed Rate (mm/min)	390	390	390	390	390	590	390	540	450
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	3,000	2,200	1,800	1,500	1,100	1,100	900	900	700
					Feed Rate (mm/min)	310	310	310	310	310	470	310	430	360
		> 40HRC	Shouldering	1.5Dc×0.25Dc	Spindle Revolution (min^{-1})	3,200	2,400	1,900	1,600	1,200	1,200	1,000	1,000	800
					Feed Rate (mm/min)	300	300	300	300	300	430	300	430	370
			Slotting	0.3Dc	Spindle Revolution (min^{-1})	2,500	1,900	1,500	1,300	1,000	1,000	800	800	600
					Feed Rate (mm/min)	230	230	230	230	230	340	230	340	290
	Heat-resistant Alloys (Inconel)		Shouldering	1Dc×0.2Dc	Spindle Revolution (min^{-1})	1,600	1,200	1,000	800	600	600	500	500	400
					Feed Rate (mm/min)	100	100	100	100	100	140	100	140	130
			Slotting	0.25Dc	Spindle Revolution (min^{-1})	1,300	1,000	800	600	500	500	400	400	300
					Feed Rate (mm/min)	80	80	80	80	80	120	80	120	100

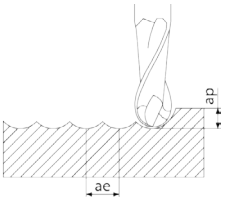
* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

3RFRS, 4RFRS

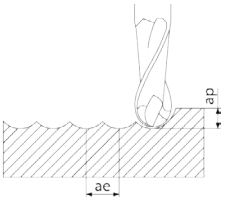
Applications	Workpiece Material		Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12
 Shouldering  Slotting	Steel	< 30HRC	Shouldering	0.8Dc×0.5Dc	Spindle Revolution (min^{-1})	14,300	11,500	9,600	7,200	5,700	4,800
					Feed Rate (mm/min)	860	860	1,150	1,150	1,150	1,150
			Slotting	0.8Dc	Spindle Revolution (min^{-1})	11,500	9,200	7,600	5,700	4,600	3,800
					Feed Rate (mm/min)	690	690	920	920	920	920
		30~40HRC	Shouldering	0.8Dc×0.4Dc	Spindle Revolution (min^{-1})	9,600	7,600	6,400	4,800	3,800	3,200
					Feed Rate (mm/min)	430	460	640	610	610	570
			Slotting	0.8Dc	Spindle Revolution (min^{-1})	7,600	6,100	5,100	3,800	3,100	2,500
					Feed Rate (mm/min)	340	370	490	490	490	460
		40~50HRC	Shouldering	0.8Dc×0.4Dc	Spindle Revolution (min^{-1})	6,400	5,100	4,200	3,200	2,500	2,100
					Feed Rate (mm/min)	190	230	320	320	320	340
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	5,100	4,100	3,400	2,500	2,000	1,700
					Feed Rate (mm/min)	150	180	260	260	260	270
		50~60HRC	Shouldering	0.8Dc×0.25Dc	Spindle Revolution (min^{-1})	4,800	3,800	3,200	2,400	1,900	1,600
					Feed Rate (mm/min)	100	100	130	140	150	160
			Slotting	0.3Dc	Spindle Revolution (min^{-1})	3,800	3,100	2,500	1,900	1,500	1,300
					Feed Rate (mm/min)	80	80	100	120	120	130
		60~70HRC	Shouldering	0.8Dc×0.2Dc	Spindle Revolution (min^{-1})	3,200	2,500	2,100	1,600	1,300	1,100
					Feed Rate (mm/min)	60	60	70	70	80	90
			Slotting	0.25Dc	Spindle Revolution (min^{-1})	2,500	2,000	1,700	1,300	1,000	800
					Feed Rate (mm/min)	50	50	60	60	60	70
	Titanium Alloys		Shouldering	0.8Dc×0.4Dc	Spindle Revolution (min^{-1})	6,400	5,100	4,200	3,200	2,500	2,100
					Feed Rate (mm/min)	190	230	340	320	350	380
			Slotting	0.5Dc	Spindle Revolution (min^{-1})	4,000	3,200	2,700	2,000	1,600	1,300
					Feed Rate (mm/min)	80	100	150	140	160	170

* Cutting with coolant is recommended for titanium alloys.

2UEBS

Applications	Workpiece Material		Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Copying	Steel	< 42HRC	0.3Dc×0.7Dc	Spindle Revolution (min^{-1})	9,600	6,400	4,800	3,800	3,200	2,400	1,900
				Feed Rate (mm/min)	380	420	380	380	340	300	310
		42~48HRC		Spindle Revolution (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000	1,600
				Feed Rate (mm/min)	300	330	300	290	270	240	240
		48~52HRC		Spindle Revolution (min^{-1})	6,400	4,200	3,200	2,500	2,100	1,600	1,300
				Feed Rate (mm/min)	190	210	190	190	170	150	150
	Cast Iron	< 180HB		Spindle Revolution (min^{-1})	12,700	8,500	6,400	5,100	4,200	3,200	2,500
				Feed Rate (mm/min)	760	850	760	750	690	610	610
		> 180HB		Spindle Revolution (min^{-1})	11,100	7,400	5,600	4,500	3,700	2,800	2,200
				Feed Rate (mm/min)	540	590	540	530	480	420	430

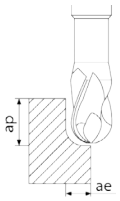
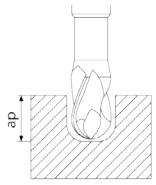
3UEBS

Applications	Workpiece Material	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	Ø12
 Copying	Carbon Steel < 20HRC	0.2Dc×0.3Dc	Spindle Revolution (min^{-1})	13,300	10,000	8,000	6,600	5,000	4,000	3,300
			Feed Rate (mm/min)	600	870	840	850	1,400	1,200	990
	Alloy Steel < 35HRC	0.2Dc×0.3Dc	Spindle Revolution (min^{-1})	10,600	8,000	6,400	5,300	4,000	3,200	2,700
			Feed Rate (mm/min)	410	500	610	640	940	830	730
	Pre-hardened steel 30~45HRC	0.1Dc×0.2Dc	Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,900
			Feed Rate (mm/min)	220	250	257	280	250	240	230
	Stainless Steel	0.05Dc×0.1Dc	Spindle Revolution (min^{-1})	5,800	4,400	3,500	2,900	2,200	1,800	1,500
			Feed Rate (mm/min)	160	180	190	180	190	190	170

* Cutting with coolant is recommended for stainless steel.

Recommended Cutting Conditions

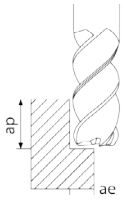
4YEBM

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø5	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering	Low Carbon Steel	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	9,400	7,900	5,900	4,700	3,900	2,900	2,400
				Feed Rate (mm/min)	1,020	1,130	1,270	1,020	990	800	760
		Slotting	1Dc	Spindle Revolution (min^{-1})	8,600	7,200	5,400	4,300	3,600	2,700	2,200
				Feed Rate (mm/min)	930	1,030	1,160	930	900	730	700
	Stainless Steel	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	5,700	4,800	3,600	2,900	2,400	1,800	1,400
				Feed Rate (mm/min)	620	630	630	640	560	450	390
		Slotting	1Dc	Spindle Revolution (min^{-1})	5,100	4,200	3,200	2,500	2,100	1,600	1,300
				Feed Rate (mm/min)	550	610	570	550	500	400	350
	Titanium Alloys	Shouldering	1Dc×0.3Dc	Spindle Revolution (min^{-1})	3,200	2,700	2,000	1,600	1,300	1,000	800
				Feed Rate (mm/min)	180	190	220	170	170	160	160
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	2,900	2,400	1,800	1,400	1,200	900	700
				Feed Rate (mm/min)	160	170	190	170	170	160	160
 Slotting	Heat-resistant Alloys	Shouldering	1Dc×0.2Dc	Spindle Revolution (min^{-1})	1,700	1,400	1,000	800	700	500	400
				Feed Rate (mm/min)	70	80	100	80	90	90	80
		Slotting	0.5Dc	Spindle Revolution (min^{-1})	1,400	1,200	900	700	600	400	400
				Feed Rate (mm/min)	60	70	80	80	80	80	70
	Gray Cast Iron	Shouldering	1Dc×0.4Dc	Spindle Revolution (min^{-1})	7,800	6,500	4,900	3,900	3,200	2,400	1,900
				Feed Rate (mm/min)	840	930	1,050	840	820	660	630
		Slotting	1Dc	Spindle Revolution (min^{-1})	7,000	5,800	4,400	3,500	2,900	2,200	1,800
				Feed Rate (mm/min)	760	840	950	760	740	600	570

* Cutting with coolant is recommended for stainless steel, titanium alloys and heat-resistant alloys.

4HFSS, 5HFSS, 6HFSS, 7HFSS (Shouldering)

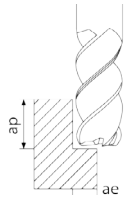
4HFSM, 5HFSM, 6HFSM, 7HFSM, 8HFSM (Shouldering)

Applications	Workpiece Material	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø1	Ø2	Ø4	Ø6	Ø8	Ø12
 Shouldering	Tool Steel (< 40HRC) · Pre-hardened steel	1.5Dc×0.05Dc (Dc<Ø3) 1.5Dc×0.1Dc (Ø3≤Dc)	Spindle Revolution (min^{-1})	20,700	20,000	11,100	7,400	5,600	3,700
			Feed Rate (mm/min)	910	1,750	2,000	2,900	2,930	2,930
	Tool Steel / Hardened Steel (40~45HRC) Pre-hardened steel		Spindle Revolution (min^{-1})	20,700	20,000	9,900	6,600	5,000	3,300
			Feed Rate (mm/min)	910	1,750	1,800	2,630	2,650	2,650
	Hardened Steel (45~55HRC)	1.5Dc×0.05Dc	Spindle Revolution (min^{-1})	20,700	16,000	8,000	5,300	4,000	2,700
			Feed Rate (mm/min)	910	1,400	1,400	2,100	2,100	2,100
	Hardened Steel (55~60HRC)	1.5Dc×0.02Dc	Spindle Revolution (min^{-1})	20,700	12,000	6,000	4,000	3,000	2,000
			Feed Rate (mm/min)	640	730	740	1,100	1,100	1,100
	Hardened Steel (60~65HRC)		Spindle Revolution (min^{-1})	20,700	11,100	5,600	3,700	2,800	1,900
			Feed Rate (mm/min)	550	600	600	880	880	880
	Hardened Steel (65~70HRC)		Spindle Revolution (min^{-1})	15,900	8,000	4,000	2,700	2,000	1,330
			Feed Rate (mm/min)	370	370	370	560	560	550

* Above is even number flute condition. In case of Odd number flute, please take standard with increasing feed rate 15-20% condition.

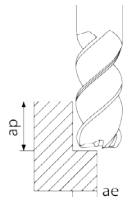
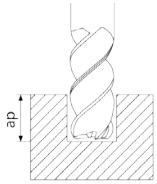
Slotting is not recommended.

4UGSM, 6UGSM (Shouldering)

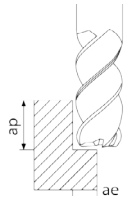
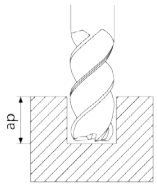
Applications	Workpiece Material		Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø4	Ø6	Ø8	Ø10	Ø12	Ø16
 Shouldering	Steel	**45~55HRC**	1Dc×0.05Dc	Spindle Revolution (min^{-1})	11,900	8,000	6,000	4,800	4,000	3,000
				Feed Rate (mm/min)	810	1,200	1,200	1,000	980	900
		55~60HRC		Spindle Revolution (min^{-1})	8,000	5,300	4,000	3,200	2,700	2,000
				Feed Rate (mm/min)	510	760	740	610	610	540
		60~65HRC	1Dc×0.2mm	Spindle Revolution (min^{-1})	5,200	3,500	2,600	2,100	1,700	1,300
				Feed Rate (mm/min)	290	480	450	390	370	330
		65~70HRC		Spindle Revolution (min^{-1})	2,800	1,900	1,400	1,100	900	700
				Feed Rate (mm/min)	150	250	230	200	200	170

Slotting is not recommended.

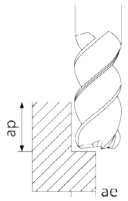
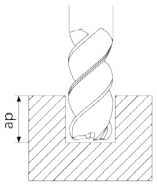
3NESM

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering	Aluminum Alloys	Shouldering	1.5Dc×0.5Dc	Spindle Revolution (min^{-1})	34,000	17,000	13,000	10,200	8,500	6,400	5,100
				Feed Rate (mm/min)	2,750	2,750	2,750	2,750	2,750	2,750	2,750
 Slotting		Slotting	1Dc	Spindle Revolution (min^{-1})	26,500	13,000	9,800	8,000	6,600	5,000	4,000
				Feed Rate (mm/min)	1,100	1,100	1,100	1,100	1,100	1,100	1,100

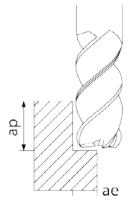
2NFSM

Applications	Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering	Aluminum Alloys	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	26,500	13,300	10,000	8,000	6,600	5,000	4,000
				Feed Rate (mm/min)	690	950	950	1,130	1,260	1,000	880
		Slotting	1Dc	Spindle Revolution (min^{-1})	21,200	10,600	8,000	6,400	5,300	4,000	3,200
				Feed Rate (mm/min)	550	750	750	900	1,010	800	700
 Slotting	High-silicon Aluminum Alloys	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	19,100	9,600	7,200	5,700	4,800	3,600	2,900
				Feed Rate (mm/min)	420	500	500	600	670	770	570
		Slotting	1Dc	Spindle Revolution (min^{-1})	15,900	7,900	5,900	4,800	4,000	3,000	2,400
				Feed Rate (mm/min)	350	420	420	500	560	640	480

3NFSM

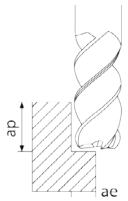
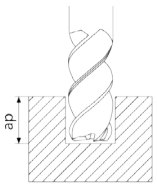
Applications		Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø3	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20
 Shouldering	 Slotting	Aluminum Alloys	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	26,500	13,300	10,000	8,000	6,600	5,000	4,000
					Feed Rate (mm/min)	1,040	1,400	1,400	1,700	1,890	1,490	1,310
			Slotting	1Dc	Spindle Revolution (min^{-1})	21,200	10,600	8,000	6,400	5,300	4,000	3,200
					Feed Rate (mm/min)	830	1,100	1,100	1,360	1,510	1,290	1,050
		High-silicon Aluminum Alloys	Shouldering	1Dc×0.5Dc	Spindle Revolution (min^{-1})	19,100	9,600	7,200	5,700	4,800	3,600	2,900
					Feed Rate (mm/min)	630	750	750	890	1,000	1,160	860
			Slotting	1Dc	Spindle Revolution (min^{-1})	15,900	7,900	5,900	4,800	4,000	3,000	2,400
					Feed Rate (mm/min)	520	630	630	740	830	960	710

3NFSL (Shouldering)

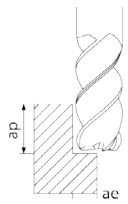
Applications	Workpiece Material	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Aluminum Alloys	2.5Dc×0.5Dc	Spindle Revolution (min^{-1})	18,500	9,300	7,000	5,600	4,600	3,500	2,800
			Feed Rate (mm/min)	730	980	980	1,200	1,320	1,040	920
	High-silicon Aluminum Alloys	1.5Dc×0.5Dc	Spindle Revolution (min^{-1})	13,400	6,700	5,000	4,000	3,400	2,500	2,000
			Feed Rate (mm/min)	440	530	530	620	700	810	600

Slotting is not recommended.

3AESM

Applications		Workpiece Material	Application	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	 Slotting	Aluminum Alloys	Shouldering	1.5Dc×0.5Dc	Spindle Revolution (min^{-1})	33,200	24,900	19,900	16,600	12,400	10,000	8,000
					Feed Rate (mm/min)	5,370	5,150	5,080	4,980	4,890	4,840	4,780
			Slotting	1Dc	Spindle Revolution (min^{-1})	19,900	14,900	11,900	10,000	7,500	6,000	4,800
					Feed Rate (mm/min)	3,230	3,090	3,050	2,990	2,930	2,900	2,870
		High-silicon Aluminum Alloys	Shouldering	1.5Dc×0.5Dc	Spindle Revolution (min^{-1})	10,600	8,000	6,400	5,300	4,000	3,200	2,500
					Feed Rate (mm/min)	1,430	1,390	1,360	1,320	1,300	1,290	1,280
			Slotting	1Dc	Spindle Revolution (min^{-1})	6,400	4,800	3,800	3,200	2,400	1,900	1,500
					Feed Rate (mm/min)	860	830	810	790	780	770	770

3AESL (Shouldering)

Applications	Workpiece Material	Depth of Cut (ap×ae) (mm)	Outside Dia. Dc (mm)	Ø6	Ø8	Ø10	Ø12	Ø16	Ø20	Ø25
 Shouldering	Aluminum Alloys	2.5Dc×0.5Dc	Spindle Revolution (min^{-1})	23,000	17,500	14,000	11,600	8,700	7,000	5,600
			Feed Rate (mm/min)	3,760	3,600	3,560	3,490	3,420	3,390	3,350
	High-silicon Aluminum Alloys		Spindle Revolution (min^{-1})	7,400	5,600	4,500	3,700	2,800	2,200	1,800
			Feed Rate (mm/min)	1,000	970	950	920	910	900	900

Slotting is not recommended.

Technical Information

R

R1~R24

Inch Metric Conversion Chart

● Cutting Speed (Vc)

Cutting Speed (Vc)	
SFM	m/min
300	91
600	183
900	274
1,200	366

SFM=(0.262x rpm) x dia (inch)
3.28feet/min (SFM)=1m/min

SFM (surface feet per minute)

● D.O.C. (ap)

D.O.C. (ap)	
inch	mm
0.02	0.5
0.04	1.0
0.08	2.0
0.12	3.0

1inch=25.4mm
0.04inch=1mm

● Feed Rate

1) ipr

Feed Rate (f)	
ipr	mm/rev
0.002	0.05
0.004	0.1
0.008	0.2
0.012	0.3

1ipr=25.4mm/rev
0.004ipr=0.1mm/rev

ipr (inch per revolution)
mm/rev (mm per revolution)

2) ipt

Feed Rate (fz)	
ipt	mm/t
0.002	0.05
0.004	0.1
0.008	0.2
0.012	0.3

1ipt=25.4mm/t
0.004ipt=0.1mm/t

ipt (inch per tooth)
mm/t (mm per tooth)

● Torque

lbft	Nm
0.738	1
1	1.36

lbft (pound · feet)
Nm (Newton · meter)

SI Derived Units Conversion Chart

(Extracted from JIS Handbook “Iron & Steel”)

● Force

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

● Power

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}	7.5x10	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

● Revolution

min^{-1}	**s^{-1}**	**r.p.m.**
1	0.0167	1
60	1	60

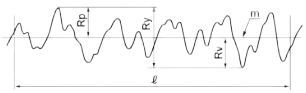
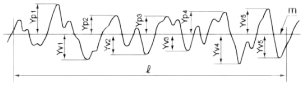
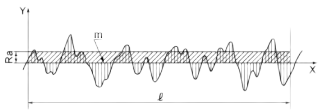
Theoretical (Geometrical) Surface Roughness

Theoretical Surface Roughness at Turning indicates the minimum roughness value from the cutting conditions and it is shown by the formula as follows:

$$Rz(h) = \frac{f^2}{8R(r\varepsilon)} \times 10^3$$

Rz(h) : Theoretical Surface Roughness 〔μm〕
f : Feed Rate 〔mm/rev〕
R(rε) : Corner Radius of Insert 〔mm〕

How to Obtain Surface Roughness Values

Type	Symbol	How to Obtain	Explanation
Max. Height Roughness	Rz	Ry is obtained from the distance in micron meter between the highest peak and the lowest valley in the range of sampled reference length (ℓ) to the direction of mean line of the roughness curve. $Rz = Rp + Rv$	
Ten Points Mean Roughness	RzJIS	Rz is obtained from the total in micron meter of the mean value of the each distance between the mean line and 5 peaks (Yp) from the highest one, and the mean value of the each distance between the mean line and the 5 valleys (Yv) from the lowest one, of the roughness curve in the range of sampled reference length "ℓ". $RzJIS = \frac{(Yp1+Yp2+Yp3+Yp4+Yp5) + (Yv1+Yv2+Yv3+Yv4+Yv5)}{5}$	 *Yp1, Yp2, Yp3, Yp4, Yp5:* Distance from the mean line to highest 5 peaks in the range of sampled reference length "ℓ" *Yv1, Yv2, Yv3, Yv4, Yv5:* Distance from the mean line to the lowest 5 valleys in the range of sampled reference length "ℓ"
Arithmetical Mean Roughness	Ra	Ra is obtained from the following formula in micron meter when the roughness curve is expressed by y=f(x), taking X-axis to the mean line direction and Y-axis to the vertical magnification of the roughness curve in the range of sampled reference length "ℓ". $Ra = \frac{1}{\ell}\int_0^{\ell} \{f(x)\}\, dx$	

Relationship with Triangle Symbol

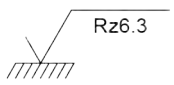
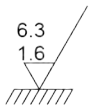
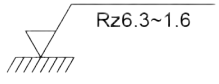
Arithmetical Mean Roughness Ra(μm)	Max. Height Roughness Rz(μm)	Ten PointsMean Roughness RzJIS(μm)	Note: (Relationship with Triangle)
0.025 0.05 0.1 0.2	0.1 0.2 0.4 0.8	0.1 0.2 0.4 0.8	▽▽▽▽
0.4 0.8 1.6	1.6 3.2 6.3	1.6 3.2 6.3	▽▽▽
3.2 6.3	12.5 25	12.5 25	▽▽
12.5 25	50 100	50 100	▽

Note: Finishing symbol (Triangle▽and wave~) was abolished from JIS standard from 1994 Revision

・How to Indicate

Example
①When Ra is 1.6μm→1.6μmRa
②When Rz is 6.3μm→6.3μmRz
③When RzJIS is 6.3μm→6.3μmRzJIS

Indication in JIS Standard

Example of Ra Indication		Example of Ry, (Rz) Indication	
①When indicating the upper limit only (when upper limit is 6.3μmRa)		①When indicating upper limit only Indicate surface roughness following the parameter symbol.	
②When indicating both lower and upper limit (when upper limit is 6.3μmRa, lower limit is 1.6μmRa)		②When indicating both lower and upper limit Indicate surface roughness as (upper limit ~ lower limit) following the parameter symbol.	

Note: The indications of Ra and Rz are different.

Surface Roughness Symbol Caution

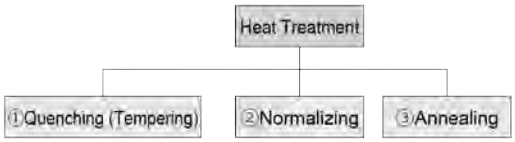
The above information is based on JIS B 0601-2001.
However, some symbols were revised as shown in the right table in accordance with ISO Standard from JIS B 0601-2001 version.
Ten Points Mean Roughness (Rz) was eliminated from 2001 version but it still remains as RzJIS reference, since it was popular in Japan.

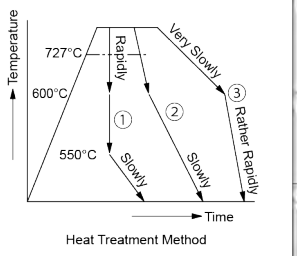
Type	Symbol of JIS B 0601-1994	Symbol of JIS B 0601-2001
Max. Height Roughness	Ry	→ Rz
Ten Points Mean Roughness	Rz	→ (RzJIS)
Arithmetical Mean Roughness	Ra	→ Ra

Heat Treatment and Hardness Expression

Heat Treatment

One of the ways to determine the hardness of steel is the heat treatment and it is classified to 3 types.



 Heat Treatment Method	• Quenching (Tempering)	After heating to over 727°C, cool rapidly down to 550°C in water or oil.	Quenching makes steel hard because it cools down red-hot steel very rapidly in water or oil, but it may promote internal stress. In order to remove such internal stress, tempering is used. (After cooled down once, reheat it to 200°C~600°C)
	• Normalizing	After heating to over 727°C, cool down rapidly to 600°C and then to normal temperature.	It miniaturizes the crystals. (Steel is also composed of small cells.) It is used to improve the mechanical character or machinability.
	• Annealing	After heating to over 727°C, cool down very slowly to 600°C, then to normal temperature.	It miniaturizes the crystals like the process of normalizing, but the crystal size is bigger than that of normalizing. It targets machinability improvement and distortion correction.

Hardness Value

Hardness	Reference Standard	Example	Explanation of Example
Brinell Hardness	JIS Z 2243：1992	250HB	Hardness Value : 250, Hardness Symbol : HB
		200~250HB	When the hardness has the range
Vickers Hardness	JIS Z 2244：1998	640HV	Hardness Value : 640, Hardness Symbol : HV
Rockwell Hardness	JIS Z 2245：1992	60HRC	Hardness Value : 60, Hardness Symbol : HRC
Shore Hardness	JIS Z 2246：1992	50HS	Hardness Value : 50, Hardness Symbol : HS

Vickers Hardness Conversion Chart

Vickers Hardness (HV)	Brinell Hardness 10mm Dia. Ball Load: 3000kgf (HB)		Rockwell Hardness[2]			Shore Hardness (HS)	Tensile Strength Mpa[1]
	Standard Ball	Tungsten Carbide Ball	A Scale Load: 60kgf Diamond Point (HRA)	B Scale Load: 100kgf 1.6mm Dia. Ball (HRB)	C Scale Load: 150kgf Diamond Point (HRC)		
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	78.9	–	55.7	–	
600	–	564	78.6	–	55.2	74	
590	–	554	78.4	–	54.7	–	2055
580	–	545	78.0	–	54.1	72	2020
570	–	535	77.8	–	53.6	–	1985
560	–	525	77.4	–	53.0	71	1950
550	505	517	77.0	–	52.3	–	1905
540	496	507	76.7	–	51.7	69	1860
530	488	497	76.4	–	51.1	–	1825
520	480	488	76.1	–	50.5	67	1795
510	473	479	75.7	–	49.8	–	1750
500	465	471	75.3	–	49.1	66	1705
490	456	460	74.9	–	48.4	–	1660
480	448	452	74.5	–	47.7	64	1620
470	441	442	74.1	–	46.9	–	1570
460	433	433	73.6	–	46.1	62	1530
450	425	425	73.3	–	45.3	–	1495
440	415	415	72.8	–	44.5	59	1460
430	405	405	72.3	–	43.6	–	1410
420	397	397	71.8	–	42.7	57	1370
410	388	388	71.4	–	41.8	–	1330
400	379	379	70.8	–	40.8	55	1290
390	369	369	70.3	–	39.8	–	1240
380	360	360	69.8	(110.0)	38.8	52	1205
370	350	350	69.2	–	37.7	–	1170
360	341	341	68.7	(109.0)	36.6	50	1130
350	331	331	68.1	–	35.5	–	1095
340	322	322	67.6	(108.0)	34.4	47	1070
330	313	313	67.0	–	33.3	–	1035

Vickers Hardness (HV)	Brinell Hardness 10mm Dia. Ball Load: 3000kgf (HB)		Rockwell Hardness[2]			Shore Hardness (HS)	Tensile Strength Mpa[1]
	Standard Ball	Tungsten Carbide Ball	A Scale Load: 60kgf Diamond Point (HRA)	B Scale Load: 100kgf 1.6mm Dia. Ball (HRB)	C Scale Load: 150kgf Diamond Point (HRC)		
320	303	303	66.4	(107.0)	32.2	45	1005
310	294	294	65.8	–	31.0	–	980
300	284	284	65.2	(105.5)	29.8	42	950
295	280	280	64.8	–	29.2	–	935
290	275	275	64.5	(104.5)	28.5	41	915
285	270	270	64.2	–	27.8	–	905
280	265	265	63.8	(103.5)	27.1	40	890
275	261	261	63.5	–	26.4	–	875
270	256	256	63.1	(102.0)	25.6	38	855
265	252	252	62.7	–	24.8	–	840
260	247	247	62.4	(101.0)	24.0	37	825
255	243	243	62.0	–	23.1	–	805
250	238	238	61.6	99.5	22.2	36	795
245	233	233	61.2	–	21.3	–	780
240	228	228	60.7	98.1	20.3	34	765
230	219	219	–	96.7	(18.0)	33	730
220	209	209	–	95.0	(15.7)	32	695
210	200	200	–	93.4	(13.4)	30	670
200	190	190	–	91.5	(11.0)	29	635
190	181	181	–	89.5	(8.5)	28	605
180	171	171	–	87.1	(6.0)	26	580
170	162	162	–	85.0	(3.0)	25	545
160	152	152	–	81.7	(0.0)	24	515
150	143	143	–	78.7	–	22	490
140	133	133	–	75.0	–	21	455
130	124	124	–	71.2	–	20	425
120	114	114	–	66.7	–	–	390
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	–	–	–

・Extracted from JIS Handbook "Iron & Steel" (SAE J 417)
Note (1) 1MPa = 1N/mm²
(2) Value in ( ) is not in practical use, but reference only

Material List (JIS)

Metal

Classification		Name of JIS Standard	Symbol
Structural Steel		Rolled Steel for Welded Structure	SM
		Re-Rolled Steel	SRB
		Rolled Steel for General Structure	SS
		Light Guage Steel for General Structure	SSC
		Hot-Rolled Steel Plate, Sheet and Strip for Automobile Structural Use	SAPH
Steel Sheet		Cold-Rolled Steel Plate, Sheet and Strip	SPC
		Hot-Rolled Soft Steel Plate, Sheet and Strip	SPH
Steel Pipe		Carbon Steel Pipe for Ordinary Piping	SGP
		Carbon Steel Pipe for Boiler / Heat Exchanger	STB
		Seamless Steel Pipe for High Pressure Gas Cylinder	STH
		Carbon Steel Pipe for General Structural Use	STK
		Carbon Steel Pipe for Machine Structural Use	STKM
		Alloy Steel Pipe for Structural Use	STKS
		Stainless Steel Pipe for Machine Structural Use	SUS-TK
		Steel Square Pipe for General Structural Use	STKR
		Alloy Steel Pipe for Ordinary Piping	STPA
		Carbon Steel Pipe for Pressure Service	STPG
		Carbon Steel Pipe for High-Temperature Service	STPT
		Carbon Steel Pipe for High-Pressure Service	STS
		Stainless Steel Pipe for Ordinary Piping	SUS-TP
Steel for Machine Structural Use		Carbon Steel for Machine Structural Use	SxxC, SxxCK
		Aluminium Chromium Molybdenum Steel	SACM
		Chromium Molybdenum Steel	SCM
		Chromium Steel	SCr
		Nickel Chromium Steel	SNC
		Nickel Chromium Molybdenum Steel	SNCM
		Manganese Steel and Manganese Chromium Steel for Machine Structural Use	SMn, SMnC
Special Steel	Tool Steel	Carbon Tool Steel	SK
		Hollow Drill Steel	SKC
		Alloy Tool Steel	SKS, SKD, SKT
		High Speed Tool Steel	SKH
	Special Steel	Free Cutting Carbon Steel	SUM
		High Carbon Chromium Bearing Steel	SUJ
		Spring Steel	SUP
	Stainless Steel	Stainless Steel Bar	SUS-B
		Hot-Rolled Stainless Steel Plate, Sheet and Strip	SUS-HP, SUS-HS
		Cold-Rolled Stainless Steel Plate, Sheet and Strip	SUS-CP, SUS-CS
	Heat Resisting Steel	Heat-Resisting Steel Bar	SUH-B, SUH-CB
		Heat-Resisting Steel Plate and Sheet	SUH-HP, SUH-CP
	Super Alloy	Corrosion-Resisting and Heat-Resisting Superalloy Bar	NCF-B
		Corrosion-Resisting and Heat-Resisting Superalloy Plate and Sheet	NCF-P
Forged Steel		Carbon Steel Forging	SF
		Chromium Molybdenum Steel Forging	SFCM
		Nickel Chromium Molybdenum Steel Forging	SFNCM
Cast Iron		Gray Cast Iron	FC
		Spheroidal Graphite Cast Iron	FCD
		Blackheart Malleable Cast Iron	FCMB
		Whiteheart Malleable Cast Iron	FCMW
		Pearlitic Malleable Cast Iron	FCMP
Cast Steel		Carbon Cast Steel	SC
		High Tensile Strength Carbon Cast Steel & Low Alloy Cast Steel	SCC
		Stainless Cast Steel	SCS
		Heat-Resisting Cast Steel	SCH
		High Manganese Cast Steel	SCMnH
		Cast Steel for High Temperature and High Pressure Service	SCPH

Non-ferrous Metal

Classification	Name of JIS Standard	Symbol
Copper	Copper and Copper Alloy Sheet / Strip	CxxxxP CxxxxPP CxxxxR
	Copper and Copper Alloy Rod and Bar	CxxxxBD CxxxxBDS CxxxxBE
Aluminum Alloy and Aluminum Alloy Expanded Material	Aluminum and Al. Alloy Sheet / Strip	AxxxxP AxxxxPC
	Aluminum and Al. Alloy Rod, Bar, and Wire	AxxxxBE AxxxxBES AxxxxBD AxxxxBDS AxxxxW AxxxxWS
	Aluminum and Al. Alloy Extruded Shape	AxxxxS
	Aluminum and Al. Alloy Forging	AxxxxFD AxxxxFH
Magnesium Alloy Expanded Material	Magnesium Alloy Sheet and Plate	MP
	Magnesium Alloy Rod and Bar	MB
Nickel Alloy	Nickel Copper Alloy Sheet and Plate	NCuP
	Nickel Copper Alloy Rod and Bar	NCuB
Titanium Expanded Material	Titanium Rod and Bar	TB
Casting	Brass Casting	CAC20x
	High Strength Brass Casting	CAC30x
	Bronze Casting	CAC40x
	Phosphoric Bronze Casting	CAC50x
	Aluminum Bronze Casting	CAC70x
	Aluminum Alloy Casting	AC
	Magnesium Alloy Casting	MC
	Zinc Alloy Die Casting	ZDCx
	Aluminum Alloy Die Casting	ADC
	Magnesium Alloy Die Casting	MD
	White Metal	WJ

Material Cross Reference Table

● Steel

Classification	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	AISI / SAE	JIS	GB
Carbon Steel for Machine Structural Use	C10E C10R	040A10 045A10 045M10	XC10		1010	S10C	08 10
		040A12	XC12		1012	S12C	
	C15E C15R	055M15			1015	S15C	15
			XC18		1017	S17C	
	C22 C22E C22R	070M20 C22 C22E C22R	C22 C22E C22R		1020	S20C	20
					1023	S22C	
	C25 C25E C25R	C25 C25E C22R	C25 C25E C25R		1025	S25C	25
				25Г	1029	S28C	
	C30 C30E C30R	080A30 080M30 C30 C30E C30R	C30 C30E C30R	30Г	1030	S30C	30
				30Г		S33C	
	C35 C35E C35R	C35 C35E C35R	C35 C35E C35R	35Г	1035	S35C	35
				35Г	1038	S38C	
	C40 C40E C40R	080M40 C40 C40E C40R	C40 C40E C40R	40Г	1039 1040	S40C	40
		080A42		40Г	1042 1043	S43C	
	C45 C45E C45R	C45 C45E C45R	C45 C45E C45R	45Г	1045 1046	S45C	45
		080A47		45Г		S48C	
	C50 C50E C50R	080M50 C50 C50E C50R	C50 C50E C50R	50Г	1049	S50C	50
				50Г	1050 1053	S53C	
	C55 C55E C55R	070M55 C55 C55E C55R	C55 C55E C55R		1055	S55C	55
	C60 C60E C60R	C60 C60E C60R	C60 C60E C60R	60Г	1059 1060	S58C	60
	C10E	045A10 045M10	XC10			S09CK	
	C15E		XC12			S15CK	15F
			XC18			S20CK	

Material Cross Reference Table

● Steel

Classification	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	AISI / SAE	JIS	GB
Nickel Chromium Steel	36NiCr6			40ХН		SNC236	
	14NiCr10					SNC415	12CrNi2
	36NiCr10			30ХН3А		SNC631	30CrNi3
	15NiCr13	655M13				SNC815	12Cr2Ni4
	31NiCr14					SNC836	37CrNi3
Nickel Chromium Molybdenum Steel	20NiCrMo2 20NiCrMoS2	805A20 805M20 805A22 805M22	20NCD 2		8615 8617 8620 8622	SNCM220	20CrNiMo
	40NiCrMo2-2				8637 8640	SNCM240	
						SNCM415	
	17NiCrMo6-4			20ХН2М (20ХНМ)	4320	SNCM420	18CrNiMnMoA
	30CrNiMo8					SNCM431	
	40NiCrMo6				4340	SNCM439	40CrNiMoA
	34CrNiMo6					SNCM447	
						SNCM616	
						SNCM625	
						SNCM630	
						SNCM815	
Chromium Steel	17Cr3 17CrS3			15Х 15ХА		SCr415	15Cr 15CrA
				20Х	5120	SCr420	20Cr
	34Cr4 34CrS4	34Cr4 34CrS4	34Cr4 34CrS4	30Х	5130 5132	SCr430	30Cr
	37Cr4 37CrS4	37Cr4 37CrS4	37Cr4 37CrS4	35Х	5132	SCr435	35Cr
	41Cr4 41CrS4	530M40 41Cr4 41CrS4	41Cr4 41CrS4	40Х	5140	SCr440	40Cr
				45Х		SCr445	45Cr 50Cr
Chromium Molybdenum Steel	15CrMo4					SCM415	15CrMo
	18CrMo4 18CrMoS4			20ХМ		SCM418	20CrMo
	20CrMo5	708M20		20ХМ		SCM420	
						SCM421	
				30ХМ 30ХМА	4131	SCM430	30CrMo 30CrMoA
						SCM432	
	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	35ХМ	4137	SCM435	35CrMo
	42CrMo4 42CrMoS4	708M40 709M40 42CrMo4 42CrMoS4	42CrMo4 42CrMoS4		4140 4142	SCM440	42CrMo
					4145 4147	SCM445	
						SCM822	

● Steel

Classifcation	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	AISI / SAE	JIS	GB
Manganese Chromium Steel Manganese Steel	20Mn5	150M19			1522	SMn420	20Mn2
	34Mn5	150M36		30Г2 35Г2	1534	SMn433	30Mn2 35Mn2
	36Mn5	150M36		35Г2 40Г2	1541	SMn438	40Mn2
				40Г2 45Г2	1541	SMn443	45Mn2
	16MnCr5				5115	SMnC420	15CrMn
					5140	SMnC443	40CrMn
Structural Steel with Specified Hardenability Band (H-Shape Steel)					1522H	SMn420H	
						SMn433H	
					1541H	SMn438H	
					1541H	SMn443H	
						SMnC420H	
						SMnC443H	
	17Cr3 17CrS3			15Х		SCr415H	15CrH
	17Cr3			20Х	5120H	SCr420H	20Cr1H
	34Cr4 34CrS3	34Cr4 34CrS4	34Cr4 34CrS4	30Х	5130H 5132H	SCr430H	
	37Cr4 34CrS4	37Cr4 37CrS4	37Cr4 37CrS4	35Х	5135H	SCr435H	
	41Cr4 41CrS4	41Cr4 41CrS4	41Cr4 41CrS4	40Х	5140H	SCr440H	40CrH
	15CrMo5				4118H	SCN415H	15CrMoH
	18CrMo4 18CrMoS4					SCM418H	
	18CrMo4	708H20			4118H	SCM420H	20CrMoH
	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4	34CrMo4 34CrMoS4		4135H 4137H	SCM435H	
	42CrMo4 42CrMoS4	42CrMo4 42CrMoS4	42CrMo4 42CrMoS4		4140H 4142H	SCM440H	
					4145H 4147H	SCM445H	
						SCM822H	
						SNC415H	
						SNC631H	
	15NiCr13	655H13				SNC815H	12Cr2Ni4H
	21NiCrMo2	805H17 805H20 805H22	20N CD 2		8617H 8620H 8622H	SNCM220H	20CrNiMoH
	20NiCrMoS6-4				4320H	SNCM420H	20CrNi2MoH

Material Cross Reference Table

● Steel

Classification	Germany	UK	France	Russia	USA		Japan	China
	DIN	BS	NF	ГОСТ	UNS	AISI	JIS	GB
Stainless Steel			Z12CMN17-07Az		S20100	201	SUS 201	1Cr17Mn6Ni5N
		284S16		12Х17Г9АН4	S20200	202	SUS 202	1Cr18Mn8Ni5N
	X12CrNi17 7	301S21	Z11CN17-08	07Х16Н6	S30100	301	SUS 301	1Cr18Mn10Ni5Mo3N 1Cr17Ni7
	X2CrNiN18-7						SUS 301L	
	X12CrNi17 7						SUS 301J1	
		302S25	Z12CN18-09	12Х18Н9	S30200	302	SUS 302	1Cr18Ni9
					S30215	302B	SUS 302B	
	X10CrNiS18 9	303S21	Z8CNF18-09		S30300	303	SUS 303	Y1Cr18Ni9
		303S41		12Х18Н10Е	S30323	303Se	SUS 303Se	Y1Cr18Ni9Se
	X5CrNi18 10	304S31	Z7CN18-09	08Х18Н10	S30400	304	SUS 304	0Cr18Ni9
	X2CrNi19 11	304S11	Z3CN19-11	03Х18Н11	S30403	304L	SUS 304L	00Cr18Ni10
			Z6CN19-09Az		S30451	304N	SUS 304N1	0Cr18Ni9N
					S30452		SUS 304N2	0Cr19Ni10NbN
	X2CrNiN18 10		Z3CN18-10Az		S30453	304LN	SUS 304LN	00Cr18Ni10N
							SUS 304J1	
							SUS 304J2	
					S30431	S30431	SUS 304J3	
	X5CrNi18 12	305S19	Z8CN18-12	06Х18Н11	S30500	305	SUS 305	1Cr18Ni12
							SUS 305J1	
			Z10CN24-13		S30908	309S	SUS 309S	0Cr23Ni13
		310S31	Z8CN25-20	10Х23Н18	S31008	310S	SUS 310S	0Cr25Ni20
	X5CrNiMo17 12 2	316S31	Z7CND17-12-02		S31600	316	SUS 316	0Cr17Ni12Mo2
	X5CrNiMo17 13 3		Z6CND18-12-03					
	X2CrNiMo17 13 2	316S11	Z3CND17-12-02		S31603	316L	SUS 316L	00Cr17Ni14Mo2
	X2CrNiMo17 14 3		Z3CND17-13-03	03Х17Н14М3				
					S31651	316N	SUS 316N	0Cr17Ni12Mo2N
	X2CrNiMoN17 12 2		Z3CND17-11Az		S31653	316LN	SUS 316LN	00Cr17Ni13Mo2N
	X2CrNiMoN17 13 3		Z3CND17-12Az					
	X6CrNiMoTi17 12 2		Z6CNDT17-12	08Х17Н13М2Т	S31635		SUS 316Ti	
							SUS 316J1	0Cr18Ni12Mo2Cu2
							SUS 316J1L	00Cr18Ni14Mo2Cu2
		317S16			S31700	317	SUS 317	0Cr19Ni13Mo3
	X2CrNiMo18 16 4	317S12	Z3CND19-15-04		S31703	317L	SUS 317L	00Cr19Ni13Mo3
			Z3CND19-14Az		S31753		SUS 317LN	
							SUS 317J1	0Cr18Ni16Mo5
							SUS 317J2	
							SUS 317J3L	
					N08367		SUS 836L	
		904S14	Z2NCDU25-20		N08904	N08904	SUS 890L	
	X6CrNiTi18 10	321S31	Z6CNT18-10	08Х18Н10Т	S32100	321	SUS 321	1Cr18Ni9Ti 0Cr18Ni10Ti
	X6CrNiNb18 10	347S31	Z6CNNb18-10	08Х18Н12Б	S34700	347	SUS 347	0Cr18Ni11Nb
			Z6CN18-16		S38400	384	SUS 384	
		394S17	Z2CNU18-10		S30430	304Cu	SUS XM7	0Cr18Ni9Cu3
			Z15CNS20-12		S38100		SUS XM15J1	0Cr18Ni13Si4
					S32900	329	SUS 329J1	0Cr26Ni5Mo2
			Z3CNDU22-05Az	08Х21Н6М2Т	S39240	S31803	SUS 329J3L	
			Z3CNDU25-07Az		S39275	S31260	SUS 329J4L	

● Steel

Classification	Germany	UK	France	Russia	USA		Japan	China
	DIN	BS	NF	ГОСТ	UNS	AISI	JIS	GB
Stainless Steel	X6CrAl13	405S17	Z8CA12		S40500	405	SUS 405	0Cr13Al 0Cr13
			Z3C14				SUS 410L	00Cr12
					S42900	429	SUS 429	
	X6Cr17	430S17	Z8C17	12Х17	S43000	430	SUS 430	1Cr17
	X7CrMoS18		Z8CF17		S43020	430F	SUS 430F	Y1Cr17
	X6CrTi17		Z4CT17		S43035		SUS 430LX	
	X6CrNb17		Z4CNb17				SUS 430J1L	
	X6CrMo17 1	434S17	Z8CD17-01		S43400	434	SUS 434	1Cr17Mo
					S43600	436	SUS 436L	
							SUS 436J1L	
			Z3CDT18-02		S44400	444	SUS 444	
					S44700		SUS 447J1	00Cr30Mo2
			Z1CD26-01		S44627		SUS XM27	00Cr27Mo
					S40300	403	SUS 403	1Cr12
	X10Cr13	410S21	Z13C13		S41000	410	SUS 410	1Cr13
	X6Cr13	403S17	Z8C12	08Х13	S41008	410S	SUS 410S	
							SUS 410F2	
	X12CrS13				S41025		SUS 410J1	1Cr13Mo 1Cr12Mo
		416S21	Z11CF13		S41600	416	SUS 416	Y1Cr13
	X20Cr13	420S29	Z20C13	20Х13	S42000	420	SUS 420J1	2Cr13
	X30Cr13	420S37	Z33C13	30Х13	S42000	420	SUS 420J2	3Cr13
			Z30CF13		S42020	420F	SUS 420F	Y3Cr13
							SUS 420F2	
							SUS 429J1	
	X20CrNi17 2	431S29	Z15CN16-02	20Х17Н2	S43100	431	SUS 431	1Cr17Ni2
			Z70C15		S44002	440A	SUS 440A	7Cr17
					S44003	440B	SUS 440B	8Cr17
			Z100CD17	95Х18	S44004	440C	SUS 440C	9Cr18 11Cr17 9Cr18Mo
					S44020	S44020	SUS 440F	Y11Cr17
	X5CrNiCuNb16-4		Z6CNU17-04		S17400	S17400	SUS 630	0Cr17Ni4CuNb
	X7CrNiAl17 7		Z9CNA17-07	09Х17Н7 Ю	S17700	S17700	SUS 631	0Cr17Ni7Al
							SUS 632J1	

● Representative Classification of Stainless Steel

•Stainless Steel (Austenitic related)

JIS	
SUS201	SUS309S
SUS202	SUS310S
SUS301	SUS316
SUS302	SUS316L
SUS302B	SUS316N
SUS303	SUS317
SUS303Se	SUS317L
SUS304	SUS321
SUS304L	SUS347
SUS304N1	SUS384
SUS304N2	SUSXM7
SUS305	SUSXM15J1
SUS308	

•Stainless Steel (Ferritic related)

JIS
SUS405
SUS429
SUS430
SUS430F
SUS434
SUSXM27

•Stainless Steel (Martensitic related)

JIS
SUS403
SUS410
SUS410S
SUS416
SUS420J1
SUS420F
SUS431
SUS440A
SUS440B
SUS440C
SUS440F

•Stainless Steel: (Precipitation Hardening related)

JIS
SUS630
SUS631

Material Cross Reference Table

● Steel

Classification	Germany	UK	France	Russia	USA		Japan	China
	DIN	BS	NF	ГОСТ	UNS	AISI	JIS	GB
Heat Resisting Steel		331S42	Z35CNWS14-14	45Х14Н14В2М			SUH 31	
		349S52	Z52CMN21-09Az				SUH 35	
	X53CrMnNi21 9	349S54	Z55CMN21-09Az	55Х20 Г 9АН4	S63008		SUH 36	5Cr21Mn9Ni4N
		381S34			S63017		SUH 37	2Cr21Ni12N
							SUH 38	
		309S24	Z15CN24-13		S30900	309	SUH 309	2Cr23Ni13
	CrNi2520	310S24	Z15CN25-20	20Х25Н20С2	S31000	310	SUH 310	2Cr25Ni20
			Z12NCS35-16		N08330	N08330	SUH 330	1Cr16Ni35
			Z6NCTV25-20		S66286		SUH 660	0Cr15Ni25Ti2MoAlVB
					R30155		SUH 661	
	CrAl1205						SUH 21	
	X6CrTi12	409S19	Z6CT12		S40900	409	SUH 409	
			Z3CT12				SUH 409L	
			Z12C25	15Х28	S44600	446	SUH 446	2Cr25N
	X45CrSi9 3	401S45	Z45CS9		S65007		SUH 1	4Cr9Si2
			Z40CSD10	40Х10С2М			SUH 3	4Cr10Si2Mo
		443S65	Z80CSN20-02				SUH 4	8Cr20Si2Ni
				40Х 9С2			SUH 11	
				20Х12ВНМБФР			SUH 600	2Cr12MoVNbN
					S42200		SUH 616	2Cr12NiMoWV

● Representative Classification of Heat Resisting Steell

•Heat Resisting Steel
(Austenitic related)

JIS
SUH31
SUH35
SUH36
SUH37
SUH38
SUH309
SUH310
SUH330
SUH660
SUH661

•Heat Resisting Steel
(Ferritic related)

JIS
SUH21
SUH409
SUH446

•Heat Resisting Steel
(Martensitic related)

JIS
SUH1
SUH3
SUH4
SUH11
SUH600
SUH616

● Steel

Classification	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	AISI / ASTM	JIS	GB
Carbon Tool Steel			C140E3U	У13		SK140 (SK1)	T13
			C120E3U	У12	W1-11½	SK120 (SK2)	T12
	C105W1		C105E2U	У11	W1-10	SK105 (SK3)	T11
			C90E2U	У10	W1-9	SK95 (SK4)	T10
	C80W1		C90E2U C80E2U	У8Г У9	W1-8	SK85 (SK5)	T8Mn T9
	C80W1		C80E2U C70E2U	У8		SK75 (SK6)	T8
	C70W2		C70E2U	У7		SK65 (SK7)	T7
High Speed Tool Steel		BT1	HS18-0-1	Р18	T1	SKH2	W18Cr4V
	S18-1-2-5	BT4	HS18-1-1-5	Р18К5Ф2	T4	SKH3	W18Cr4VCo5
		BT5	HS18-0-2-9	Р18К5Ф	T5	SKH4	W18Cr4V2Co8
	S12-1-4-5	BT15	HS12-1-5-5		T15	SKH10	W12Cr4V5Co5
	S6-5-2	BM2	HS6-5-2	Р6М5	M2	SKH51	W6Mo5Cr4V2
				Р6М5Ф3	M3-1	SKH52	CW6Mo5Cr4V2 W6Mo5Cr4V3
	S6-5-3		HS6-5-3	Р6М5Ф3	M3-2	SKH53	CW6Mo5Cr4V3
		BM4	HS6-5-4		M4	SKH54	
	S6-5-2-5	BM35	HS6-5-2-5HC	Р6М5К5	M35 M41	SKH55	W6Mo5Cr4V2Co5 W7Mo5Cr4V2Co5
					M36	SKH56	
	S10-4-3-10	BT42	HS10-4-3-10			SKH57	
			HS2-9-2		M7	SKH58	W2Mo9Cr4V2
	S2-10-1-8	BM42	HS2-9-1-8		M42	SKH59	W2Mo9Cr4VCo8
Alloy Tool Steel				ХВ4	F2	SKS11	
	105WCr6		105WCr5	ХВГ		SKS2	
						SKS21	W
						SKS5	
					L6	SKS51	
						SKS7	
			C140E3UCr4	13Х		SKS8	Cr06
				6ХВ2С 5ХВ2СФ	S1	SKS4	5CrW2Si 6CrW2Si
				4ХВ2С	S1	SKS41	4CrW2Si
		BW2	100V2		W2-9½	SKS43	
					W2-8	SKS44	
				9ХВГ		SKS3	9CrWMn
	105WCr6		105WCr5	ХВГ		SKS31	CrWMn
						SKS93	
						SKS94	
						SKS95	8MnSi
	X210Cr12	BD3	X200Cr12	Х12	D3	SKD1	Cr12
	X153CrMoV12			Х12МФ	D2	SKD10	Cr12Mo1V1
	X153CrMoV12	BD2	X160CrMoV12		D2	SKD11	Cr12MoV
		BA2	X100CrMoV5		A2	SKD12	Cr5Mo1V
			X32WCrV3			SKD4	
	X30WCrV9-3	BH21	X30WCrV9		H21	SKD5	3Cr2W8V
	X38CrMoV51	BH11	X38CrMoV5	4Х5МФС	H11	SKD6	4Cr5MoSiV
	X40CrMoV51	BH13	X40CrMoV5	4Х5МФ1С	H13	SKD61	4Cr5MoSiV1
		BH12	X35CrWMoV5	3Х3М3Ф	H12	SKD62	
	X32CrMoV33	BH10	32CrMoV12-18		H10	SKD7	4Cr3Mo3SiV
		BH19			H19	SKD8	
			55CrNiMoV4			SKT3	
	55NiCrMoV6	BH224 / 5	55NiCrMoV7	5ХНМ		SKT4	5CrNiMo

Material Cross Reference Table

● Steel

Classification	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	AISI / ASTM	JIS	GB
Spring Steel				75 80 85	1075 1078	SUP3	
	56SiCr7		60Si7	60С2		SUP6	55Si2Mn
	61SiCr7		60Si7	60С2Г	9260	SUP7	60Si2Mn 60Si2MnA
	55Cr3		55Cr3		5155	SUP9	55CrMnA
	55Cr3		60Cr3		5160	SUP9A	60CrMnA
	50CrV4	735A51, 735H51	51CrV4	ХФА50ХГФА	6150	SUP10	50CrVA
	51CrV4			50ХГР	51B60	SUP11A	60CrMnBA
	54SiCr6	685A57, 685H57	54SiCr6		9254	SUP12	
	60CrMn3-2	705A60, 705H60	60CrMo4		4161	SUP13	60CrMnMoA
Free Cutting Carbon Steel					1110	SUM11	
					1108	SUM12	Y12
					1212	SUM21	
	9SMn28	(230M07)	S250		1213	SUM22	Y15
	9SMnPb28		S250Pb		12L13	SUM22L	Y12Pb
					1215	SUM23	
						SUM23L	
	9SMnPb28		S250Pb		12L14	SUM24L	Y15Pb
	9SMn36		S300			SUM25	
	15S10				1117	SUM31	
						SUM31L	
		210M15, 210A15	(13MF4)			SUM32	Y20
			(35MF6)		1137	SUM41	Y30 Y35
			(45MF6.1)		1141	SUM42	Y40Mn
		(226M44)	(45MF6.3)		1144	SUM43	
Carbon Chromium Bearing Steel					51100	SUJ1	GCr4
	100Cr6		100Cr6	ШХ15	52100	SUJ2	GCr5
					ASTM A 485 Grade 1	SUJ3	GCr15SiMn
						SUJ4	GCr15SiMo
						SUJ5	GCr18Mo

● Cast Iron

Classification	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	AISI / SAE	JIS	GB
Gray Cast Iron		100		СЧ10	NO.20	FC100	HT100
	GG15	150	FGL150	СЧ15	NO.30	FC150	HT150
	GG20	200	FGL200	СЧ20	NO.35	FC200	HT200
	GG25	250	FGL250	СЧ25	NO.45	FC250	HT250
	GG30	300	FGL300	СЧ30	NO.50	FC300	HT300
	GG35	350	FGL350	СЧ35	NO.60	FC350	HT350
	GG40		FGL400	СЧ40			
Nodular Cast Iron	GGG40	400/17	FGS370-17	ВЧ40	60-40-18	FCD400	QT400-18
		420/12	FGS400-12	ВЧ45	65-45-12	FCD450	QT450-10
	GGG50	500/7	FGS500-7	ВЧ50	70-50-05	FCD500	QT500-7
	GGG60	600/7	FGS600-2	ВЧ60	80-60-03	FCD600	QT600-3
	GGG70	700/2	FGS700-2	ВЧ70	100-70-03	FCD700	QT700-2
	GGG80	800/2	FGS800-2	ВЧ80	120-90-02	FCD800	QT800-2
		900/2		ВЧ100			QT900-2

● Non-ferrous Metal

Classification	Germany	UK	France	Russia	USA	Japan	China
	DIN	BS	NF	ГОСТ	ASTM	JIS	GB
Aluminum Alloy	A199.99R			А99	1199		1A99
	A199.98R			А97			1A97
				А95			1A95
	A199.90	1080(1A)	1080A	А8		A1080	1A80
	A199.50	1050(1B)	1050A	А5	1050	A1050	1A50
	AlMg2.5	NS4	5052	Амг	5052	A5052	5A02
		NS5		АМг3			5A03
	AlMg5	NB6		АМг5В	5056	A5056	5A05
		NG61	5957		5456	A5556	5A30
	AlCu2.5Mg0.5		2117	Д18	2036	A2117	2A01
	AlCuMg1	HF15	2017S	Д1		A2017	2A11
	AlCuMg2		2024	Д16АВТВ	2124	A2024	2A12
					2319		2B16
				АК4		A2N01	2A80
				АК2	2218	A2018	2A90
	AlCuSiMn		2014	АК8	2014	A2014	2A14
	AlZnMgCu1.5		7075	В95Р	7175	A7075	7A09
Aluminum Alloy Casting	G-AlSi7Mg	LM25			356.2	AC4C	ZAlSi7Mn
	G-Al12	LM6	A-S12-Y4	АЛ2	413.2	AC3A	ZAlSi12
				АЛ5	355.2		ZAlSi5Cu1Mg
	G-Al12(Cu)				413.0	AC8A	ZAlSi2Cu2Mg1
				АЛ19			ZAlCu5Mn
					201.0		ZAlCu5MnCdVA
	G-AlMg10	LM10	AG11	АЛ8	520.2		ZAlMg10
	G-AlMg5Si			АЛ13			ZAlMg5Si

Material Cross Reference Table

Coated Carbide (Milling)

·This table is Kyocera's own estimation based on publications and is not authorized by companies mentioned in it.

Classification		Kyocera	Dijet	Hitachi	Mitsubishi	NTK	Sandvik	Seco	Sumitomo	Tungaloy	Kennametal WIDIA	Iscar
Classification	Symbol											
P (Steel)	P10	**PR730 PR830 PR1025 PR1225**	JC5003 JC5030 JC8003	JX1020			GC1025		ACP100		KC715M	
	P20	**PR730 PR830 PR1025 PR1225 PR1230**	JC730U JC5015 JC5030 JC8015	CY150 TB6020 JX1015	F7030 UP20M		GC1030 GC4220 GC4020 GC4030	MP1500 T250M T25M T20M	ACP200		KC522M KC525M	IC250 IC520M IC950
	P30	**PR660 PR1230**	JC5015 JC5040	CY250 CY9020 HC844 TB6045 JX1045	F7030 VP15TF VP30RT		GC4040 GC4230	MP2500 T250M T25M F25M F30M	AC230 ACP300	T3130 GH330 AH120 AH330 AH730	KC994M KC725M KC792M KC530M	IC328 IC635 IC908 IC928
	P40		JC5040	CY250 HC844 TB6060 JX1060			GC4040 GC4240	T350M T40M T25M	AC230 ACZ330 ACZ350	AH140	KC735M	IC635 IC928 IC4050
M (Stainless Steel)	M10	**PR730 PR1025 PR1225**		CY9020 JX1020			GC1025 GC1030		EH10Z		KC522M	
	M20	**PR660 PR730 PR1025 PR1225**	JC730U JC1341 JC5015 JC5030 JC5040	CY150 TB6020 JX1015	F7030 UP20M VP15TF		GC2030	MP2500 T250M T25M F20M F25M F30M	ACP200 EH20Z	GH330 AH330 AH120 AH130	KC730M KC525M	IC908 IC928
	M30	**PR660**	JC5015 JC5030 JC5040	CY250 TB6045 JX1045	F7030 VP30RT		GC2040	T350M T250M F40M	ACP300 ACZ350	T3130 AH130	KC994M KC725M	IC328
	M40		JC8050					T60M	ACZ350	AH140		
K (Cast Iron)	K01		JC8003	TB6005						AH110		IC4100
	K10	**PR905 PR1210**	JC600 JC610 JC605W	CY10H CY100H CY9020	MC5020 VP10RT		GC3220	MK1500 T150M F15M	ACK200 AC211	T1015 T1115 AH110	KC915M	IC4010 IC910 DT7150
	K20	**PR905 PR1210**	JC610 JC5015 JC8015	CY150 TB6020 JX1015	VP15TF VP20RT		GC1020 GC3020	MP1500 T150M T250M MK2000	EH20Z ACZ310 ACK300	AH120	KC920M KC925M KC992M	IC910 IC928
	K30		JC5080				GC3040 GC4040	MK3000 T250M			KC930M	IC928

Cermet (Milling)

Classification		Kyocera	Dijet	Hitachi	Mitsubishi	NTK	Sandvik	Seco	Sumitomo	Tungaloy	Kennametal WIDIA	Iscar
Classification	Symbol											
P (Steel)	P10	**TN60**	NIT CX75		NX2525			C15M		NS530 NS730	KT530M KT195M	
	P20	**TN60 TN100M**	NAT CX75 CX90	CH550 CH570 CH7030	NX2525	C7X C7Z	CT530	C15M	T250A	NS530 NS730	HT7 KT530M KT605M	IC30N
	P30		CX90 CX99 SUZ		NX4545					NS540		IC30N
M (Stainless Steel)	M10	**TN60**			NX2525			C15M				
	M20	**TN60 TN100M**	NIT CX75 NAT	CH550 CH570 CH7030	NX2525		CT530	C15M	T250A	NS530 N308	KT7 KT530M KT605M	IC30N
	M30		CX75 CX90 CX99 SUZ		NX4545			C15M		NS740		
K (Cast Iron)	K01		LN10									
	K10		LN10 CX75		NX2525							IC30N
	K20		NIT		NX2525							

R

Technical Information

Ceramic

·This table is Kyocera's own estimation based on publications and is not authorized by companies mentioned in it.

Classification		Kyocera	Dijet	Nippon Tungsten	Mitsubishi	NTK	Sandvik	Seco	Sumitomo	Tungaloy	Kennametal WIDIA	Iscar
Classification	Symbol											
K (Cast Iron)	K01	KA30 A65 KT66 **PT600M** **CS7050**		NPC-H2 NPC-A2		HC1 HC2 HC5 HC6 HW2	CC620 CC650		NB90S NB90M WX120		KW80 KY1615 AC5	
	K10	A65 KT66 **A66N** **PT600M** **CS7050** KS6050		NX **NXA** Whiskal WIN		WA1 HC2 HC6 HC7	CC6090 CC6190 **GC1690**		WX120 **NS260C**	LX11 LX21	KB90 KY1320 KY3000 **KY3400**	
	K20	KS6000 KS6050				SX6 SX9 **SP9**	CC6090 CC6190 **GC1690**		WX120	WG300 FX105 CX710	**KY3400** KY3500	
S (Difficult-to-Cut Material)	S01						CC650				KY2100	
	S10	CF1	CA200	Whiskal WIN		WA1 WA5 SX9	CC670 CC6060 CC6065		WX120	WG300	KY4300 KY1525 KY1540	
	S20											
H (Hard Materials)	H01	A65 KT66 **A66N** **PT600M**		NPC-A2		HC4 HC7 **ZC7**	CC650 CC670 CC6050		**NB100C**	LX11 LX21	**KY4400**	
	H10	A65 KT66 **A66N** **PT600M**		NPC-A2 Whiskal WIN		**ZC7** WA1 WA5	CC670			WG300	KY4300	

·**Boldface** grade shows PVD Coated Ceramic.

CBN

Classification		Kyocera	Dijet	Hitachi	Mitsubishi	NTK	Sandvik	Seco	Sumitomo	Tungaloy	Kennametal WIDIA	Iscar
Classification	Symbol											
K (Cast Iron)	K01	**KBN60M**	JBN795		MB710	B20 B22	CB50 CB7525	CBN050C CBN300P	BN500 **BNC500**	BX930 BX950 BX90S	PB100	IB50 IB85
	K10	**KBN60M** **KBN900**	JBN330	BH200	MB710 MB5015 MB4020	B22		CBN20 CBN200 CBN300	BN600 BN700 BN7000	BX950 BXC90 BX470	KB1630 **KB9610**	IB55
	K20	**KBN900**		BH250	MB730 MBS140 BC5030	B16		CBN350	BN7000 BNS800	BX950 BXC90	**KB9640**	
H (Hard Materials)	H01	KBN510 **KBN10C** **KBN05M** **KBN10M**			**MBC010** MB810	B24 B52		**CBN050C** CBN10 CBN100	BN1000 BNX10 **BNC100** **BNC160**	BXA30 BX310 BXC30 **BXM10**	KB1610	IB50
	H10	KBN525 **KBN25C** **KBN05M** **KBN25M**	JBN300	BH200	**MBC020** **BC8020** MB8025	B24 B36 B54	CB7015 CB20	CBN150 CBN170 CBN200 **CBN160P**	**BNC160** BNX20 BN2000 **BNC200**	**BXM10** BXA40 BX330 BX360 **BXC50**	KB1615 KB5610 **KB9610**	IB50
	H20	**KBN30M** **KBN35M** **KBN900**	JBN245	BH250	**MBC020** **BC8020** MB8025	B22 B36	CB50 CB7025 CB7525	CBN350 **CBN300P**	BNX25 BN350 **BNC300**	BX380 **BXC50** **BXM20**	KB1340 KB5625 **KB9640**	IB55
Sintered Steel	-	KBN65B KBN570 **KBN65M** **KBN70M**							BN700 BN7000 BN7500	BX450 BX470 BX480		

·**Boldface** grade shows PVD Coated CBN.

PCD

Classification		Kyocera	Dijet	Hitachi	Mitsubishi	NTK	Sandvik	Seco	Sumitomo	Tungaloy	Kennametal WIDIA	Iscar
Classification	Symbol											
N (Non-ferrous Metals)	N01	**KPD001**	JDA30 JDA735		MD205	PD1	CD10	PD10	DA90 DA1000 DA2200	DX180 DX160	PD100 KD1400 KD1405	
	N10	**KPD001** **KPD010** **KPD230**	JDA40 JDA745		MD220		CD10	PD20	DA150 DA1000 DA2200	DX140	KD100 KD1400 KD1415	ID5
	N20	**KPD001** **KPD010** **KPD230**	JDA10 JDA715		MD230			PD30	DA1000 DA2200	DX110 DX120	KD1425	

Material Cross Reference Table

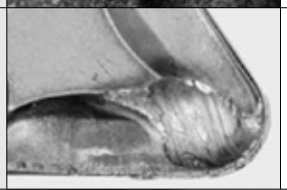
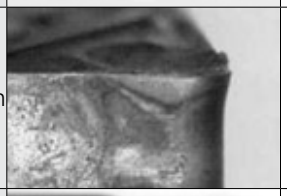
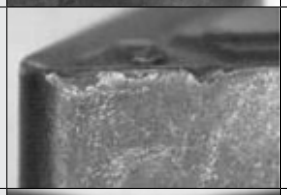
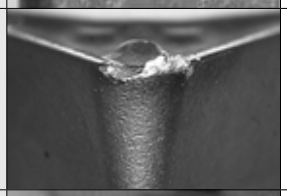
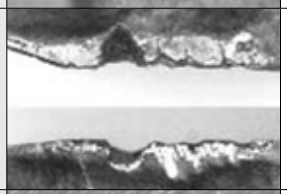
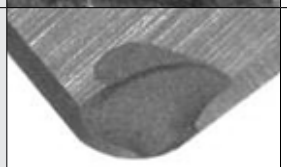
Uncoated Carbide

·This table is Kyocera's own estimation based on publications and is not authorized by companies mentioned in it.

Classification		Kyocera	Dijet	Hitachi	Mitsubishi	NTK	Sandvik	Seco	Sumitomo	Tungaloy	Kennametal WIDIA	Iscar
Classification	Symbol											
P (Steel)	P10		SRT	WS10	STi10T		S1P		ST10P	TX10S	K2885	IC70
	P20		SRT DX30	EX35	STi20 UTi20T		SMA	S10M	ST20E	TX20 TX25	K125M	IC70 IC50M
	P30	**PW30**	SR30 DX30 DX35	EX35 EX40			SM30	S25M	A30N A30 ST30E	TX30 UX30	KMF	IC50M IC54
	P40		SR30 DX35	EX45			S6	S60M	ST40E	TX40	PVA	IC54
K (Cast Iron)	K01		KG03	WH02 WH05	HTi05T		H1P		H1 H2	TH03 KS05F	K68 K10	IC04
	K10	**KW10** **GW15**	KG1 KG10 KT9	WH10	HTi10	KM1	H1P H10 HM	890	EH10 EH510	G1F TH10 H10T	KMI K8735 K313	IC20
	K20	**GW25**	CR1 KG20	WH20	HTi20T UTi20T	KM3	H13A	883 890 HX	G10E EH20 EH520	G2F KS15F KS20	KMF	IC20 IC10
	K30		KG30 LF12					883	G3 G10E	G3	THR	IC10 IC28
V (Wear and Shock Resistant Tool)	V40		G5 GD195	WH50	GTi30				G5	D40		
	V50	**VW50**	MH3 MH4 GD174 GD201	WH60	GTi35 GTi40 GTi30S				G6	D50		
	V60		MH5 MH7 MH8 GD206	WB60	GTi40S GTi50S				G7 G8	D60		

Troubleshooting

Cutting Edges Figuration and Countermearsures

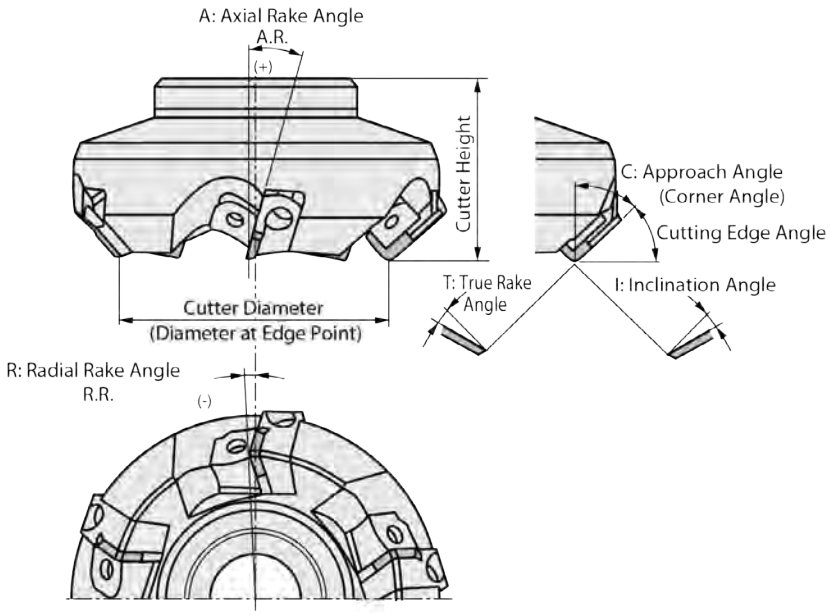
Typical Cutting Edge Figuration		Observation	Causes	Countermeasures
Nose Wear		• Deterioration of surface roughness and dimensional accuracy	• Too high Vc • End of tool life	• Reduce Vc • Change to higher wear resistant grade
Notching		• Burr formation • Cutting force increase	• Too high f and Vc	• Sharper cutting performance • Reduce Vc • Change to higher heat resistant grade
Crater Wear		• Chip control deterioration • Surface finish deterioration (peeled surface)	• Too high Vc	• Reduce Vc • Change to high speed type like Cermet or Al_2O_3 coated insert
Plastic Deformation		• Workpiece dimension's change • Crack at nose	• Too high cutting load • Inappropriate tool grade	• Change to harder grade • Reduce f and ap
Crack from Wear		• Surface finish's sudden deterioration • Workpiece dimension changes	• Too high Vc	• Reduce the pre-set tool life • Change to higher wear resistant grade
Chipping		• Cutting force increase • Surface roughness deterioration	• Too high f • Chattering • Lack of insert toughness	• Reduce f and ap • Change to more rigid toolholder • Change to tougher grade
Crack from Welding or Built-up Edge		• Surface finish deterioration • Cutting force increase	• Too low Vc	• Increase Vc • Improve sharp cutting performance (rake angle, chamfer)
Mechanical Fracture		• Sudden cracking • Unstable tool life	• Too high f and ap • Chattering	• Change to tougher grade • Enlarge chamfer • Enlarge Corner-R(rε) • Change to more rigid toolholder
Fracture from Thermal Crack		• Cracking by heat cycle • Possible in interrupted cutting and milling	• Too high Vc and f	• Reduce f • Reduce Vc • Change to dry cutting
Flaking		• Possible in high hardness material cutting • Possible in machining with chattering	• Lack of insert toughness • Lack of toolholder's rigidity	• Change to harder grade (TiC-base ceramic to CBN.) • Change to more rigid toolholder • Change edge preparation

Milling

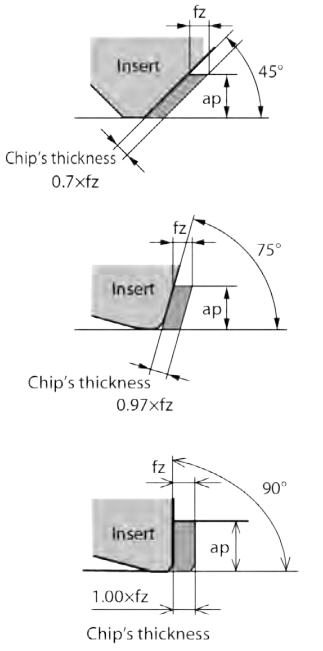
Trouble	Trouble Item	Countermeasures / Check Item	Tool Grade: Change to Harder Grade	Tool Grade: Change to Tougher Grade	Tool Grade: Change to More Thermal Shock Resistant Grade	Tool Grade: Change to More Welding Resistant Grade	Cutting Conditions: Vc (Higher (Larger) ↑ Lower (Smaller) ↓)	Cutting Conditions: fz (Higher (Larger) ↑ Lower (Smaller) ↓)	Cutting Conditions: ap (Higher (Larger) ↑ Lower (Smaller) ↓)	Cutting Conditions: Cutter Dia. Cutting Width Review	Cutting Conditions: Tool Path Review	Cutting Conditions: Coolant: Usage of Mist	Cutting Conditions: Coolant: Dry	Tool geometry: Insert with Chipbreaker	Tool geometry: Relief Angle (Larger ↑ Smaller ↓)	Tool geometry: Corner Angle (Larger ↑ Smaller ↓)	Tool geometry: Edge Strength / Honing (Larger ↑ Smaller ↓)	Tool geometry: Insert Number (More ↑ Less ↓)	Tool geometry: Insert Pocket (Larger ↑ Smaller ↓)	Tool geometry: Wiper Edge (Relief Angle) Review	Tool geometry: Insert Runout Check	Tool geometry: Cutter Rigidity	Setting: Workpiece / Tool Installation	Setting: Overhang Length	Machine: Power, Rigidity
Edge Damage	Flank Wear Increase	Unsuitable Cutting Conditions					●↓					●													
		Unsuitable Tool Geometry	●												●↑		●↓			●					
	Rake Face Wear Increase	Unsuitable Cutting Conditions					●↓	●↓	●↓			●													
		Unsuitable Tool Geometry	●												●↑	●↑	●↓								
	Chipping, Cracking	Unsuitable Cutting Conditions						●↓	●↓	●	●														
		Unsuitable Tool Geometry		●											●↓	●↑	●↑			●	●	●	●	●	●
	Edge Breakage by Thermal Shock	Unsuitable Cutting Conditions					●↓	●↓	●↓				●												
		Unsuitable Tool Geometry			●										●↑		●↓								
	Built-up Edge	Unsuitable Cutting Conditions					●↑	●↑				●													
		Unsuitable Tool Geometry				●									●↑		●↓								
Cutting Accuracy	Poor Surface Finish	Unsuitable Cutting Conditions					●↑	●↓	●↓			●													
		Unsuitable Tool Geometry	●			●											●↓	●↓		●	●		●	●	●
	Burr	Unsuitable Cutting Conditions					●↓	●↓	●↓	●	●														
		Unsuitable Tool Geometry													●↑	●↓	●↓			●					
	Workpiece Chip Off	Unsuitable Cutting Conditions						●↓	●↓		●														
		Unsuitable Tool Geometry													●↑	●↑	●↓	●↑		●					
	Poor Planeness /Parallelness	Tool and Workpiece Evacuation						●↓	●↓			*5 ●↓		●	●↑	●↓	●↓	●↓		●	●	●	●	●	●
Others	Heavy Chattering, Vibration	Unsuitable Cutting Conditions, Installation					●↓	*1 ●↓	*2 ●↓	●	*4 ●↓			●	●↑	●↓	●↓	●↓				●	●	●	●
	Damaging Chips	Unsuitable Cutting Conditions					●↑	*3 ●↓		●		*6 ●↓	●												
		Unsuitable Tool Geometry												●	●↑			●↓	●↑						

*1) To prevent chattering, the higher fz may be suitable.
*2) To prevent chattering, the larger ap may be suitable.
*3) Higher fz may be suitable.
*4) Down-cut method is recommended for Helical Endmilling.
*5) If the surface is warped by cutting heat.
*6) Compressed air is recommended.

Terms and Angles of Milling Cutter



·Lead Angle and chip thickness



Function of Tool Angle

Symbol	Name	Function	Effect
A	Axial Rake Angle (A.R.)	Controls chip flow direction and cutting force	When it is positive --- Good cutting performance and less chip welding
R	Radial Rake Angle (R.R.)	Controls chip flow direction and cutting force	When it is negative --- Good chip evacuation
C	Approach Angle	Controls chip thickness and chip flow direction	When it is large ---Thinner chip thickness Lower cutting load
T	True Rake Angle	Actual rake angle	When it is positive ---Good cutting performance and less chip welding, but lower edge strength When it is negative --- Higher edge strength but easier to weld
I	Inclination Angle	Controls chip flow direction	When it is positive ---Good chip evacuation Less cutting force Lower edge stability of the corner part

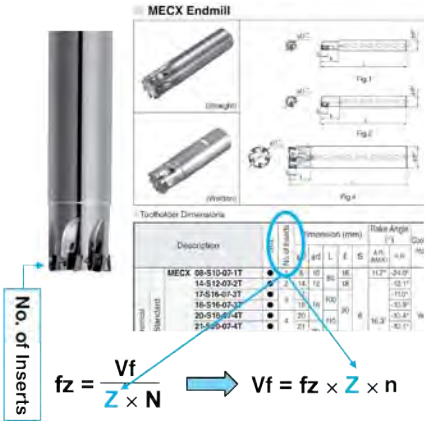
$\tan T = \tan R \times \cos C + \tan A \times \sin C$

$\tan I = \tan A \times \cos C - \tan R \times \sin C$

Notes: Number of inserts (Z)

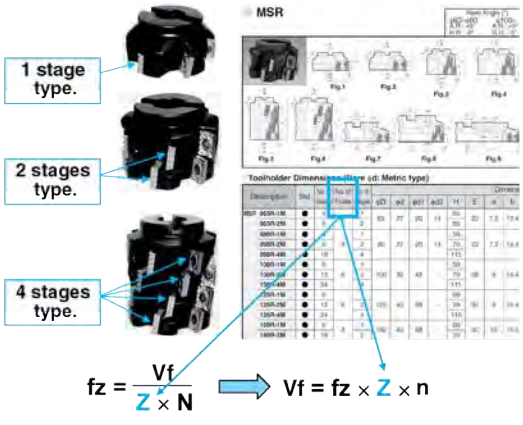
1) If the number of stage is one,

If the number of stage is one, it is not indicated on the catalogue.
Please use "Number of inserts" of the catalogue for "Z" of the formula to calculate cutting conditions.

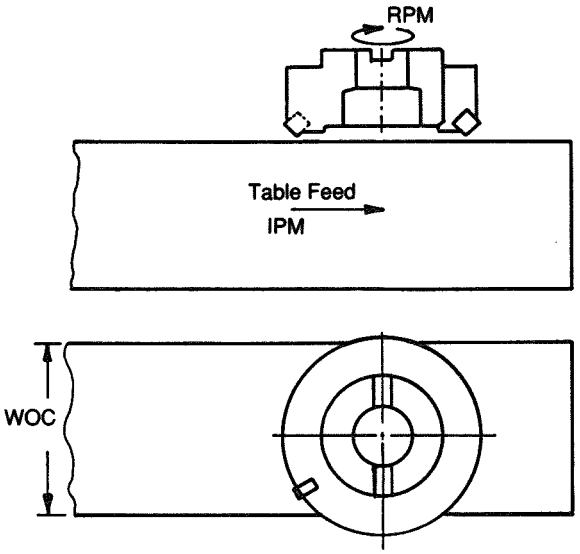


2) If the number of stages is more than two,

If the number of stages is more than two, it is indicated on the catalogue.
Please use "No. of Flutes" of the catalogue for "Z" of the formula to calculate cutting conditions.



Basic Milling Formulas



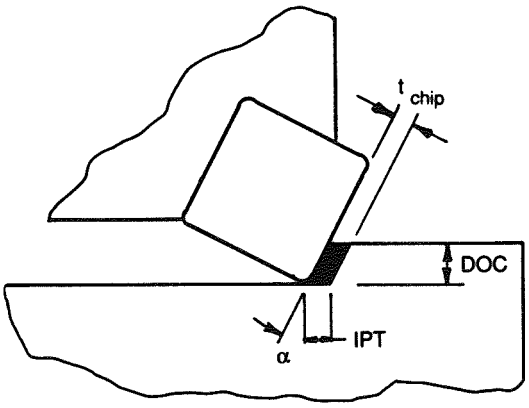


Table Feed with f_1 Compensation (inches/minute)
= IPT x N x RPM x f_1

Surface Speed per Minute

$$SFM = .262 \times DIA \times RPM$$

Revolutions per Minute

$$RPM = \frac{3.82 \times SFM}{DIA}$$

Feedrate (inches/minute)

$$IPM = IPT \times N \times RPM$$

Feedrate (inches/tooth)

$$\text{Programmed IPT} = \frac{t_{chip\ Max}}{\cos\alpha}$$

Radial Chip Thinning for 90° Cutters

$$f_1 = \frac{1/2\left(\frac{Dia}{Ae}\right)}{\sqrt{\left(\frac{Dia}{Ae}\right) - 1}}$$

Metal Removal Rate

$$Q = WOC \times DOC \times IPM\ (in/min)$$

Horsepower Required at the Spindle

$$HPS = Q \times UHP$$

Horsepower Required at the Motor

$$HPM = \frac{HPS}{EFF}$$

Time in Cut (seconds)

$$T = \frac{15.7 \times DIA \times LOC}{SFM \times IPR \times N}$$

or

$$T = \frac{60 \times LOC}{IPM}$$

Definition of Terms

DIA = Cutter Diameter (Inches)

ap= Axial depth of Cut (Inches)

EFF = Machine Efficiency

f = Feedrate (See IPM, IPR and IPT)

HPM = Horsepower Required at the Motor (HP)

HPS = Horsepower Required at the Spindle (HP)

IPM = Feedrate (Inches per Minute)

IPR = Feedrate (Inches per Revolution)

IPT = Feedrate (Inches per Tooth)

f_1 = Cutter Compensation Factor

WOC = Width of Cut (Inches)

LOC = Length of Cut (Inches)

N = Number of Effective Teeth in Cutter

Q = Metal Removal Rate (Cubic Inches per Minute)

RPM = Revolutions per Minute

SFM = Surface Speed (Feet per Minute)

T = Time (in Seconds)

$t_{chip\ Max}$ = Maximum Recommended Chip Thickness (Inches)

UHP = Unit Horsepower Factor

α = Lead Angle

Cutting speed

$$Vc = \frac{\pi \times Ds \times n}{1000}$$

Vc : Cutting speed [m/min]

Ds : Cutter Diameter [mm]

n : Spindle Revolution [min^{-1}]

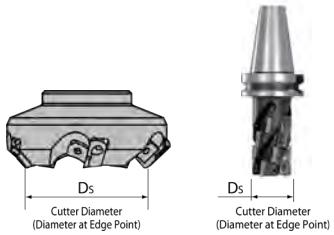


Table Feed & Feed per Tooth

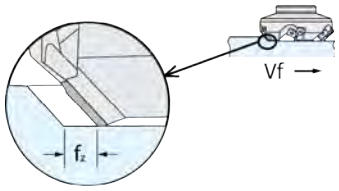
$$f_z = \frac{Vf}{Z \times n}$$

f_z : Feed per Tooth [mm/t]

Vf : Table Feed [mm/min]

Z : Number of Inserts

n : Spindle Revolution [min^{-1}]



Power Requirement

$$Pc = \frac{Ks \times Q}{6120 \times \eta} = \frac{Ks \times ae \times Vf \times ap}{6120000 \times \eta}$$

$$= \frac{Ks \times ae \times fz \times Z \times n \times ap}{6120000 \times \eta}$$

$$P_{HP} = \frac{6120}{4500} \times Pc$$

Pc : Power Requirement [kW]

P_{HP} : Power Requirement (Horse Power) [HP]

ae : Width of Cut[mm]

Vf : Table Feed [mm/min]

f_z : Feed per Tooth [mm/t]

Z : Number of Inserts

n : Spindle Revolution [min^{-1}]

ap : Depth Of Cut [mm]

Ks : Specific Cutting Resistance [kgf/mm^2]

η : Mechanical Efficiency (0.7~0.8)

Q : Chip Removal Volume [cm^3/min]

Ks Figure	
Low Carbon Steel	190
Medium Carbon Steel	210
High Carbon Steel	240
Low Alloy Steel	190
High Alloy Steel	245
Cast Iron	93
Malleable Cast Iron	120
Bronze, Brass	70

Chip Removal Volume

$$Q = \frac{ae \times Vf \times ap}{1000} = \frac{ae \times f_z \times Z \times n \times ap}{1000}$$

Q : Chip Removal Volume [cm^3/min]

ae : Width of Cut [mm]

Vf : Table Feed [mm/min]

f_z : Feed per Tooth [mm/t]

Z : Number of Inserts

n : Spindle Revolution [min^{-1}]

ap : Depth Of Cut [mm]

Cutting Time

$$T = \frac{60 \times L'}{Vf} = \frac{60 \times L'}{f_z \times Z \times n}$$

T : Cutting Time [second]

L' : Total Table Transfer Length [mm]
(=L + Ds + 2α)

L : Workpiece Length [mm]

Ds : Cutter Diameter [mm]

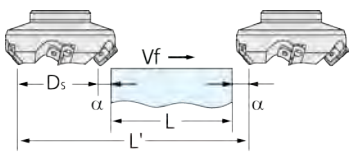
α : Idling Distance [mm]

Vf : Table Feed [mm/min]

f_z : Feed per Tooth [mm/t]

Z : Number of Inserts

n : Spindle Revolution [min^{-1}]



Basic Milling Formulas

True Rake Angle

$$\tan T = \tan R \times \cos C + \tan A \times \sin C$$

Inclination Angle

$$\tan I = \tan A \times \cos C - \tan R \times \sin C$$

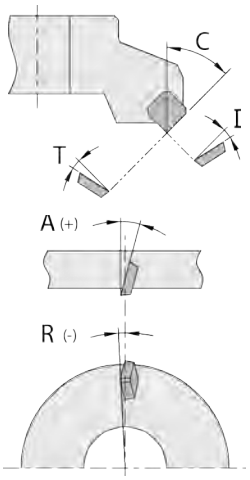
A : Axial Rake Angle A.R. [°] (-90°<A<90°)

R : Radial Rake Angle R.R. [°] (-90°<R<90°)

C : Approach Angle [°] (0°<C<90°)

T : True Rake Angle [°] (-90°<T<90°)

I : Inclination Angle [°] (-90°< I <90°)



Ball-Nose End Mill Cutting & Revolution

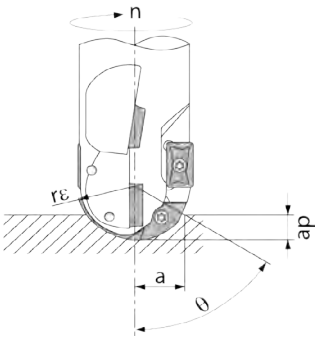
$$n = \frac{1000 \times V_a}{2 \times \pi \times \sqrt{a(2r\varepsilon - ap)}}$$

n : Revolution [min^{-1}]

rε : Radius of Ball-Nose End Mill (Ball Part's radius [mm])

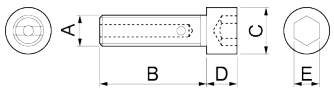
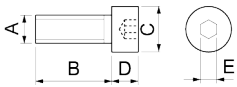
ap : Depth Of Cut [mm]

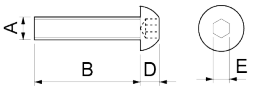
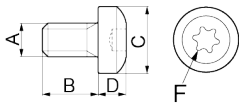
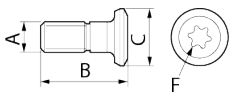
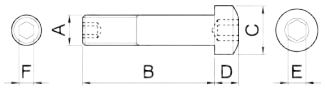
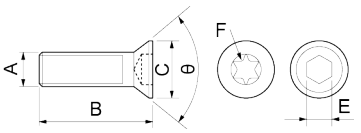
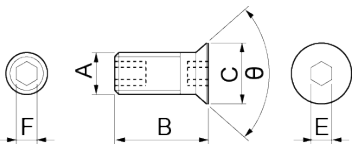
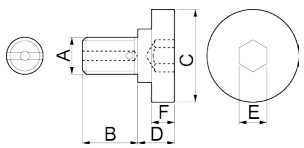
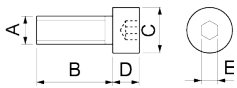
V_a : Cutting Speed at Point "a" [m/min]

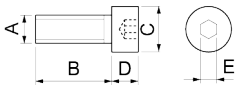
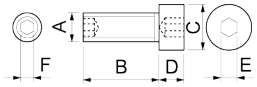
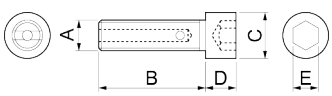


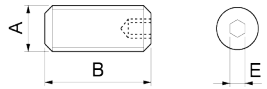
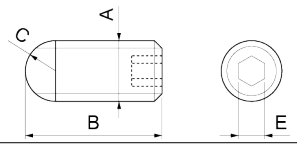
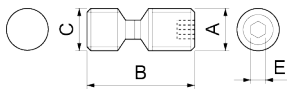
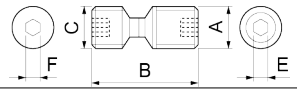
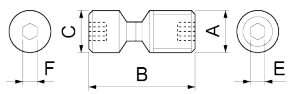
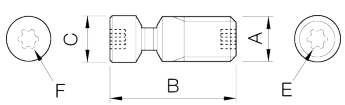
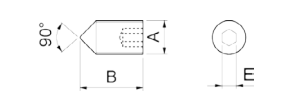
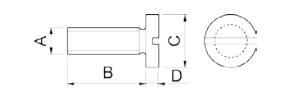
Spare Parts

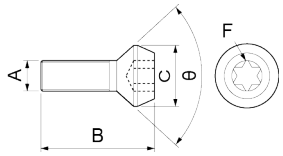
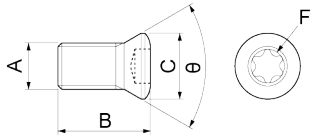
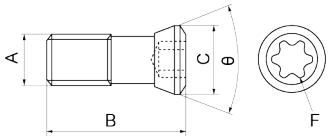
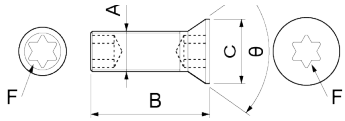
S1~S18

Shape	Description		Dimension (in) A	B	C	D	E	F	Angle (°) α	θ	Torque (N • m)	Remarks
	HH	3/8-1.25H	3/8-24 UNF	1.25	0.55	0.375	0.312	-	-	-	-	With Coolant Hole
		1/2-1.25H	1/2-20 UNF	1.25	0.75	0.5	0.375					
		3/4-2.3H	3/4-16 UNF	1.5	1.12	0.75	0.625					
	HH	3/8-1.25	3/8-24 UNF	1.25	0.55	0.375	0.312	-	-	-	-	-
		3/8-1.5	3/8-24 UNF	1.5	0.55	0.375	0.312					
		1/2-1.25	1/2-20 UNF	1.25	0.75	0.5	0.375					
		3/4-2.3	3/4-16 UNF	1.5	1.12	0.75	0.625					

Shape	Description		Dimension (mm) A	B	C	D	E	F	Angle (°) α	θ	Torque (N • m)	Remarks
	AJ	-6X38	M6X1.0	38.0	6.0	10.0	3.0	3.0	-	-	-	
		-8X44-9.5	M8X1.25	44.0	9.5	6.0	4.0	4.0	-	-		
		-10X46	M10X1.5	46.0	11.5	8.0	5.0	5.0	-	-		
	BH	3X6	M3X0.5	6.0	-	1.7	2.0	-	-	-	-	
		3X12	M3X0.5	12.0	-	1.7	2.0	-	-	-		
		6X25	M6X1.0	25.0	-	3.3	4.0	-	-	-		
		8X30	M8X1.25	30.0	-	4.4	5.0	-	-	-		
	BH	6X10TR	M6X1.0	10.0	12.0	5.0	-	T25	-	-	6.5	
	CP	8X15TL	M8X1.25	15.0	15.0	-	-	T25	-	-	6.0	L…shows Left-hand Thread
		8X23TL		23.0								
	CS	-2D	M4X0.7	21.5	6.4	3.5	2.5	2.0	-	-	-	
		-3D	M5X0.8	22.0	8.0	4.0	3.0	2.5	-	-		
		-5D	M5X0.8	28.0	8.0	4.0	3.0	2.5	-	-		
	GS	-50	M5X0.8	13.0	7.5	-	3.0	-	-	82°	-	
		-50S	M5X0.8	9.0	7.5	-	3.0	-	-	82°		
	GS	-4090T R/L W	M4X0.7	9.0	5.8	-	2.0	2.0	-	82°	-	R…shows Right-hand Thread L…shows Left-hand Thread
	HF	20X53H	M20X2.5	35.0	43.0	18.0	14.0	14.0	-	-	-	With Coolant Hole
		24X60H	M24X3.0	40.5	65.0	19.5	17.0					
	HH	3X6	M3X0.5	6.0	5.5	3.0	2.5	-	-	-	-	
		3X12		12.0								
	HH	4X16	M4X0.7	16.0	7.0	4.0	3.0	-	-	-		
	HH	5X15	M5X0.8	15.0	8.5	5.0	4.0	-	-	-		
		5X16		16.0								
		5X20		20.0								
		5X25		25.0								
		5X30		30.0								
	HH	6X12	M6X1.0	12.0	10.0	6.0	5.0	-	-	-		
		6X20		20.0								
		6X25		25.0								
		6X30		30.0								

Shape	Description	Dimension (mm)						Angle (°)		Torque (N • m)	Remarks
		A	B	C	D	E	F	α	θ		
	HH 8X25	M8X1.25	25.0	13.0	8.0	6.0	-	-	-	-	
	HH 8X35		35.0								
	HH 8X40		40.0								
	HH 8X50		50.0								
	HH 8X55		55.0								
	HH 8X65		65.0								
	HH 8X70		70.0								
	HH 8X80		80.0								
	HH 8X85		85.0								
	HH 8X100		100.0								
	HH 8X110		110.0								
	HH 10X25	M10X1.5	25.0	16.0	10.0	8.0	-	-	-		
	HH 10X30		30.0								
	HH 10X30M		30.0								
	HH 10X30S		30.0		6.0	7.0					
	HH 10X35		35.0		10.0	8.0					
	HH 10X40		40.0								
	HH 12X25	M12X1.75	25.0	18.0	12.0	10.0	-	-	-		
	HH 12X30		30.0								
	HH 12X35		35.0								
	HH 12X35M		35.0								
	HH 12X40		40.0								
	HH 12X55		55.0								
	HH 12X65		65.0								
	HH 12X80		80.0								
	HH 12X85		85.0								
	HH 12X100		100.0								
	HH 12X110		110.0								
	HH 12X120		120.0								
	HH 12X130		130.0								
	HH 12X140		140.0								
	HH 12X150		150.0								
	HH 16X35	M16X2.0	35.0	24.0	16.0	14.0	-	-	-		
	HH 16X40		40.0								
	HH 16X45		45.0								
	HH 16X65		65.0								
	HH 16X90		90.0								
	HH 16X110		110.0								
	HH 16X130		130.0								
	HH 20X40	M20X2.5	40.0	30.0	20.0	17.0	-	-	-		
	HH 20X55		55.0								
	HH 20X75		75.0								
	HH 20X90		90.0								
	HH 20X110		110.0								
	HH 20X120		120.0								
	HH 20X140		140.0								
	HH 20X150		150.0								
	HH 20X170		170.0								
	HH 24X40	M24X3.0	40.0	36.0	24.0	19.0	-	-	-		
	HH 24X60		60.0								
	HH 24X75		75.0								
	HH 24X90		90.0								
	HH 24X110		110.0								
	HH 24X120		120.0								
	HH 24X140		140.0								
	HH 24X150		150.0								
	HH 24X170		170.0								
	HH 4X12	M4X0.7	12.0	7.0	4.0	3.0	2.0	-	-	-	
	HH 8X25H	M8X1.25	25.0	13.0	8.0	5.0	-	-	-	-	With Coolant Hole
	10X30H	M10X1.5	30.0	16.0	10.0	6.0					
	12X35H	M12X1.75	35.0	18.0	12.0	8.0					
	16X52H	M16X2.0	36.0	24.0	16.0	12.0					

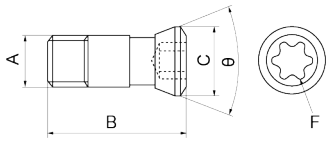
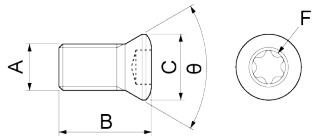
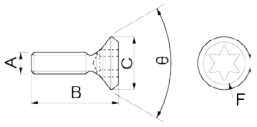
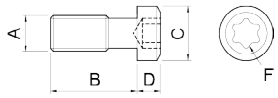
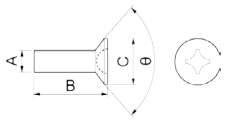
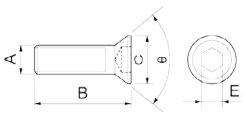
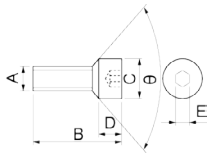
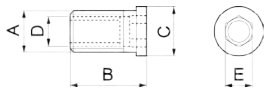
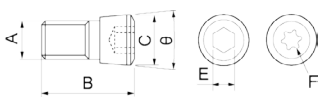
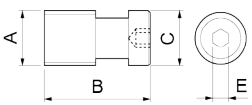
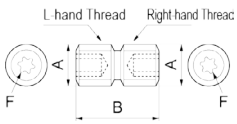
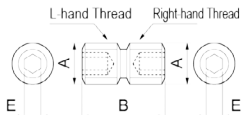
Shape	Description	Dimension (mm)						Angle (°)		Torque (N • m)	Remarks
		A	B	C	D	E	F	α	θ		
	HS 3X4P	M3X0.5	3.9	-	-	1.5	-	-	-	-	HS4X4P and HS6X4P have a flat edge
	HS 3X4		4.0								
	HS 3X8		8.0								
	HS 3X12		12.0								
	HS 3X16		16.0								
	HS 4X4P	M4X0.7	3.9	-	-	2.0	-	-	-		
	HS 4X4		4.0								
	HS 5X5	M5X0.8	5.0			2.5					
	HS 6X4P	M6X0.75	3.9	-	-	3.0	-	-	-		
	HS 6X6	M6X1.0	6.0								
	HS 6X14		14.0								
	HS 6X22		22.0								
	HS 8X10	M8X1.25	10.0	-	-	4.0	-	-	-		
	HS 8X12		12.0								
	HS 10X10	M10X1.5	10.0	-	-	5.0	-	-	-		Clamp screw equivalent to JIS B-1177
	HS 10X16		16.0								
	HS 12X12	M12X1.75	12.0	-	-	6.0	-	-	-		
	HS 12X16		16.0								
	HS 12X18		18.0								
	HS 12X20		20.0								
	HS 12X25		25.0								
	HS 12X30		30.0								
	HS 12X35		35.0								
	HS 16X12	M16X2.0	12.0	-	-	8.0	-	-	-		
	HS 16X18		18.0								
	HS 16X20		20.0								
	HSB 4X8R/L	M4X0.7	8.0	R2.0	-	2.0	-	-	-	-	R…shows Right-hand Thread L…shows Left-hand Thread
	LS -03	M5X0.8	10.0	M5X0.8	-	2.0	-	-	-	2.0	
	LS -03S		12.2			2.5				3.0	
	LS -03N		9.7	M5X0.8	-	2.0	-	-	-	2.0	N: Silver coated
	LS -03SN		12.0			2.5				3.0	
	LS -05	M5X0.8	15.5	M5X0.8	-	2.0	2.0	-	-	2.0	
	LS -1	M6X1.0	17.0	6.0	-	2.5	2.5	-	-	3.0	N: Silver coated
	LS -1N										
	LS -1S		14.2								
	LS -1SN										
	LS -1T		21.0								
	LS -2	M8X1.0	20.0	8.0	-	3.0	3.0	-	-	4.0	
	LS -2N										
	LS -3		22.0								
	LS -4		24.0								
	LS -4N										
	LS -1P	M6X1	16.5	6.0	-	10IP	10IP	-	-	1.4	○○IP shows Torx Plus
	LS -2P	M8X1	18.2	8.0		15IP	15IP			3.5	
	LS -3P		21.8								
	LS -11	M6X1.0	9.5	-	-	3.0	-	-	-	-	
	LS -15		12.5								
	M 3X8	M3X0.5	8.0	5.5	2.0	-	-	-	-	-	Flat fillister head screw equivalent to JIS B-1101
	M 3X12		12.0								
	M 4X10	M4X0.7	10.0	7.0	2.6						

Shape	Description	Dimension (mm)						Angle (°)		Torque (N • m)	Remarks
		A	B	C	D	E	F	α	θ		
	SB -1TR	M2X0.4	5.3	3.8			T6			0.5	
	SB -2TR	M2.5X0.45	6.2	4.5			T8			1.2	
	SB -3TR	M3X0.5	7.2	4.8			T10		82°	1.4	
	SB -3STR		6.4	5.2							
	SB -3.5TR	M3.5X0.6	9.3	5.6			T15			3.5	
	SB -4TR	M4X0.7	7.7	5.8							
	SB -5TR	M5X0.8	20.0	8.7	-	-	T20	-	90°	4.5	R…shows Right-hand Thread
	SB -2290TR	M2.2X0.45	9.2	2.8			T6		60°	0.5	
	SB -25100TR	M2.5X0.45	10.0	3.5			T7			0.8	
	SB -40115TR	M4X0.7	11.5	5.5			T15			3.5	
	SB -5070TR	M5X0.8	7.0	6.8			T20			4.5	
	SB -5090TR		9.0								
	SB -50120TR		12.0								
	SB -1635TR	M1.6X0.35	3.3	2.6			T6		60°	0.5	
	SB -1STR	M2X0.4	5.0	3.1							
	SB -2035TR		3.7	3.0							
	SB -2035TRG		3.5	2.7							
	SB -2040TR		3.8	3.0							
	SB -2040TRG		4.0	3.0	-	-		-			
	SB -2042TRG		4.1	2.7							
	SB -2045TR		4.3	2.7							
	SB -2045TRN		4.3	2.8					37°		
	SB -2050TR		4.8	3.0					60°		
	SB -2060TR		5.8	3.5			T8			1.2	
	SB -2080TR		8.3	2.8			T6			0.5	
	SB -2250TR	M2.2X0.45	5.1	3.1							
	SB -2255TR		5.5	3.5	-	-	T7	-	60°	0.8	
	SB -2260TR		5.8	3.1							
	SB -2545TR	M2.5X0.45	4.6	3.5							
	SB -2555TRG		5.4								
	SB -2560TR		5.7		-	-	T8	-	60°	1.2	
	SB -2570TR		6.8								
	SB -3060TR	M3X0.5	5.3	4.2							R…shows Right-hand Thread○○IP shows Torx Plus
	SB -3060TRG		5.9								
	SB -3070TRG		7.0		-	-	T10	-	60°	1.4	
	SB -3080TR		8.0								
	SB -3580TR	M3.5X0.6	8.0	5.3			T15			3.5	
	SB -3590TRP		9.0		-	-	15IP	-	60°		
	SB -3592TR		9.2	5.1			T10			1.4	
 SB-40125TRN	SB -4050TRN	M4X0.5	4.6	5.1			T10		57°	1.4	
	SB -4060TR	M4X0.7	5.9	5.5			T15		60°	3.5	
	SB -4065TR		6.7								
	SB -4070TRG		7.0								
	SB -4070TRN		6.9	5.4							
	SB -4070TRS		6.7	5.5	-	-	T10	-		1.4	
	SB -4082TPR		8.2	5.5			15IP			3.5	
	SB -4085TR		8.5	5.5			T15				
	SB -40125TRN		12.5	5.2					50°		
	SB -40140TR		14.0	5.5					60°		
	SB -40140TRN		14.0	6.7					75°		
	SB -45130TR	M4.5X0.75	13.0	6.6	-	-	20IP		55°	4.5	
	SB -5085TR	M5X0.8	8.5	6.8			T20		50°	4.5	
	SB -50120TRS		12.0	7.2	-	-	15IP	-	60°	3.5	
	SB -50140TR		14.0	7.3			T15		50°	3.5	
	SB -60120TR	M6X1.0	12.0	8.5			T25		60°	6.0	
	SB -4070TRW	M4X0.7	6.7	5.5	-	-	T8	-	60°	1.2	R…shows Right-hand Thread
	-4590TRWN	M4.5X0.75	9.3	5.6			T10		57°	1.4	

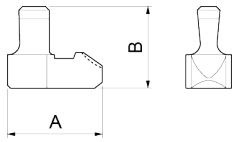
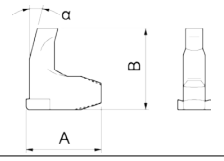
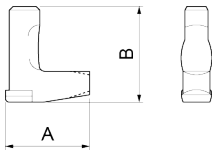
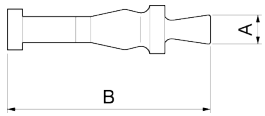
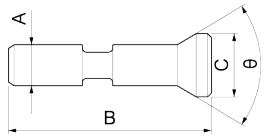
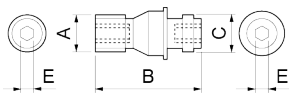
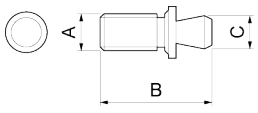
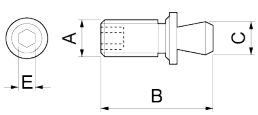
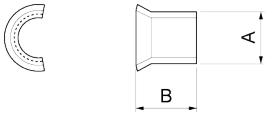
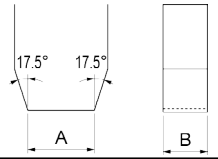
Reference

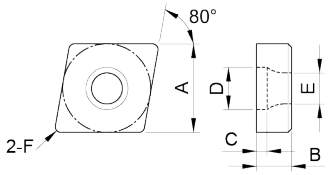
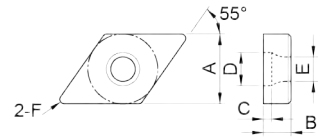
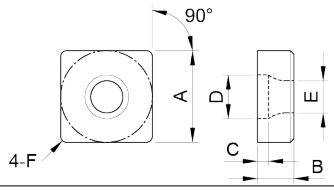
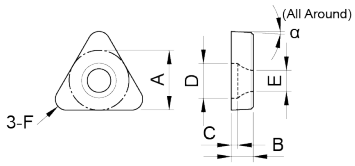
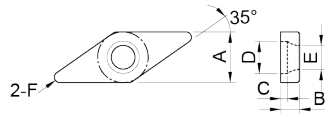
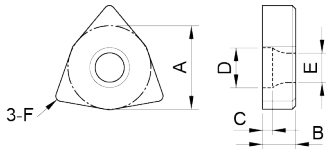
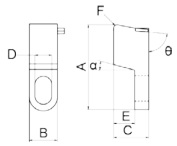
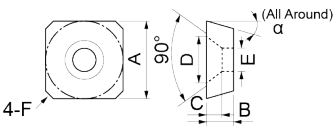
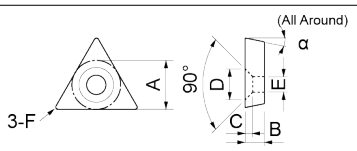
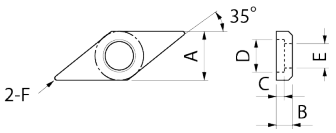
Torx and Torx Plus have different cross-section.

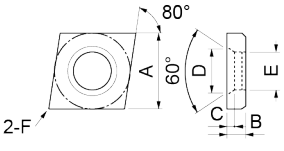
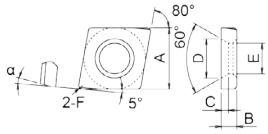
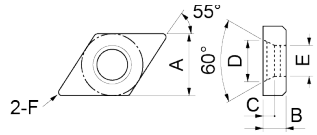
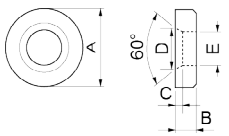
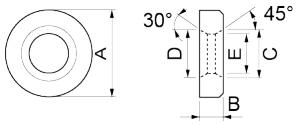
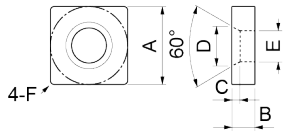
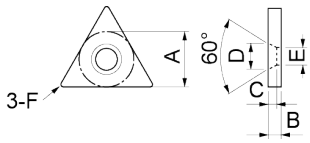
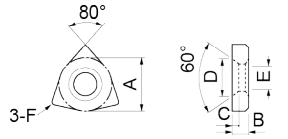
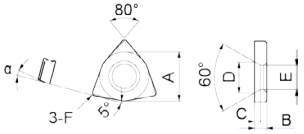
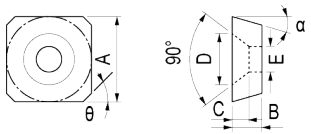
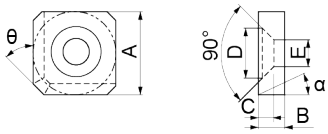
Torx Torx Plus

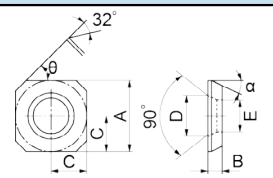
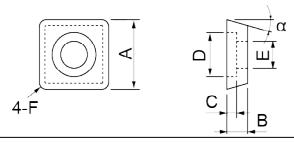
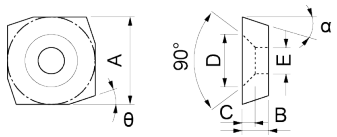
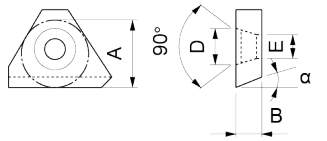
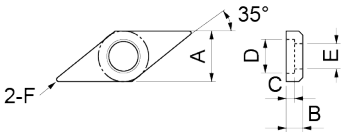
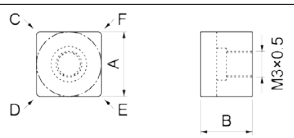
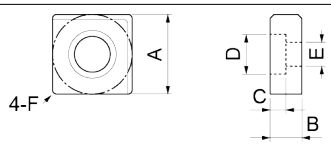
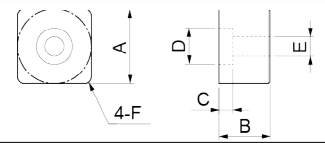
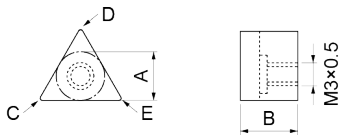
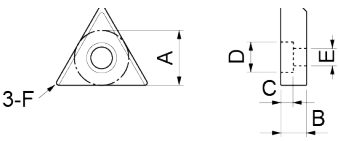
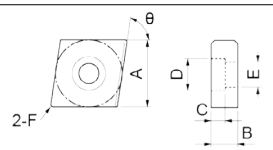
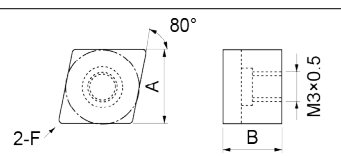
Shape	Description		Dimension (mm) A	B	C	D	E	F	Angle (°) α	θ	Torque (N • m)	Remarks
	SC	-30067	M3X0.35	6.7	4.4	-	-	T8	-	60°	1.2	
		-35085	M3.5X0.35	8.5	5.7			T10			1.4	
		-40100	M4X0.5	10.0	6.0			T15			3.5	
		-50130	M5X0.5	13.0	6.6			T20		40°	4.5	
		-60160	M6X0.75	16.0	8.0			T25			6.0	
		-60210		21.0	9.6			T30			8.0	
	SE	-3070TRP	M3X0.5	7.0	4.3	-	-	9IP	-	43°	1.2	○○IP shows Torx Plus
		-40050TR	M4X0.7	5.0	5.0			T15			3.5	
		-40055TR		5.5								
		-40068TR		6.8								
		-40080TR		8.0								
		-40090TR		9.0								
		-40100TR		10.0								
	SE	-40120TR	M4X0.7	12.0	5.6	-	-	T15	-	60°	3.5	
		-50125TR	M5X0.8	12.5	6.4			T20			4.5	
	SH	-50150TR	M5X0.8	15.1	7.4	3.2	-	T20	-	-	4.5	
	SP	3X4	M3X0.5	4.0	4.0	-	-	-	-	90°	-	Below flat head screw additionally processed item
		3X6		6.0	6.0							Cross recessed flat head screw equivalent to JIS… B-1111
		3X8		8.0								
		3X10		10.0								
	SP	4X9	M4X0.7	9.0	5.6	-	2.0	-	-	90°	-	
	SP	8X35	M8X1.25	35.0	11.0	4.4	5.0	-	-	90°	-	
	SPW	-6045	M6X0.75	9.0	7.5	M4.5X0.75	4.5	-	-	-	-	A shows External, D shows Internal External and Internal threads are both Right-hand threads
		-7050	M7X0.75	9.0	8.8	M5X0.8	5.0	-	-	-		
	SS	-4N	M5.5X0.5	8.5	6.6	M4X0.7	4.0	-	-	-		
	SV	-60136R	M6X1.0	13.6	6.3	-	4.0	-	-	6°	-	Hexagon socket
		-60136TR					-	T20	-		4.5	Torx
	TH	8X15	M8X1.25	20.0	8.5	-	4.0	-	-	-	-	
	W	6X17	M6X1.0	17.0	-	-	-	T20	-	-	4.5	
		8X16	M8X1.0	16.0				T25			6.0	
	W	6X18	M6X1.0	17.5	-	-	3.0	-	-	-	-	
		6X20	M6X1.0	20.5								
		8X18	M8X1.25	18.0			4.0					
		8X21	M8X1.0	21.0								

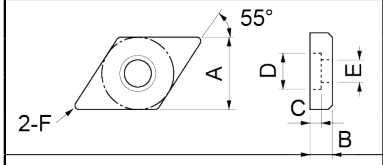
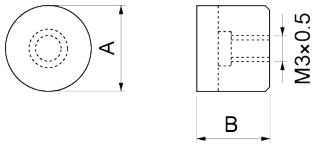
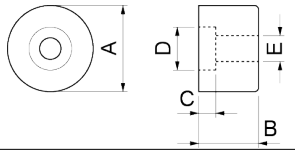
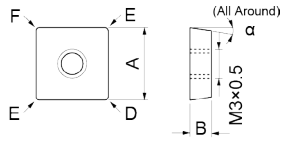
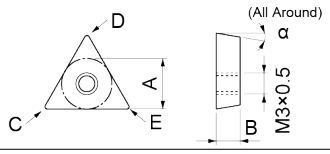
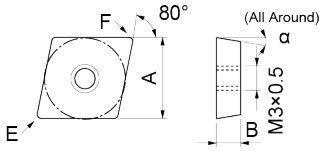
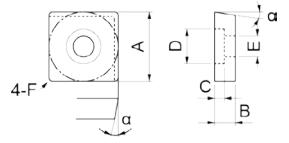
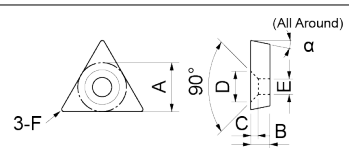
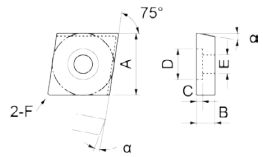
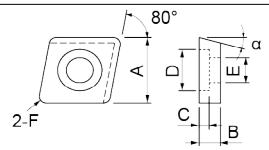
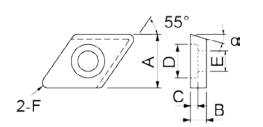
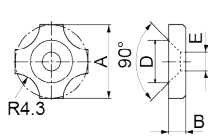
Pins

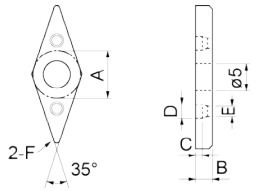
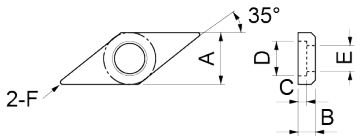
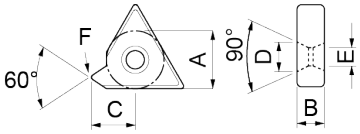
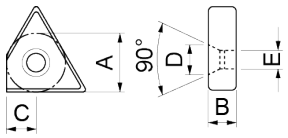
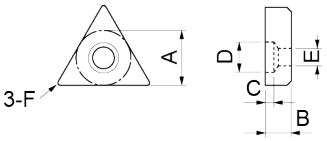
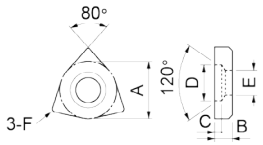
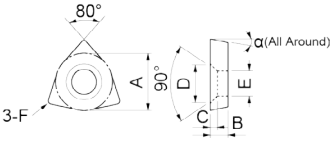
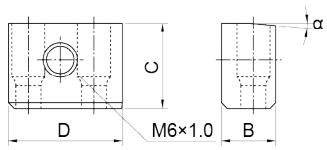
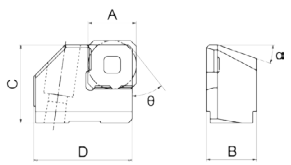
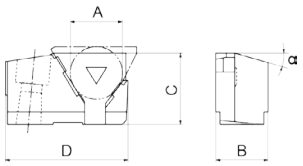
Shape	Description		Dimension (mm)						Angle (°)		Remarks
			A	B	C	D	E	F	α	θ	
	LL	-03	7.8	6.3	-	-	-	-	-	-	
		-03N	7.8	6.3							
		-03S	11.1	8.9							
		-03SN	11.1	8.9							
		-03T	8.3	8.9							
		-03TN	8.3	8.9							
	LL	-05C	10.7	11.7	-	-	-	-	12°	-	
		-1C	13.0	13.3					14°		
		-1CN	13.0	13.3					14°		
		-2C	18.8	17.6					14°		
	LL	-1	10.3	12.0	-	-	-	-	-	-	
		-1K	10.0	12.0							
		-1N	10.3	12.0							
		-1D	12.3	12.0							
		-1DN	12.3	12.0							
		-2	13.5	13.0							
		-2K	13.3	13.2							
		-2N	13.5	13.0							
		-3	16.4	13.0							
		-3K	16.0	14.8							
		-3N	16.4	13.0							
		-4	16.4	14.7							
		-5	17.1	16.7							
		-5N	17.1	16.7							
	LP	-2S	3.65	20.0	-	-	-	-	-	-	
		-6S	3.65	25.0	-	-	-	-	-	-	
	LPA	-11	2.8	11.0	4.2	-	-	-	-	60°	
		-13		13.0							
		-17		17.0							
	LPF	-11	2.5	11.0	3.5	-	-	-	-	60°	
		-1113		13.0							
		-1117		17.0							
		-13	3.8	13.0	5.5						
		-17		17.0							
	TS	-3S	M5X0.8	15.0	3.60	-	2.0	-	-	-	
	WP	-1S	M5X0.8	17.5	3.65	-	-	-	-	-	
		5X15		15.0	5.0						
	WP	5X11	M5X0.8	10.5	5.0	-	2.0	-	-	-	
	LSP	-1	5.0	5.3	-	-	-	-	-	-	
		-2	6.5	5.6							
		-3	8.25	7.9							
	LSP	-2K	5.1	5.2							
		-3K	6.7	5.7							
	P	-03	2.8	1.95	-	-	-	-	-	-	
		-03S	3.5	1.95	-	-	-	-	-	-	

Shape	Description	Dimension (mm)						Angle (°)		Remarks
		A	B	C	D	E	F	α	θ	
	**DC -44**	12.55	5.0	1.5	6.0	4.4	R0.8	-	-	Shim Screw: SB-4085TR
	**DD -43**	12.55	3.4	1.3	6.0	4.4	R0.8	-	-	Shim Screw: SB-4085TR
	-44		5.0	1.5						
	**DS -44**	12.55	5.0	1.5	6.0	4.4	R0.8	-	-	Shim Screw: SB-4085TR
	**DT -32**	8.63	3.2	0.95	5.0	3.4	R1.6	3°	-	Shim Screw: SB-3080TR
	**DV -33**	9.40	3.5	1.2	6.0	4.4	R1.0	-	-	Shim Screw: SB-4085TR
	**DW -44**	12.65	5.0	1.5	6.0	4.4	R0.8	-	-	Shim Screw: SB-4085TR
	**556 CR/L**	34.0	10.0	12.7	5.6	7.5	1.6	0°	55°	R...shows Right-Hand, L...shows Left-hand Shim Screw: HH5X16
	**KPS -42**	11.5	3.2	2.0	7.2	3.2	C1.0	7°	-	Shim Screw: SP3X8
	**KPT -32**	8.0	3.2	1.9	7.0	3.2	R0.4	11°	-	Shim Screw: SP3X8 : SP3X10
	-42	10.5	3.18	1.9	7.0	3.2	R0.8	11°	-	
	**KVN -32**	9.525	3.175	2.1	7.6	5.5	R0.8	-	-	Lock Pin: LP-6S : LP-2S

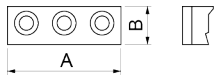
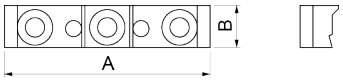
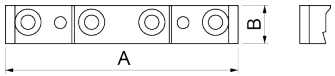
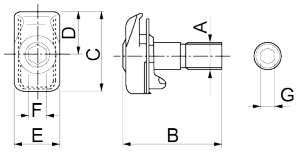
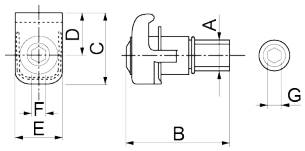
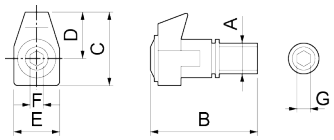
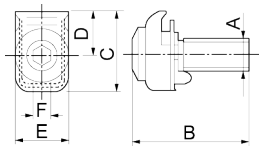
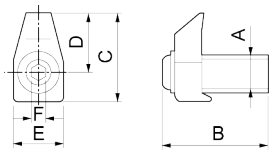
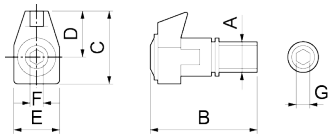
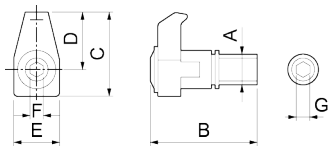
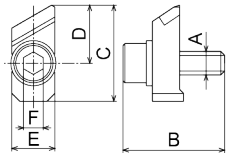
Shape Handed Spare Parts show Right-hand	Description		Dimension (mm)						Angle (°)		Remarks
			A	B	C	D	E	F	α	θ	
	LC	-32	9.47	2.4	1.3	6.18	4.68	R0.8	-	-	Shim Pin: LSP-1
		-32N	9.47	2.4	1.3	6.18	4.68	R0.8	-	-	Shim Pin: LSP-1
		-4K	11.7	3.2	1.4	8.1	6.73	R0.8	-	-	Shim Pin: LSP-3K
		-42	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	Shim Pin: LSP-2
		-42N	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	Shim Pin: LSP-2
		-53	15.9	4.8	1.7	10.0	8.0	R1.2	-	-	Shim Pin: LSP-3
		-53N	15.9	4.8	1.7	10.0	8.0	R1.2	-	-	Shim Pin: LSP-3
	LC	-42R/L	12.65	3.2	1.5	8.01	6.28	R0.8	10°	-	R…shows Right-hand, L…shows Left-hand Shim Pin: LSP-2
		-42NR/L	12.65	3.2	1.5	8.01	6.28	R0.8	10°	-	R…shows Right-hand, L…shows Left-hand Shim Pin: LSP-2
	LD	-32	9.47	2.4	1.3	6.18	4.68	R0.4	-	-	Shim Pin: LSP-1
		-32N	9.47	2.4	1.3	6.18	4.68	R0.4	-	-	
		-4K	11.7	3.2	1.4	8.1	6.73	R0.8	-	-	Shim Pin: LSP-3K
		-4K43		4.8	3.0	8.3	6.60	R1.2			
		-42	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	Shim Pin: LSP-2
		-42-20						R2.0			
		-43	12.65	4.8	3.1	8.5	6.28	R0.8	-	-	
		-43-20						R2.0			
	LR	-80	9.47	3.2	1.3	6.25	4.75	-	-	-	Shim Pin: LSP-1
		-81	12.65	3.2	1.5	8.01	6.28	-	-	-	Shim Pin: LSP-2
	LR	-10C	8.5	3.18	6.3	6.3	4.7	-	-	-	Shim Pin: LSP-1
		-12C	10.0	3.18	6.3	6.3	4.7	-	-	-	
		-16C	16.0	3.18	7.9	8.01	6.28	-	-	-	Shim Pin: LSP-2
	LS	-32	9.47	3.2	1.3	6.18	4.68	R0.8	-	-	Shim Pin: LSP-1
		-42	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	Shim Pin: LSP-2
	LT	-3K	8.53	2.7	1.0	6.1	5.13	R0.8	-	-	Shim Pin: LSP-2K
		-32	9.47	2.7	1.3	6.18	4.68	R0.8	-	-	Shim Pin: LSP-1
		-32N	9.47	2.7	1.3	6.18	4.68	R0.8	-	-	Shim Pin: LSP-1
		-32N-20						R2.0			
		-42	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	Shim Pin: LSP-2
		-42N	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	
		-42N-20						R2.0			
	LW	-32	9.47	2.4	1.3	6.18	4.68	R0.8	-	-	Shim Pin: LSP-1
		-32N	9.47	2.4	1.3	6.18	4.68	R0.8	-	-	
		-42	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	Shim Pin: LSP-2
		-42N	12.65	3.2	1.5	8.01	6.28	R0.8	-	-	
	LW	-42R/L	12.65	3.2	1.5	8.01	6.28	R0.8	10°	-	R...shows Right-hand, L...shows Left-hand Shim Pin: LSP-2
		-42NR/L	12.65	3.2	1.5	8.01	6.28	R0.8	10°	-	R...shows Right-hand, L...shows Left-hand Shim Pin: LSP-2
	MSD	-42	10.7	3.18	1.85	7.0	3.3	-	20°	45°	Shim Screw: SP3X8
	MSE	-4245S	10.3	3.18	2.0	6.0	5.0	-	20°	45°	Shim Screw: SP4X9
	MSE	-4215	10.53	3.18	1.5	6.4	3.4	-	25°	15°	Shim Screw: SP3X8
		-4245	10.53	3.18	1.5	6.4	3.4	-	25°	45°	Shim Screw: SP3X8

Shape	Description	Dimension (mm)						Angle (°)		Remarks
		A	B	C	D	E	F	α	θ	
	**MSO -4T245**	10.0	2.0	4.7	6.4	4.8	-	27°	45°	Shim Screw: SP3X6
	**MSO -5200**	12.6	3.18	1.8	8.0	6.5	R0.8	15°	-	Shim Screw: SPW-6045
	**MSP -42**	11.3	3.18	1.85	7.0	3.3	-	11°	15°	Shim Screw: SP3X8
	**MTE -42**	9.8	3.18	-	6.4	3.4	-	25°	-	Shim Screw: SP3X8
	**MVN -32**	9.525	3.2	2.1	7.4	6.5	R0.8	-	-	Lock Pin: TS-3S
	**SP -129**	9.52	9.52	R0.8	R1.6	R1.2	R1.6	-	-	Shim Screw: HH3X12
	**SP -141**	12.7	4.0	2.4	6.2	3.3	R1.2	-	-	Shim Screw: M3X8
	-143	12.7	7.2	2.4	6.2	3.3	R1.2	-	-	Shim Screw: M3X12
	-162	15.8	6.0	3.4	8.0	4.4	R1.5	-	-	Shim Screw: M4X10
	**SP -148**	12.7	8.8	2.4	6.2	3.3	R1.2	-	-	Shim Screw: BH3X12
	**SP -219**	6.35	9.52	R0.8	R1.2	R1.6	-	-	-	Shim Screw: HH3X12
	**SP -221**	9.52	4.0	2.5	6.5	3.5	R1.2	-	-	Shim Screw: M3X8
	-223	9.52	7.2	2.5	6.5	3.5	R1.2	-	-	Shim Screw: M3X12
	**SP -342**	12.7	6.0	2.5	6.5	3.5	R1.2	-	75°	Shim Screw: M3X8
	-441	12.7	4.0	2.5	6.5	3.5	R0.8	-	80°	Shim Screw: M3X8
	-443	12.7	7.2	2.5	6.5	3.5	R0.8	-	80°	Shim Screw: M3X12
	-454	15.7	8.0	3.4	8.0	4.5	R1.6	-	80°	Shim Screw: M4X10
	**SP -429**	9.52	9.52	-	-	-	R1.2	-	-	Shim Screw: HH3X12

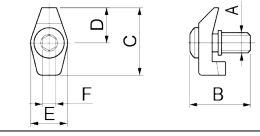
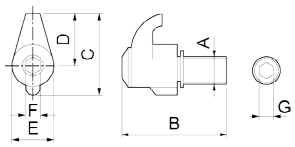
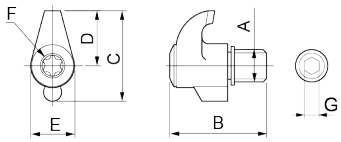
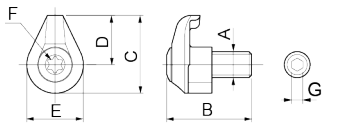
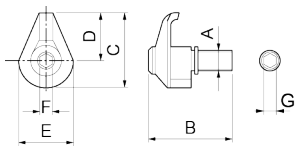
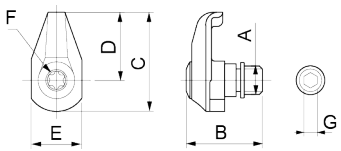
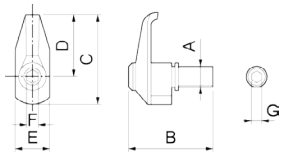
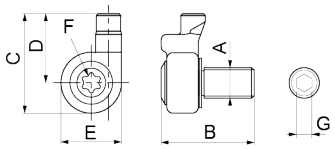
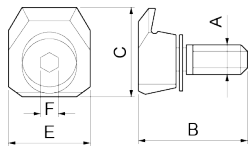
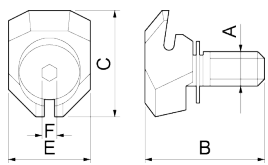
Shape	Description	Dimension (mm)						Angle (°)		Remarks
		A	B	C	D	E	F	α	θ	
	SP -521	10.0	4.0	2.5	6.0	3.4	R1.2	-	-	Shim Screw: M3X8
	-523		7.2							Shim Screw: M3X12
	-541	12.7	4.0	2.5	6.0	3.4	R1.2	-	-	Shim Screw: M3X8
	-543		7.2							Shim Screw: M3X12
	SP -826	9.5	7.9	-	-	-	-	-	-	Shim Screw: HH3X12
	-829	9.52	9.52	-	-	-	-	-	-	
	SP -841	12.7	4.0	2.4	6.2	3.3	-	-	-	Shim Screw: M3X8
	-843	12.7	7.2	2.4	6.2	3.3	-	-	-	Shim Screw: M3X12
	-849	12.7	8.8	2.4	6.2	3.3	-	-	-	Shim Screw: BH3X12
	-861	15.8	6.0	3.4	8.0	4.4	-	-	-	Shim Screw: M4X10
	SP -130A	9.525	3.2	-	R0.4	R0.8	R1.2	8°	-	Shim Screw: BH3X12
	SP -210A	6.35	3.2	R0.4	R0.8	R1.2	-	8°	-	Shim Screw: BH3X6
	SP -420A	9.525	3.22	-	-	R0.8	R1.2	8°	-	Shim Screw: BH3X6
	SP -141P	12.6	4.0	2.5	6.5	3.5	R1.2	7°	-	Shim Screw: M3X8
	-143P	12.7	7.2	2.4	6.2	3.3	R1.2	7°	-	Shim Screw: M3X12
	SP -230P	8.3	3.2	2.0	7.2	3.2	R0.5	7°	-	Shim Screw: SP3X10
	SP -341P	12.6	4.0	2.5	6.5	3.5	R1.2	7°	-	Shim Screw: M3X8
	SP -441P	12.7	4.0	2.5	6.3	3.5	R1.2	11°	-	Shim Screw: M3X8
	-443P		7.2							Shim Screw: M3X12
	SP -521P	10.0	4.0	2.5	6.0	3.5	R1.2	11°	-	Shim Screw: M3X8
	-523P		7.2							Shim Screw: M3X12
	SP -RC	12.6	3.0	-	7.35	3.35	-	-	-	Shim Screw: SP3X8

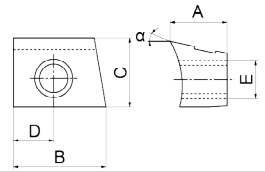
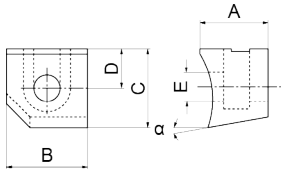
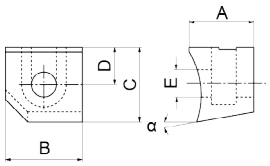
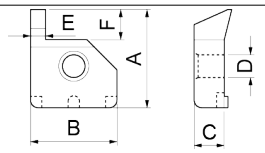
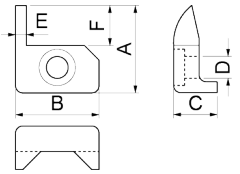
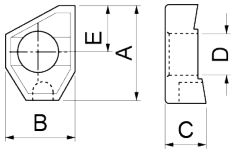
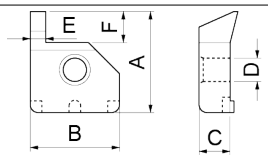
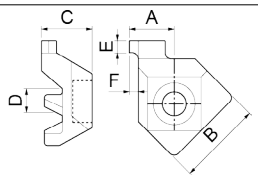
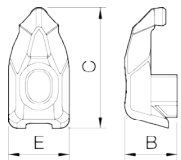
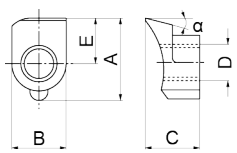
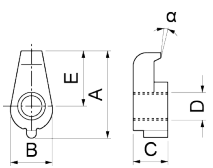
Shape Handed Spare Parts show Right-hand	Description	Dimension (mm)						Angle (°)		Remarks
		A	B	C	D	E	F	α	θ	
	**SVN -32**	8.0	3.18	1.5	3.1	2.3	R0.4	-	-	Shim Screw: SB-2050TR
	**SVN -32N**	8.2	3.18	1.5	7.0	5.9	R0.6	-	-	Shim Screw: SS-4N
	**TN -32**	9.52	3.2	6.5	7.0	4.2	R0.4	-	-	Shim Screw: SP3X8
	-43	12.70	3.2	8.1	7.0	4.2	R0.5	-	-	
	**TNW -32**	9.52	3.2	4.8	7.0	4.2	-	-	-	Shim Screw: SP3X8
	**WTN -33**	9.52	4.76	2.5	7.0	5.3	R0.8	-	-	Shim Pin: WP-1S
	-33-20						R2.0			
	**WWN -42**	12.7	3.0	1.4	7.0	5.3	R1.2	-	-	Shim Pin: WP5X15
	**WWP -42**	12.7	3.0	1.5	8.3	5.3	R1.2	11°	-	Shim Pin: WP5X11
	-42-16						R1.6			
	**MAP -2506**	-	9.5	14.9	20	-	-	5°	-	Clamp Screw: SB-40140TR
	**LSD -445R**	12.7	13.0	20.0	26.5	-	-	20°	45°	Dimension A shows I.D. of Insert
	LSE -445R	12.7	13.0	19.5	26.0	-	-	20°	45°	
	LSO -445R	13.494	12.0	21.3	23.5	-	-	27°	45°	
	LSP -415R	12.7	13.0	18.0	26.0	-	-	15°	15°	
	**LTE -490R**	12.7	12.0	17.0	30.0	-	-	15°	-	Dimension A shows I.D. of Insert

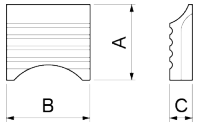
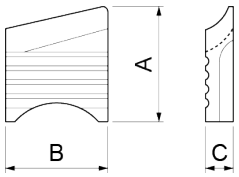
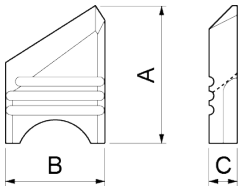
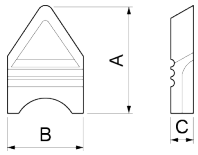
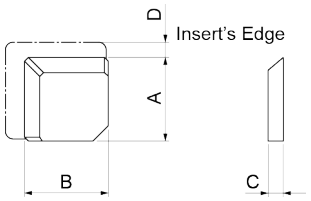
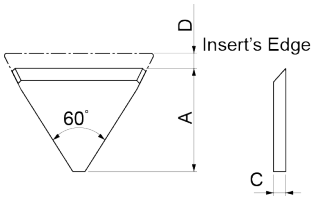
Clamp Set

Shape Handed Spare Parts show Right-hand	Description		Dimension (mm)							Remarks
			A	B	C	D	E	F	G	
	BCS	-1	64.0	13.0	-	-	-	-	-	
		-5	48.0	16.5	-	-	-	-	-	
	BCS	-2	74.0	15.0	-	-	-	-	-	
		-3	88.0	16.0	-	-	-	-	-	
	BCS	-4	98.0	16.0	-	-	-	-	-	
	CE	-010	M8X1.25	28.0	24.0	6.5	13.0	4.0	4.0	G: Indicates hexagon hole two side widths of back side of bolts
		-220			27.0	15.8	15.0			
	CE	-020	M8X1.25	30.0	17.0	10.5	12.7	4.0	4.0	G: Indicates hexagon hole two side widths of back side of bolts
	CE	-030	M8X1.25	30.0	19.0	12.5	12.7	4.0	4.0	G: Indicates hexagon hole two side widths of back side of bolts
		-040			22.5	16.0				
	CE	-320	M6X1.0	20.0	18.2	9.7	12.7	4.0	-	
	CE	-360S	M6X1.0	16.0	18.0	10.55	12.4	4.0	-	
	CE	-030A	M8X1.25	30.0	20.0	13.7	12.7	4.0	-	G: Indicates hexagon hole two side widths of back side of bolts
	CE	-410	M8X1.25	30.0	26.0	19.5	12.7	4.0	4.0	G: Indicates hexagon hole two side widths of back side of bolts
		-430			29.0	22.5				
	CP	-RC R,L	M6X1.0	20.0	24.5	14.8	11.0	5.0	-	R...shows Right-hand, L...shows Left-hand

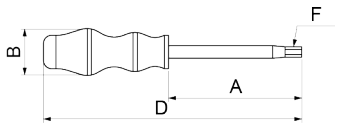
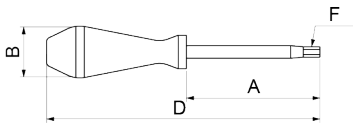
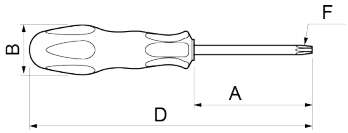
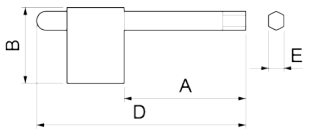
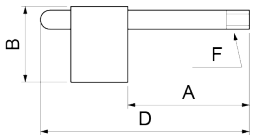
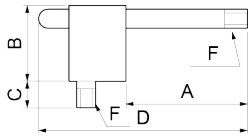
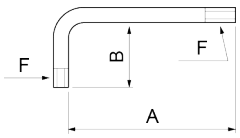
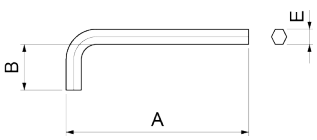
Clamp Set

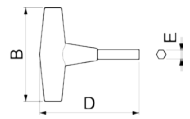
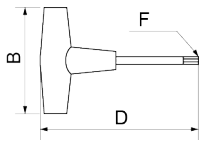
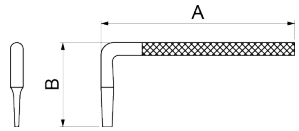
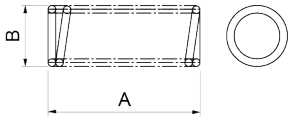
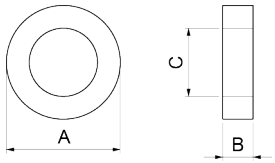
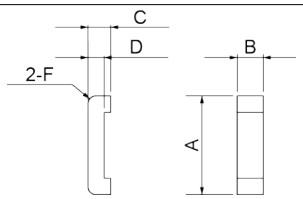
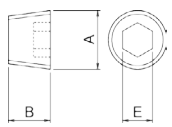
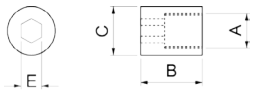
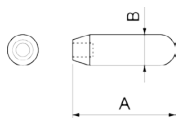
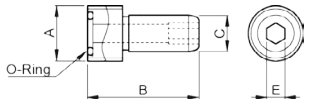
Shape	Description	Dimension (mm)							Remarks
		A	B	C	D	E	F	G	
Handed Spare Parts show Right-hand 	CPS -1	M3X0.5	9.0	10.0	5.2	5.5	2.0	-	
	CPS -2	M5X0.8	14.5	14.0	8.5	6.8	2.5	2.5	G: Indicates hexagon hole two side widths of back side of bolts
	-2P		18.0						
	-3	M6X1.0	19.0	16.5	10.0	8.8	3.0	3.0	
	CPS -2S	M5X0.8	13.5	14.0	8.5	6.8	T15	2.5	G: Indicates hexagon hole two side widths of back side of bolts
	-2TR		15.0						
	CPS -4V	M4X0.7	8.9	11.3	7.3	8.0	T10	-	G: Indicates hexagon hole two side widths of back side of bolts
	-5F	M5X0.8	11.3	12.7	7.5	10.3	T15	2.5	
	-5S		18.0	15.0	9.5	11.0			
	-5V		13.5	12.7	7.5	10.3			
	CPS -6F	M6X1.0	16.5	15.6	9.5	12.2	3.0	-	G: Indicates hexagon hole two side widths of back side of bolts
	-6M		18.5	17.5	11.0	13.0		3.0	
	-6S			18.0	12.0	12.0			
	-6V			15.6	9.5	12.2			
	-8V	M8X1.25	24.0	20.8	13.0	15.5	4.0	4.0	
	CPS -5E	M5X0.8	13.5	17.5	12.0	9.0	T15	2.5	G: Indicates hexagon hole two side widths of back side of bolts
	CPS -5R/L	M5X0.8	18.0	17.5	12.0	9.0	2.5	2.5	G: Indicates hexagon hole two side widths of back side of bolts R...shows Right-hand, L... shows Left-hand
	LGBA -16R/L S	M5X0.8	15.0	16.1	11.2	9.85	T15	2.0	G: Indicates hexagon hole two side widths of back side of bolts R...shows Right-hand, L... shows Left-hand
	-22R/L S			17.6	12.7				
	WCS -1N	M6X1.0	21.0	16.7	-	15.0	3.0	-	
	WCS -8	M6X1.0	21.0	19.4	-	15.0	3.0	-	

Shape	Description		Dimension (mm)						Angle (°)		Remarks
			A	B	C	D	E	F	α	θ	
	**C**	**17R**	12.2	19.5	14.3	8.5	M8X1.25 (L-hand Thread)	-	12°	-	Clamp Screw: W8X18
	**C**	**20R**	15.1	15.5	15.0	7.5	5.3	-	10°	-	Clamp Screw: TH8X15
	CH	**-20R**	13.1	15.5	14.8	7.5	5.3	-	10°	-	Clamp Screw: TH8X15
	**C**	**25R**	13.2	15.5	15.0	7.5	5.3	-	10°	-	Clamp Screw: TH8X15
	**CE**	**-111**	35.0	25.0	10.0	8.0	3.0	10.0	-	-	Right-Hand
		-121									Left-hand
		-131					4.5		-	-	Right-Hand
		-141									Left-hand
	**CGA**	**-3R/L**	24.0	17.66	12.0	6.2	1.9	11.0	-	-	R...shows Right-hand, L... shows Left-hand
		-4R/L	24.0	17.66	12.0	6.2	2.9	11.0	-	-	
		-5R/L	27.5	18.66	12.0	6.2	3.9	14.5	-	-	
	**CGB**	**R/L**	19.0	14.0	8.2	6.35	9.5	-	-	-	R...shows Right-hand, L... shows Left-hand
	**CGH**	**-1R/L**	25.0	22.0	8.0	6.05	3.0	5.5	-	-	R...shows Right-hand, L... shows Left-hand
		-2R/L					5.0				
		-3R/L	29.0	23.0	8.5		6.0	6.0			
	**CGIA**	**-3R**	10.7	17.0	10.5	5.2	1.8	2.0	-	-	
		-4R					2.5				
		-5R	15.7				3.5	7.0			
	**CP**	**-2D**	-	11.2	21.6	-	10.4	-	-	-	
		-3D		12.0	27.6		14.0				
		-5D		13.0	32.0						
	**CP**	**-8TE**	17.9	12.0	12.0	M8X1.25 (L-hand Thread)	10.0	-	15°	-	
	**CP**	**-8W**	20.9	12.0	8.0	M8X1.25 (L-hand Thread)	13.0	-	3°	-	

Shape Handed Spare Parts show Right-hand	Description		Dimension (mm)						Angle (°)		Remarks
			A	B	C	D	E	F	α	θ	
	CB	-11	11.5	12.7	3.5	-	-	-	-	-	
		-51	16.0	15.6	3.5	-	-	-	-	-	
	CB	-12	13.8	12.7	3.5	-	-	-	-	-	Right-hand
		-13	13.8	12.7	3.5	-	-	-	-	-	Left-hand
	CB	-14	18.51	12.7	3.5	-	-	-	-	-	Right-hand
		-15	18.51	12.7	3.5	-	-	-	-	-	Left-hand
	CB	-16	18.0	12.7	3.5	-	-	-	-	-	
		-17	21.0	15.6	3.5	-	-	-	-	-	
	CB	-S3220	7.94	7.94	1.0	2.0	-	-	-	-	
		-S4220	11.12	11.12	2.0	2.0	-	-	-	-	
	CB	-T2212	7.48	-	1.5	1.2	-	-	-	-	
		-T3220	10.87	-	2.0	2.0	-	-	-	-	

Wrench

Shape	Description		Dimension (mm)						Angle (°)		Remarks
			A	B	C	D	E	F	α	θ	
	DT	-7	44	16	-	114	-	T7	-	-	Torx
		-8	70	26	-	150	-	T8	-	-	
	DT	-10	70	29	-	160	-	T10	-	-	Torx
		-15	70	32	-	170	-	T15	-	-	
		-20	90	32	-	190	-	T20	-	-	
		-25	82	36	-	190	-	T25	-	-	
	DTM	-6	39	17	-	113	-	T6	-	-	Top of Torx is magnetized
		-7	40	17	-	115	-	T7	-	-	
		-8	70	24	-	150	-	T8	-	-	
		-10	70	28	-	167	-	T10	-	-	
		-15	70	31	-	174	-	T15	-	-	
	DTP	-15	81	33	-	186	-	15IP	-	-	○○IP shows Torx Plus
		-20	100			206		20IP			
	FH	-2	42	20	-	73	2.0	-	-	-	Hexagon
		-2.5	42	20	-	73	2.5	-	-	-	
	FT	-6	30	20	-	65	-	T6	-	-	Torx
		-7	34	15	-	62	-	T7	-	-	
		-8	35	20	-	74	-	T8	-	-	
		-10	40	20	-	74	-	T10	-	-	
	FT	-15	43	25.0	10.0	80	-	T15	-	-	Torx
	LTW	-8SS	45	6.0	-	-	-	T8	-	-	Torx
		-10S	65	10.0	-	-	-	T10	-	-	
		-10SS	50	7.0	-	-	-	T10	-	-	
		-15S	65	10.0	-	-	-	T15	-	-	
		-20	57	20.0	-	-	-	T20	-	-	
	LW	-1.5	45	14	-	-	1.5	-	-	-	Hexagon
		-2	50	16	-	-	2.0	-	-	-	
		-2.5	56	18	-	-	2.5	-	-	-	
		-3	63	20	-	-	3.0	-	-	-	
		-4	70	25	-	-	4.0	-	-	-	
		-4.5	78	26	-	-	4.5	-	-	-	
		-5	80	28	-	-	5.0	-	-	-	
		-6	90	32	-	-	6.0	-	-	-	
		-8	109	36	-	-	8.0	-	-	-	
		-10	112	40	-	-	10.0	-	-	-	
		-14	140	56	-	-	14.0	-	-	-	
		-17	160	63	-	-	17.0	-	-	-	
		-19	180	70	-	-	19.0	-	-	-	

Shape	Description		Dimension (mm)						Angle (°)		Remarks
			A	B	C	D	E	F	α	θ	
	**TH**	**-4**	-	80	-	83	4.0	-	-	-	Hexagon
	**TT**	**-15**	-	70	-	138	-	T15	-	-	Torx
		-25		70		70		T25			
		-25L		80		145		T25			
		-30		80		110		T30			
	TTC	**-20**	-	98	-	130	-	T20	-	-	
		-25						T25			
	**LTK**	**-5**	70	30	-	-	-	-	-	-	
	**SP**	**-2D**	8.5	5.6	-	-	-	-	-	-	Spring
		-3D	12.0	7.0							
		-5	12.0	6.7							
		-5D	12.0	7.2							
		-6	12.0	7.7							
		-8	11.0	9.7							
	**W**	**-6**	11.5	1.6	6.4	-	-	-	-	-	Washer
		6-14	11.5	1.4	6.4						
		-8	15.5	1.6	8.4						
	WB	**-5**	10.0	1.0	5.3	-	-	-	-	-	Washer (Brass)
		-6	11.5	1.6	6.4						
		-8	15.5	1.6	8.4						
	**WSP**	**-1**	15.1	4.0	3.5	2.5	-	R1.25	-	-	Spacer
	**GP**	**-1**	PT1/8	7.0	-	-	5.0	-	-	-	Plug
		-2	PT1/4	9.0	-	-	6.0	-	-	-	
	**WN**	**-1**	M5X8	10.0	7.0	-	3.0	-	-	-	Nut
	**PC**	**-1**	60.0	8.5	-	-	-	-	-	-	Punch
		-2	65.0	10.0	-	-	-	-	-	-	
	**CL**	**63-1**	M18X1.0	36.5	12	-	6.0	-	-	-	Coolant Pipe
		100-1	M24X1.5	44.0	16.0		8.0				

Index

T

T1~T8

Index Descriptions of the products described in this book are listed in alphabetical order.

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○: Figure □: Alphabet

Description Index

○: Figure □: Alphabet

Description Index

○: Figure □: Alphabet

Description		Page	Category
MHD	○○(○)-FMA-A	**E68**	Endmill (Helical "Plus Mill")
MHD	○○-○RF	**E71, J10**	Front Piece "Plus Mill"
MHD	○○-S○○-A	**E64**	Endmill (Helical "Plus Mill")
MHD	○○-S○○-A-○○○	**E64**	Endmill (Helical "Plus Mill")
MHD	○○-S○○-B	**E64**	Endmill (Helical "Plus Mill")
MHD	○○-S○○-C	**E63**	Endmill (Helical "Plus Mill")
MHD	○○-S○○-SA	**E63**	Endmill (Helical "Plus Mill")
MHD	○○-S○○-SB	**E63**	Endmill (Helical "Plus Mill")
MHD	○○-S○○-○RSA	**J10**	Endmill (Helical "Plus Mill")
MOF	○○○○○R-○○-○T	**C9**	Face Mill
MOF	○○○○○R-○○-○T-M	**C9**	Face Mill
MOFX	○○○○○R-○○-○(○)T-SF	**C12**	Face Mill
MOFX	○○○○○R○○-○(○)T-MSF	**C12**	Face Mill
MRF	○○-S○○	**J2**	Endmill (Ball-Nose)
MRF	○○-S○○-○○○	**J2**	Endmill (Ball-Nose)
MRFW	○○-S○○	**J2**	Endmill (Ball-Nose)
MRFW	○○-S○○-○○○	**J2**	Endmill (Ball-Nose)
MRP	○○○R-○○	**J5**	Face Milll ("Radius Mill")
MRP	○○○R-○○-○T	**J5**	Face Milll ("Radius Mill")
MRP	○○○-S○○-○○	**J4**	Endmill (Radius Mill)
MRP	○○○-S○○-○○-○T	**J4**	Endmill (Radius Mill)
MRP	○○○-S○○-○○-○T-○○○	**J4**	Endmill (Radius Mill)
MRP	○○○-S○○-○○-○○○	**J4**	Endmill (Radius Mill)
MSD-42		**S9**	Spare Parts (Shim)
MSE	15○○	**D9**	Endmill (High Rake)
MSE	15○○-32	**D9**	Endmill (High Rake)
MSE-4215		**S9**	Spare Parts (Shim)
MSE-4245		**S9**	Spare Parts (Shim)
MSE-4245S		**S9**	Spare Parts (Shim)
MSE	45○○	**C14**	Face Mill (with Shank)
MSE	45○○-32	**C14**	Face Mill (with Shank)
MS-FRW1		**H2, H2**	Spare Parts (Wrench / for MSTA)
MSO	45○○-S	**C15**	Face Mill (with Shank)
MSO	45○○○R	**C15**	Face Mill
MSO	90○○-S32-○○	**E19**	Face Mill (with Shank)
MSO-4T245		**S10**	Spare Parts (Shim)
MSO-5200		**S10**	Spare Parts (Shim)
MSP-42		**S10**	Spare Parts (Shim)
MSR	○○○○R-○	**E56**	Face Mill
MSR	○○○○R-○-1.5ID	**E56**	Face Mill
MSR	○○○R-○	**E57**	Face Mill
MSR	○○○R-○M	**E57**	Face Mill
MSR	○○○R-○-31.75	**E57**	Face Mill
MSR	○○○R-BT50-○	**E58**	Face Mill
MSRS	15○○○R-○(○)T	**D4**	Face Mill
MSRS	15○○○○(○)R-○(○)T	**D4**	Face Mill
MSRS	15○○○R-○(○)T-M	**D5**	Face Mill
MSRS	90○○○○R-○-○(○)T	**E50**	Face Mill
MSRS	90○○○R-○-○(○)T	**E51**	Face Mill
MSRS	90○○○R-○-○(○)T-M	**E51**	Face Mill
MSTA	○○(○)N○○-○(○)T	**H4**	Slot Mill
MSTA	○○N○○○-○(○)T	**H5**	Slot Mill
MSTB	○○(○)□□○○○○-○T	**H8, H9**	Slot Mill
MSTB	○○○○□□○○○-○T	**H8**	Slot Mill
MSTC	○○○□□○○○-○○○-○○	**H14, H16, H18**	Slot Mill
MSTC	○○○□□○○○○-○○-○(○)T	**H14, H15, H16, H17, H18, H19**	Slot Mill
MTE-42		**S10**	Spare Parts (Shim)
MTE	90○○	**E18**	Face Mill (with Shank)
MTE	90○○-32	**E18**	Face Mill (with Shank)
MTES	○○○	**F6**	Endmill
MVG	○○○○	**K7**	Endmill (Ring Grooving for M/C)
MVN-32		**S10**	Spare Parts (Shim)
N			
NDCT	○○○FR	**B22**	Insert (Milling)
NDCT	○○○□(□)(-B)	**B22**	Insert (Milling)
NDCT	○○○TRX	**B22**	Insert (Milling)
NDCW	○○○○FRX	**B27**	Insert (Milling)
NDCW	○○○○FRX-NE	**B27**	Insert (Milling)
NDCW	○○○(○)TR	**B22**	Insert (Milling)
NDCW	○○○TRX	**B22**	Insert (Milling)
NDKT	○○○○○○ER-N○	**B22**	Insert (Milling)
NDKT	○○○○○○ER-V	**B21**	Insert (Milling)
NDKW	○○○○○○ER	**B22**	Insert (Milling)
NDMM	○○○○○○ER-N○	**B23**	Insert (Milling)
NDMM	○○○○○○ER-T	**B22**	Insert (Milling)
NDMM	○○○ER-SP	**B22**	Insert (Milling)
NDMT	○○○○○○ER-D	**B23**	Insert (Milling)
NDMT	○○○○○○ER-DH	**B23**	Insert (Milling)
NEMT	○○○○○○ER-D	**B23**	Insert (Milling)
NEMT	○○○○○○ER-DH	**B23**	Insert (Milling)
O			
OFMR	○○○○○○EN-GT	**B17**	Insert (Milling)
OFMR	○○○○○○EN-SH	**B17**	Insert (Milling)
OFMT	○○○○○○EN-GT	**B17**	Insert (Milling)
OFMT	○○○○○○E□-SH	**B17**	Insert (Milling)
P			
P-03		**S7**	Spare Parts (Shim Pin)
P-03S		**S7**	Spare Parts (Shim Pin)
PC-1		**S18**	Spare Parts (Punch)
PC-2		**S18**	Spare Parts (Punch)
PNEU	○○○○ANER-GL	**B17**	Insert (Milling)
PNEU	○○○○ANER-W	**B17**	Insert (Milling)
PNMU	○○○○ANER-GH	**B17**	Insert (Milling)
PNMU	○○○○ANER-GM	**B17**	Insert (Milling)
PNMU	○○○○ANER-SM	**B17**	Insert (Milling)
R			
R○○-(R)(-SET)		**K2, K3**	Toolholder (API Ring Groover)
R○○-SET		**K2, K3**	Toolholder (API Ring Groover)
RDFG	○○FR	**B23**	Insert (Milling)
RDHX	○○○○M0T	**B23**	Insert (Milling)
RDMT	○○○○M0-H	**B23**	Insert (Milling)
RPMT	○○○○M0	**B23**	Insert (Milling)
RPMT	○○○○M0-H	**B23**	Insert (Milling)
S			
SB-1STR		**S5**	Spare Parts (Screw)
SB-1TR		**S5**	Spare Parts (Screw)
SB-2TR		**S5**	Spare Parts (Screw)
SB-3STR		**S5**	Spare Parts (Screw)
SB-3TR		**S5**	Spare Parts (Screw)
SB-3.5TR		**S5**	Spare Parts (Screw)
SB-4TR		**S5**	Spare Parts (Screw)
SB-5TR		**S5**	Spare Parts (Screw)
SB-1635TR		**S5**	Spare Parts (Screw)
SB-2035TR		**S5**	Spare Parts (Screw)
SB-2035TRG		**S5**	Spare Parts (Screw)
SB-2040TR		**S5**	Spare Parts (Screw)
SB-2040TRG		**S5**	Spare Parts (Screw)
SB-2042TRG		**S5**	Spare Parts (Screw)
SB-2045TR		**S5**	Spare Parts (Screw)
SB-2045TRN		**S5**	Spare Parts (Screw)
SB-2050TR		**S5**	Spare Parts (Screw)
SB-2060TR		**S5**	Spare Parts (Screw)
SB-2080TR		**S5**	Spare Parts (Screw)
SB-2250TR		**S5**	Spare Parts (Screw)
SB-2255TR		**S5**	Spare Parts (Screw)
SB-2260TR		**S5**	Spare Parts (Screw)
SB-2290TR		**S5**	Spare Parts (Screw)
SB-2545TR		**S5**	Spare Parts (Screw)
SB-2555TRG		**S5**	Spare Parts (Screw)
SB-2560TR		**S5**	Spare Parts (Screw)
SB-2570TR		**S5**	Spare Parts (Screw)
SB-3060TR		**S5**	Spare Parts (Screw)

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SB-3065TRP	**S5**	Spare Parts (Screw)
SB-3070TRG	**S5**	Spare Parts (Screw)
SB-3080TR	**S5**	Spare Parts (Screw)
SB-3580TR	**S5**	Spare Parts (Screw)
SB-3590TRP	**S5**	Spare Parts (Screw)
SB-3592TR	**S5**	Spare Parts (Screw)
SB-4050TRN	**S5**	Spare Parts (Screw)
SB-4060TR	**S5**	Spare Parts (Screw)
SB-4065TR	**S5**	Spare Parts (Screw)
SB-4070TRG	**S5**	Spare Parts (Screw)
SB-4070TRN	**S5**	Spare Parts (Screw)
SB-4070TRS	**S5**	Spare Parts (Screw)
SB-4070TRW	**S5**	Spare Parts (Screw)
SB-4082TPR	**S5**	Spare Parts (Screw)
SB-4085TR	**S5**	Spare Parts (Screw)
SB-4090TRP	**S5**	Spare Parts (Screw)
SB-4590TRWN	**S5**	Spare Parts (Screw)
SB-5070TR	**S5**	Spare Parts (Screw)
SB-5085TR	**S5**	Spare Parts (Screw)
SB-5090TR	**S5**	Spare Parts (Screw)
SB-25100TR	**S5**	Spare Parts (Screw)
SB-40115TR	**S5**	Spare Parts (Screw)
SB-40125TRN	**S5**	Spare Parts (Screw)
SB-40140TR	**S5**	Spare Parts (Screw)
SB-40140TRN	**S5**	Spare Parts (Screw)
SB-45130TR	**S5**	Spare Parts (Screw)
SB-50120TR	**S5**	Spare Parts (Screw)
SB-50120TRS	**S5**	Spare Parts (Screw)
SB-50140TR	**S5**	Spare Parts (Screw)
SB-60120TR	**S5**	Spare Parts (Screw)
SC-30067	**S6**	Spare Parts (Screw)
SC-35085	**S6**	Spare Parts (Screw)
SC-40100	**S6**	Spare Parts (Screw)
SC-50130	**S6**	Spare Parts (Screw)
SC-60160	**S6**	Spare Parts (Screw)
SC-60210	**S6**	Spare Parts (Screw)
SDCT ○○○○○□□-□□	**H23**	Insert (Slot Mill MSTC)
SDCT ○○○○○□ℛ-□□	**H23**	Insert (Slot Mill MSTC)
SDET ○○○○○□□-□□	**H23**	Insert (Slot Mill MSTC)
SDET ○○○○○□ℛ-□□	**H23**	Insert (Slot Mill MSTC)
SDKN ○○A□TN	**B13**	Insert (Milling)
SDKW ○○○○AESN	**B17**	Insert (Milling)
SDKW ○○AETN	**B17**	Insert (Milling)
SDKW ○○○○○○FN	**B17**	Insert (Milling)
SDKW ○○○○○○TN	**B17**	Insert (Milling)
SDMT ○○.○○C	**B18**	Insert (Milling)
SDMT ○○○○AESR-H	**B18**	Insert (Milling)
SDMT ○○○○○○E-K	**B18**	Insert (Milling)
SDMT ○○○E-K	**B18**	Insert (Milling)
SE-3070TRP	**S6**	Spare Parts (Screw)
SE-40050TR	**S6**	Spare Parts (Screw)
SE-40055TR	**S6**	Spare Parts (Screw)
SE-40068TR	**S6**	Spare Parts (Screw)
SE-40080TR	**S6**	Spare Parts (Screw)
SE-40090TR	**S6**	Spare Parts (Screw)
SE-40100TR	**S6**	Spare Parts (Screw)
SE-40120TR	**S6**	Spare Parts (Screw)
SE-50125TR	**S6**	Spare Parts (Screw)
SEEN ○○AFFN	**B27**	Insert (Milling)
SEEN ○○AFFN-NE	**B27**	Insert (Milling)
SEEN ○○AFFR-W	**B27**	Insert (Milling)
SEEN ○○○○AFTN	**B13**	Insert (Milling)
SEEN ○○○○AFTR-W	**B13**	Insert (Milling)
SEKN ○○○○AFFN	**B13**	Insert (Milling)
SEKN ○○○○AFTN	**B13**	Insert (Milling)
SEKN ○○○○EFTR	**B13**	Insert (Milling)
SEKR ○○○○AFEN-S	**B13**	Insert (Milling)
SEKT ○○AFEN-S	**B18**	Insert (Milling)
SEKW ○○AFTN	**B17**	Insert (Milling)

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SEKW ○○○FN	**B17**	Insert (Milling)
SEKW ○○○TN	**B17**	Insert (Milling)
SEMM ○○○○○○PESR	**B18**	Insert (Milling)
SEMR ○○○○AFER-H	**B13**	Insert (Milling)
SEMT ○○○C	**B18**	Insert (Milling)
SH- 50150TR	**S6**	Spare Parts (Cartridge Clump Screw)
SLT ○○-○○□□□	**H6**	Insert (Slot Mill MSTA)
SNCN ○○○○XNTN	**B14**	Insert (Milling)
SNKN ○○○○XNTN	**B14**	Insert (Milling)
SNMF ○○○○XNTN	**B14**	Insert (Milling)
SNM ○○○	**B14**	
SOKN 13T3AXFN	**B13**	Insert (Milling)
SOKN 13T3AXFN-NE	**B27**	Insert (Milling)
SOKN 13T3AXTN	**B13**	Insert (Milling)
SOKR 13T3AXEN-J	**B13**	Insert (Milling)
SP-2D	**S18**	Spare Parts (Spring)
SP-3D	**S18**	Spare Parts (Spring)
SP-5	**S18**	Spare Parts (Spring)
SP-5D	**S18**	Spare Parts (Spring)
SP-6	**S18**	Spare Parts (Spring)
SP-8	**S18**	Spare Parts (Spring)
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SP3X6	**S6**	Spare Parts (Screw)
SP3X8	**S6**	Spare Parts (Screw)
SP3X10	**S6**	Spare Parts (Screw)
SP4X9	**S6**	Spare Parts (Screw)
SP8X35	**S6**	Spare Parts (Clump Bolt for BT50 Arbor)
SP-129	**S10**	Spare Parts (Shim)
SP-130A	**S11**	Spare Parts (Shim)
SP-141	**S10**	Spare Parts (Shim)
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SP-443P	**S11**	Spare Parts (Shim)
SP-454	**S10**	Spare Parts (Shim)
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SP-521P	**S11**	Spare Parts (Shim)
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SP-523P	**S11**	Spare Parts (Shim)
SP-541	**S11**	Spare Parts (Shim)
SP-543	**S11**	Spare Parts (Shim)
SP-826	**S11**	Spare Parts (Shim)
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SP-843	**S11**	Spare Parts (Shim)
SP-849	**S11**	Spare Parts (Shim)
SP-861	**S11**	Spare Parts (Shim)
SPCN ○○○○EDTR	**B14**	Insert (Milling)
SPCN ○○○○EETR1	**B14**	Insert (Milling)
SPCN ○○○○XPTR	**B14**	Insert (Milling)
SPCT ○○T○○○□□-□□	**H22**	Insert (Slot Mill MSTC)
SPCT ○○T○○○□ℛ-□□	**H22**	Insert (Slot Mill MSTC)
SPEN ○○EESR	**B14**	Insert (Milling)
SPET ○○T○○○□ℛ-□□	**H22**	Insert (Slot Mill MSTC)
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SPKN ○○○○EDFR	**B14**	Insert (Milling)

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