NS TOOL For Crafting Tomorrow

NS TOOL CO.,LTD.

NS TOOL ENDMILL CATALOG

Vol.20 2022.11—

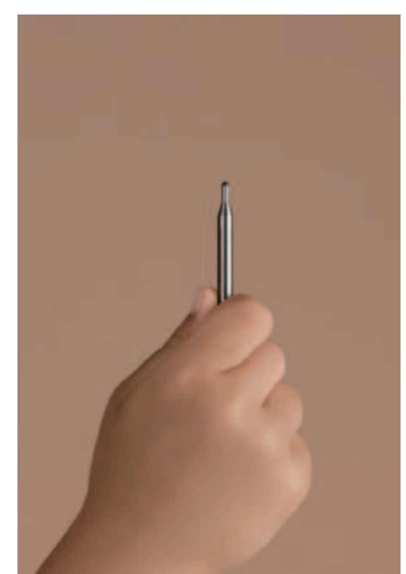
NS TOOL

For Crafting Tomorrow

In any time of period, we have always been proud to support Japan's *monozukuri* (manufacturing) and the commitment has been our basis since foundation.
As a leading company specialized in small-diameter cemented carbide end mills, NS TOOL manufactures high value-added products by responding to needs and expectations of customers and society.
NS TOOL strives constantly to enhance its own technological standards and create cutting-edge solutions.
Wishing for delivering unseen innovation in technology, quality and service for the future and the world, we, NS TOOL, will open up the infinite dreams and possibilities of *monozukuri.*

Particular about quality in Monozukuri

As a leading manufacturer of small diameter end mills, we aim to achieve sustainable growth in harmony with society by providing high value-added products that have never been seen before.
We aim to coexist with society and achieve sustainable growth.



Be a TOOL for our future

How to use NS catalog

Main Series Classification

There are four major categories, end mill, drill, thread mill, and chamfering

Furthermore, end mill from many models,
"CBN and PCD end mill"
"Ultra-micro size end mill"
"Regular line with wide variation"
and "end mill designed according to work material"

End mill

Identified color	Name of Series		Features of Series
	CBN Core Line		Various lineup optimize a long time machining on hardened steel
	PCD Core Line		Achieves nano-level surface roughess like a mirror surface by milling
	Micro Edge		Various lineup for micro manufacturing
	Regular Line	MUGEN COATING PREMIUM Plus	Optimized for machining hardened steel up to 60 to 70HRC
		MUGEN COATING PREMIUM	Suitable for machining on 50~65HRC hardened steels, stainless steels and heat resistant alloys
		MUGEN COATING	Abundant variations support machining on different work materials
	Tapered		End mills enables tapered machining
	High Efficient Milling		End mills lineup to realize high efficient machining
	Aluminium Milling		Sharp cutting to realize high speed machining without chattering
	Copper Electrode Milling		Realized overwhelming long tool life and high quality burrless cutting performance
	Resin Milling		High machinability sharp cutting edge suppresses burrs and enables good finished surface
	Graphite Milling		Long time machining and high durability are achieved on graphite machining
	Hard Brittle Material Milling		Diamond coating realizes direct milling even on hard brittle materials

Drill

Identified color		
	Drill	Standard lineup from ϕ0.01

Thread mill

Identified color		
	Thread mill	Fine thread milling is realized on different kind of work materials

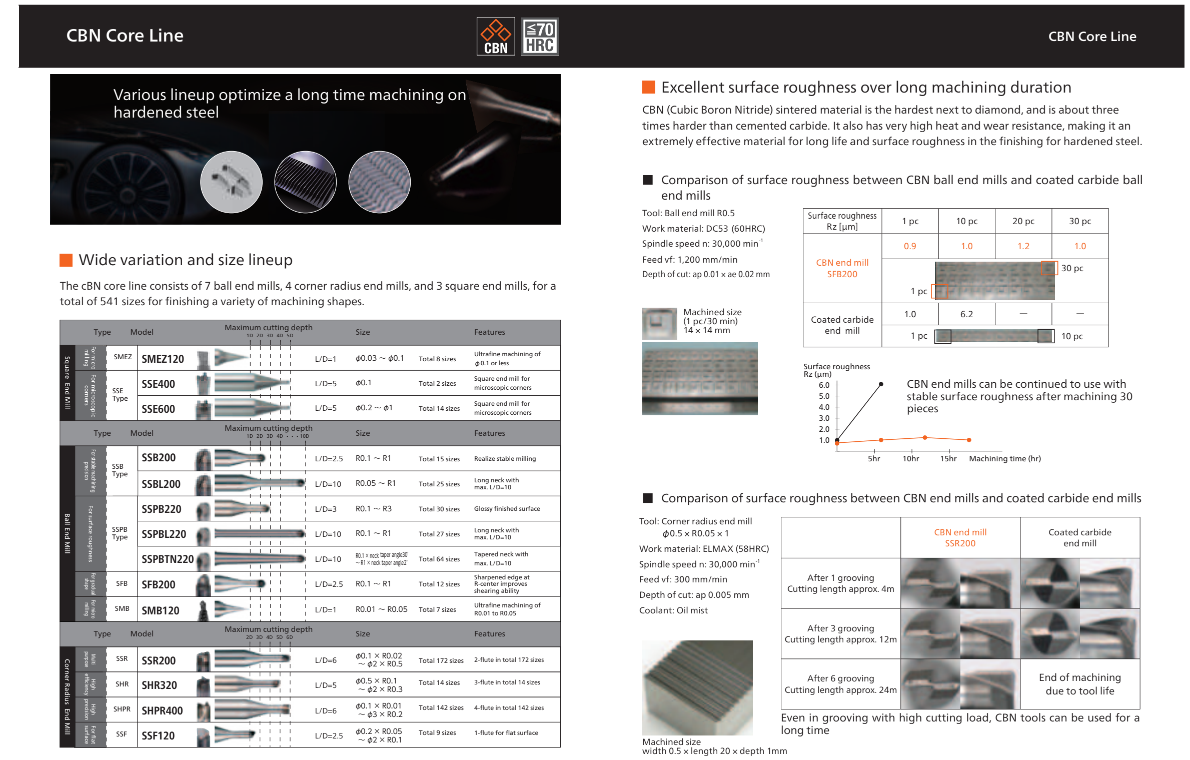
Chamfering

Identified color		
	Chamfering	Chamfering cutter enables R chamfering and C chamfering

How to use NS catalog

Introduce page of series

Series features are introduced at the start of each series page



How to use NS catalog

Spread page

Feature of Series

Name of Series

Machinable indication by ◎, ○

◎ Strongly recommended

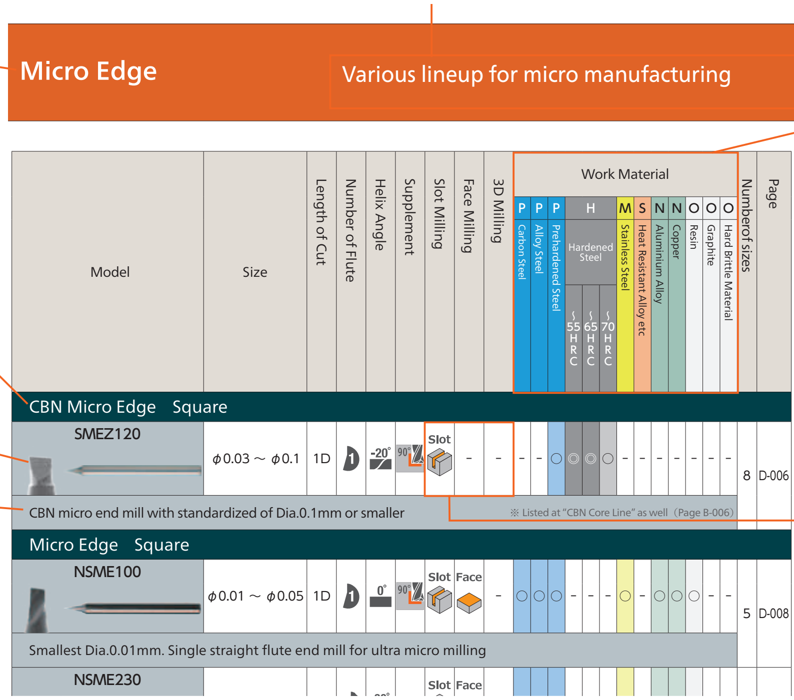
○ Recommended

Shape of cutting edge

Model

Tool image

Feature of tool



Side milling…Side

Slotting…Slot

Face milling…Face

Plunging…Plunge

3D milling…3D

Product page

Model

Product name

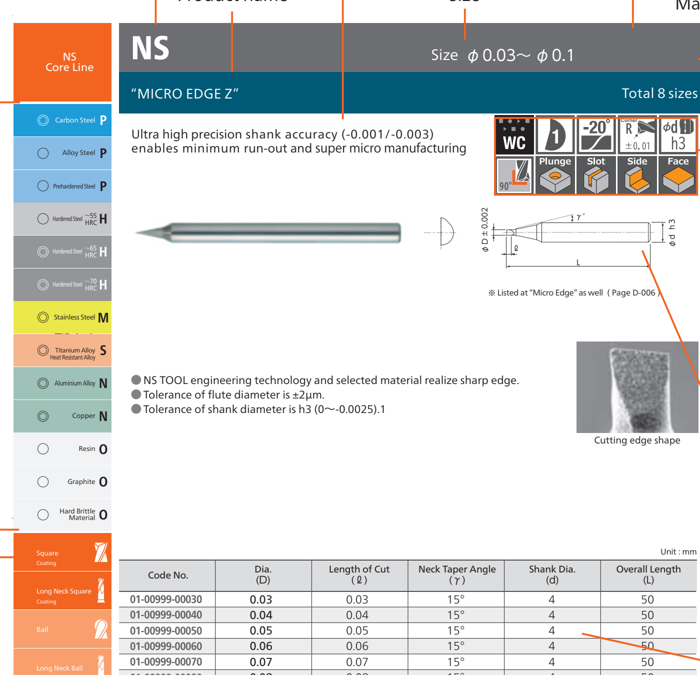
Feature of tool

Size

Material • Coating

Machinable hardness

Machinable indication by ◎, ○.



Material

Number of Flute

Helix Angle

Sharp Edge

R Tolerance

Shank Tolerance

Side…Side milling

Slot…Slotting

Face…Face milling

Plunge…Plunging

3D…3D milling

Tool drawing

Shape of cutting edge

Standard size

Recommended milling condition page

MSBH230

Regular Line MUGEN PREMIUM Full Cutting Length Type

Recommended Milling Conditions

① Select work material

② Select tool size

Work Material	Hardened Steels SKD61·STAVAX·HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.05	0.005	0.005	150	40,000	0.003	0.005	100	40,000	0.002	0.005	60	40,000
0.075	0.005	0.005	180	40,000	0.003	0.005	150	40,000	0.002	0.005	100	40,000
0.1	0.01	0.02	360	40,000	0.01	0.01	320	40,000	0.003	0.005	240	40,000
0.15	0.01	0.03	420	40,000	0.01	0.02	360	40,000	0.005	0.01	300	40,000
0.2	0.02	0.06	1,000	40,000	0.02	0.05	820	40,000	0.01	0.02	480	40,000
0.25	0.03	0.07	1,200	40,000	0.025	0.05	1,000	40,000	0.015	0.03	600	40,000
0.3	0.05	0.1	1,600	40,000	0.03	0.06	1,200	40,000	0.02	0.05	720	30,000
0.4	0.1	0.15	2,200	40,000	0.07	0.1	1,800	40,000	0.05	0.1	1,200	30,000
0.5	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
0.75	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
1	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
1.25	0.2	0.6	3,000	25,000	0.2	0.5	2,500	20,000	0.15	0.3	2,000	16,000
1.5	0.2	0.8	3,000	20,000	0.2	0.6	2,500	18,000	0.2	0.5	2,000	14,000
2	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
2.5	0.3	1.5	3,000	18,000	0.2	1.2	2,500	12,000	0.2	0.7	2,000	9,200
3	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
4	0.5	2	2,500	10,000	0.4	1.2	1,800	7,000	0.3	1	1,200	5,000
5	0.7	2.5	2,000	7,000	0.5	1.5	1,500	5,000	0.4	1.2	1,000	4,000
6	1	3	1,500	5,000	0.6	2	1,200	4,000	0.5	1.5	800	3,000

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 We recommend using oil mist coolant.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.
※5 Length of tool overhang must be as short as possible.

P Prehardened Steel ◎ · H Hardened Steel ◎ · H Hardened Steel ◎ · M Stainless Steel ○ · S Titanium Alloy Heat Resistant Alloy ○

③ It is a reference of cutting conditions

④ Please check notes

Common notes for all products

Explanation	Recommended cutting conditions indicate just for reference. It should be adjusted according to milling shape and machine tool.
Preparation	Tool measurement required. In order to avoid interference to the work material.
	Recommend to assess the machine characters, such as expansion of the spindle and others before using the tool.
	Down-cut is recommended.
	Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.)
	Use a rigid machine and holder.
	Extra care of handling when tool setting and measuring.
	Minimize a possible tool overhang length.
	Select a cutting fluid appropriate to work material, milling shape and machining content.
Milling condition adjustment	When cutting high load sections or complex shapes, it requires attention to condition setting and tool path.
	Reduce the feed for high accurate machining to avoid breakage of work piece.
	Reduce both spindle speed and feed at same rate for chattering, and also for insufficient spindle speed of a machine.
	Adjust milling condition conforming with machine rigidity and clamping condition. Final milling conditions are subject to machining profile, purpose and machine status.
	Spindle speed and feed are changed according to overhang length and depth of cut.
	For finishing process, please adjust to the optimized condition to meet the requirement of machining accuracy.
	Care for chip removal to avoid being stuck or caught during process for better surface quality.

Information of NS Connect

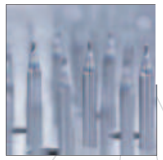
NS TOOL Connect For Crafting Tomorrow

From 2D code on back of product case

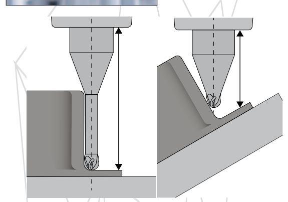
Always browse updated cloud data information all at once easily

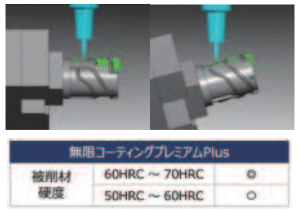
(From some products)

Connect to information



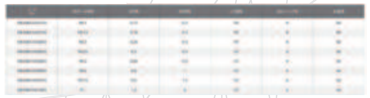
Feature of product



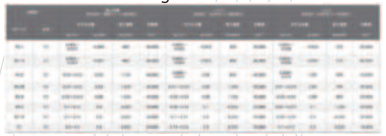


Standard Size table Recommended milling conditions

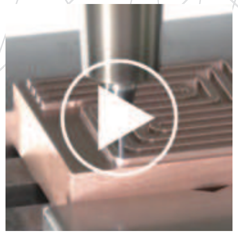
Standard Size table



Recommended milling conditions



Machining case Video



Others

Corporate Web Site

Contact us

Product Leaflet

Contact us by phone

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Index

Description of Icons

Material
Material of end mill

- SMG Super Micro Grain Carbide
- MG Micro Grain Carbide
- WC Regular Grain Carbide
- CBN Cubic Boron Nitride
- PCD Polycrystalline Diamond

Coating
Coating on cutting edge

- MUGEN COATING PREMIUM Plus
- MUGEN COATING PREMIUM
- MUGEN COATING
- MUGEN MICRO COATING
- DLC DLC COATING
- DIA DIAMOND COATING

Applications
Cutting shape

- Side milling
- Slotting
- 3D milling
- Face milling
- Plunging
- Drilling (Flat Drill)
- Drilling (Drill)
- Thread milling
- C Chamfering
- R Chamfering

Number of Flute
Flute number of end mill

- 1-Flute
- 2-Flute
- 3-Flute
- 4-Flute
- 6-Flute
- 8-Flute
- 10-Flute

Helix Angle
Helix angle of flute

- Left 20°
- Left 11°
- 0°
- 12°
- 20°
- 25°
- 30°
- 35°
- 35°/38°
- 37.5°
- 40°
- 40°/42°
- 45°

Corner Shape
Corner profile of cutting edge

- Sharp Edge

Cutting Possibility of Work Material Hardness
Machinable hardness of high hard materials

- ≦40 HRC Possible to cut up to 40HRC
- ≦50 HRC Possible to cut up to 50HRC
- ≦55 HRC Possible to cut up to 55HRC
- ≦65 HRC Possible to cut up to 65HRC
- ≦70 HRC Possible to cut up to 70HRC
- ≦92.5 HRA Possible to cut up to 92.5HRA

Description of Icons

Tolerance Shank Dia.
Tolerance of shank diameter

- ϕd $^{-0.001}_{-0.003}$
- ϕd h3
- ϕd h4
- ϕd h5

Tolerance Ball Radius
Tolerance of R for ball end mill

- R ±0.002
- R ±0.003
- R ±0.004
- R ±0.005

Corner Radius
Tolerance of Corner R for radius end mill

- Corner Radius ±0.002
- Corner Radius ±0.003
- Corner Radius ±0.005

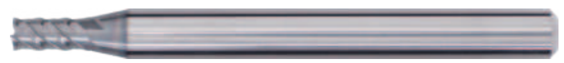
NS Connect
Always browse updated cloud data information all from 2D code on back of product case

Always browse feature of products, standard size table, recommended milling conditions and machining case video.

New Products

New | MUGEN COATING PREMIUM Plus 4-Flute Square End Mill for Hardened Steel

MHDSH445



φ1～φ4 **Total 10 Sizes**

● 4-flute is lineup of length of cut expands 2D and 3D. Long tool life even for hardened steel up to 70HRC. High rigidity tool design improves machining accuracy.

Page ▶ E-006

New | MUGEN COATING PREMIUM Plus 6-Flute Square End Mill for Hardened Steel

MHDSH645

φ5～φ6 **Total 4 Sizes**

● 6-flute is lineup of length of cut expands 2D and 3D. Long tool life even for hardened steel up to 70HRC. High rigidity tool design improves machining accuracy.

Page ▶ E-008

Size Expansion | MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

MHRSH430RSF

φ0.1 ×R0.01～φ6×R1 **Total 205 Sizes**

Wiper and seamless shape improve surface roughness. High accuracy corner R enhance finishing performance on hardened steels

● MUGEN COATING PREMIUM Plus for hardened steels with strong back taper reduce chattering to realize long tool life and excellent finishing surface.

Page ▶ E-018

New Products

Size Expansion | MUGEN COATING PREMIUM Plus High Efficient 3-Flute Small-Diameter Long Neck Ball End Mill for Hardened Steel

MRBSH330

R1.5 ～ R3 **Total 31 Sizes**

High-efficiency high-precision die machining with improved cutting edge rigidity and chip evacuation

Page ▶ E-016

Size Expansion | PCD Ball End Mill

PCDRB

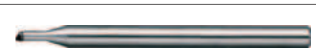
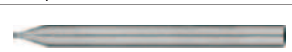
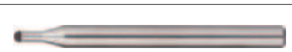
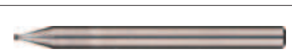
R1.5 ～ R3 **Total 13 Sizes**

Capable to machine nano level surface roughness, and mirror finishing

Page ▶ C-008

1
Search

Search from Series

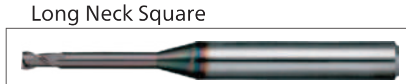
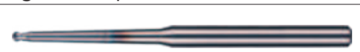
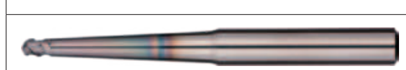
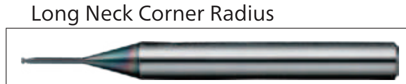
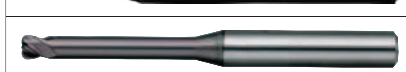
Photo	Product Name	Model	Size
CBN Core Line			
Square			
	CBN “MICRO EDGE Z”	SMEZ120 ※ Listed at "Micro Edge"	ϕ0.03 ～ ϕ0.1
Long Neck Square			
	CBN Square End Mill	SSE400	ϕ0.1
	CBN Square End Mill	SSE600	ϕ0.2 ～ ϕ1
Ball			
	CBN Ball End Mill for precision machining “CBN Micro Ball”	SMB120 ※ Listed at "Micro Edge"	R0.01 ～ R0.05
Long Neck Ball			
	CBN Super Finish Ball End Mill	SFB200	R0.1 ～ R1
	CBN Super Spiral Ball End Mill	SSPB220	R0.1 ～ R3
	CBN Super Speed Ball End Mill	SSB200	R0.1 ～ R1
	CBN Super Spiral Long Neck Ball End Mill	SSPBL220	R0.1 ～ R1
	CBN Super Speed Long Neck Ball End Mill	SSBL200	R0.05 ～ R1
Long Neck Tapered Ball			
	CBN Super Spiral Long Taper Neck Ball End Mill	SSPBTN220	R0.1×neck taper angle30' ～ R1×neck taper angle2'
Long Neck Corner Radius			
	CBN Super Speed Radius End Mill	SSR200	ϕ0.1 × R0.02 ～ ϕ2 × R0.5
	CBN High Efficient Radius End Mill	SHR320	ϕ0.5 × R0.1 ～ ϕ2 × R0.3
	CBN Super High Precision Radius End Mill	SHPR400	ϕ0.1 × R0.01 ～ ϕ3 × R0.2
	CBN Super Surface End Mill	SSF120	ϕ0.2 × R0.05 ～ ϕ2 × R0.1
PCD Core Line			
Long Neck Square			
	PCD Square End Mill	PCDSE	ϕ0.1 ～ ϕ1
Long Neck Ball			
	PCD Ball End Mill	PCDRB	R0.05 ～ R3
Long Neck Corner Radius			
	PCD Radius End Mill	PCDRS	ϕ0.3 × R0.05 ～ ϕ1 × R0.1

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material														Page
											P	P	P	H			M	S	N	N	N	O	O	O	
											Carbon Steel	Alloy Steel	Prehardened Steel	Hardened Steel ～55HRC	～65HRC	～70HRC	Stainless Steel	Heat Resistant Alloy etc	Aluminum Alloy	Copper	Copper Tungsten	Resin	Graphite	Hard Brittle Material	
CBN Core Line																									
Square																									
CBN	1	-20°	-	Slot	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	-	B-006
Long Neck Square																									
CBN	4	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-008
CBN	6	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-010
Ball																									
CBN	1	-20°	-	-	-	-	3D	-	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	-	B-012
Long Neck Ball																									
CBN	2	0°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-014
CBN	2	20°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-016
CBN	2	0°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-018
CBN	2	20°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-020
CBN	2	0°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-022
Long Neck Tapered Ball																									
CBN	2	20°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-024
Long Neck Corner Radius																									
CBN	2	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-028
CBN	3	20°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-034
CBN	4	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-036
CBN	1	-20°	-	-	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-042
PCD Core Line																									
Long Neck Square																									
PCD	2 6	0°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	C-006
Long Neck Ball																									
PCD	-	-	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	◎	C-008
Long Neck Corner Radius																									
PCD	2 4 6	0°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	C-010

Search from Series

Photo	Product Name	Model	Size
Micro Edge			
Square			
	CBN "MICRO EDGE Z"	SMEZ120 ※ Listed at "CBN Core Line"	ϕ0.03 ~ ϕ0.1
	Micro End Mill "MICRO EDGE"	NSME100	ϕ0.01 ~ ϕ0.05
	Micro End Mill "MICRO EDGE"	NSME230	ϕ0.03 ~ ϕ0.09
Ball			
	CBN Ball End Mill for precision machining "CBN Micro Ball"	SMB120 ※ Listed at "CBN Core Line"	R0.01 ~ R0.05
	Ball End Mill for precision machining "Micro Ball"	NSMB100	R0.005 ~ R0.05
Regular Line MUGEN COATING PREMIUM Plus			
Square			
	MUGEN COATING PREMIUM Plus 4-Flute Square End Mill for Hardened Steel	MHDSH445	ϕ1 ~ ϕ4
	MUGEN COATING PREMIUM Plus 6-Flute Square End Mill for Hardened Steel	MHDSH645	ϕ5 ~ ϕ6
Ball			
	MUGEN COATING PREMIUM Plus 3-Flute Ball End mill for 5-axis machining	MSBSH330-5X	R0.1 ~ R1
Long Neck Ball			
	MUGEN COATING PREMIUM Plus 2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel and High accuracy cutting	MRBSH230SF	R0.05 ~ R3
	MUGEN COATING PREMIUM Plus High Efficient 3-Flute small-diameter Long Neck Ball End Mill for Hardened Steel	MRBSH330	R0.1 ~ R3
Long Neck Corner Radius			
	MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting	MHRSH430RSF	ϕ0.1 × R0.01 ~ ϕ6 × R1
Regular Line MUGEN COATING PREMIUM			
Square			
	MUGEN COATING PREMIUM 2-Flute LEAD25 End Mill	MXH225	ϕ0.1 ~ ϕ6
	MUGEN COATING PREMIUM 2-Flute LEAD30 End Mill	MXH230	ϕ0.1 ~ ϕ6
	MUGEN COATING PREMIUM 2-Flute LEAD35 End Mill	MXH235	ϕ0.1 ~ ϕ6
	MUGEN COATING PREMIUM 2-Flute LEAD40 End Mill	MXH240	ϕ0.3 ~ ϕ6
	MUGEN COATING PREMIUM 2-Flute LEAD45 End Mill	MXH245	ϕ0.3 ~ ϕ6
	MUGEN COATING PREMIUM 2-Flute Sharp Edge LEAD25 End Mill	MXH225P	ϕ0.1 ~ ϕ6

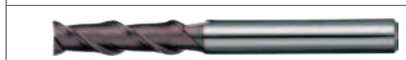
Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Micro Edge																									
Square																									
CBN	1	-20°	–	Slot	–	–	–	–	–	–	–	–	○	◎	◎	○	–	–	–	–	–	–	–	–	D-006
SMG	1	0°	–	Slot	Face	–	–	–	–	–	○	○	○	–	–	–	○	–	○	○	–	○	–	–	D-008
SMG	2	30°	–	Slot	Face	–	–	–	–	–	○	○	○	–	–	–	○	–	○	○	–	○	–	–	D-010
Ball																									
CBN	1	-20°	–	–	–	–	3D	–	–	–	–	–	○	◎	◎	○	–	–	–	–	–	–	–	–	D-012
SMG	1	0°	–	–	–	–	3D	–	–	–	○	○	○	–	–	–	○	–	○	○	–	○	–	–	D-014
Regular Line MUGEN COATING PREMIUM Plus																									
Square																									
Plus	4	45°	Side	Slot	Face	–	–	–	–	–	–	–	–	○	◎	◎	–	–	–	–	–	–	–	–	E-006
Plus	6	45°	Side	Slot	Face	–	–	–	–	–	–	–	–	○	◎	◎	–	–	–	–	–	–	–	–	E-008
Ball																									
Plus	3	30°	–	–	–	–	3D	–	–	–	–	–	–	○	◎	◎	–	–	–	–	–	–	–	–	E-010
Long Neck Ball																									
Plus	2	30°	–	–	–	–	3D	–	–	–	–	–	–	○	◎	◎	–	–	–	–	–	–	–	–	E-012
Plus	3	30°	–	–	–	–	3D	–	–	–	–	–	–	○	◎	◎	–	–	–	–	–	–	–	–	E-016
Long Neck Corner Radius																									
Plus	4	30°	Side	Slot	Face	–	–	–	–	–	–	–	–	○	◎	◎	–	–	–	–	–	–	–	–	E-018
Regular Line MUGEN COATING PREMIUM																									
Square																									
Premium	2	25°	Side	Slot	Face	–	–	–	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-010
Premium	2	30°	Side	Slot	Face	–	–	–	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-012
Premium	2	35°	Side	Slot	Face	–	–	–	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-014
Premium	2	40°	Side	–	Face	–	–	–	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-016
Premium	2	45°	Side	–	Face	–	–	–	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-018
Premium	2	25°	Side	–	Face	–	–	–	–	–	–	–	◎	–	–	–	◎	◎	–	–	–	–	–	–	F-020

Photo	Product Name	Model	Size
Regular Line MUGEN COATING PREMIUM			
Square			
	MUGEN COATING PREMIUM 2-Flute Sharp Edge LEAD30 End Mill	MXH230P	ϕ0.1 ～ ϕ6
	MUGEN COATING PREMIUM 2-Flute Sharp Edge LEAD35 End Mill	MXH235P	ϕ0.1 ～ ϕ6
	MUGEN COATING PREMIUM 4-Flute Square End Mill for Hardened Steel	MHDH445	ϕ1 ～ ϕ4
	MUGEN COATING PREMIUM 6-Flute Square End Mill for Hardened Steel	MHDH645	ϕ5 ～ ϕ12
Ball			
	MUGEN COATING PREMIUM 2-Flute Ball End Mill for Hardened Steel	MSBH230	R0.05 ～ R6
	MUGEN COATING PREMIUM 3-Flute Ball End Mill for Hardened Steel	MSBH345	R0.5 ～ R3
Corner Radius			
	MUGEN COATING PREMIUM 4-Flute Radius End Mill for Hardened Steel	MHDH445R	ϕ3 × R0.2 ～ ϕ4 × R0.5
	MUGEN COATING PREMIUM 6-Flute Radius End Mill for Hardened Steel	MHDH645R	ϕ5 × R0.2 ～ ϕ12 × R2
Long Neck Square			
	MUGEN COATING PREMIUM 2-Flute Long Neck End Mill for Hardened Steel	MHRH230	ϕ0.1 ～ ϕ3
	MUGEN COATING PREMIUM 4-Flute Long Neck End Mill for Hardened Steel	MHRH430	ϕ1 ～ ϕ6
Long Neck Ball			
	MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel	MRBH230	R0.05 ～ R3
	MUGEN COATING PREMIUM 2-Flute Ball End Mill with Short Shank for Hardened Steel	MACH225SF	R0.1 ～ R3
	MUGEN COATING PREMIUM 2-Flute Ball End Mill for Hardened Steel	MACH225	R0.1 ～ R3
Long Neck Tapered Ball			
	MUGEN COATING PREMIUM 2-Flute Long Taper Neck Ball End Mill	MRBTNH230	R0.05×neck taper angle3° ～ R2×neck taper angle1°
	MUGEN COATING PREMIUM 3-Flute Long Taper Neck Ball End Mill	MRBTNH345	R0.5×neck taper angle30' ～ R2×neck taper angle1°
Long Neck Corner Radius			
	MUGEN COATING PREMIUM 2-Flute Long Neck Radius End Mill for Hardened Steel	MHRH230R	ϕ0.2 × R0.02 ～ ϕ0.9 × R0.1
	MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel	MHRH430R	ϕ0.1 × R0.01 ～ ϕ6 × R1

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material														Page
											P	P	P	H			M	S	N	N	N	O	O	O	
											Carbon Steel	Alloy Steel	Prehardened Steel	Hardened Steel ～55HRC	Hardened Steel ～65HRC	Hardened Steel ～70HRC	Stainless Steel	Heat Resistant Alloy etc	Aluminium Alloy	Copper	Copper Tungsten	Resin	Graphite	Hard Brittle Material	
Regular Line MUGEN COATING PREMIUM																									
Square																									
∞ Premium	2	30°	Side	-	Face	-	-	-	-	-	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	-	F-022
∞ Premium	2	35°	Side	-	Face	-	-	-	-	-	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	-	F-024
∞ Premium	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-026
∞ Premium	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-028
Ball																									
∞ Premium	2	30°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-030
∞ Premium	3	45°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-032
Corner Radius																									
∞ Premium	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-034
∞ Premium	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-036
Long Neck Square																									
∞ Premium	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-038
∞ Premium	4	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-044
Long Neck Ball																									
∞ Premium	2	30°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-048
∞ Premium	2	25°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-058
∞ Premium	2	25°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-060
Long Neck Tapered Ball																									
∞ Premium	2	30°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-062
∞ Premium	3	45°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-070
Long Neck Corner Radius																									
∞ Premium	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-074
∞ Premium	4	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-078

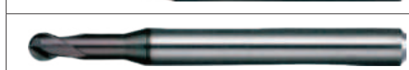
Regular Line MUGEN COATING

Square

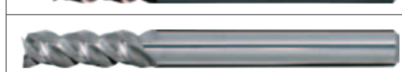
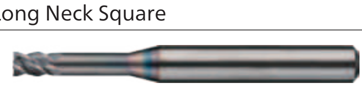
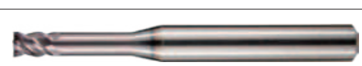
Photo	Product Name	Model	Size	Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H ～65HRC	H ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
	MUGEN COATING 2-Flute LEAD25 End Mill	MX225	φ0.3 ～ φ12	∞	2	25°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-012
	MUGEN COATING 2-Flute LEAD30 End Mill	MX230	φ0.1 ～ φ12	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-014
	MUGEN COATING 2-Flute LEAD35 End Mill	MX235	φ0.1 ～ φ12	∞	2	35°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-016
	MUGEN COATING 2-Flute LEAD40 End Mill	MX240	φ0.3 ～ φ12	∞	2	40°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-018
	MUGEN COATING 2-Flute LEAD45 End Mill	MX245	φ0.3 ～ φ12	∞	2	45°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-020
	MUGEN COATING 4-Flute LEAD25 End Mill	MX425	φ1 ～ φ12	∞	4	25°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-022
	MUGEN COATING 4-Flute LEAD30 End Mill	MX430	φ1 ～ φ12	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-024
	MUGEN COATING 4-Flute LEAD35 End Mill	MX435	φ1 ～ φ12	∞	4	35°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-026
	MUGEN COATING 4-Flute LEAD40 End Mill	MX440	φ1 ～ φ12	∞	4	40°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-028
	MUGEN COATING 4-Flute LEAD45 End Mill	MX445	φ1 ～ φ12	∞	4	45°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-030
	MUGEN COATING 2-Flute Super Short End Mill	MSE230SS	φ0.1 ～ φ6	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-032
	MUGEN COATING 2-Flute Sharp Edge Short End Mill	MSES230P	φ0.1 ～ φ12	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	G-036
	MUGEN COATING 2-Flute End Mill	MSE230	φ0.1 ～ φ12	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-038
	MUGEN COATING 2-Flute Medium End Mill	MSEM230	φ0.5 ～ φ12	∞	2	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-042
	MUGEN COATING 2-Flute End Mill with Measured Diameter	MSE230M	φ0.1 ～ φ6	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-044
	MUGEN COATING 2-Flute End Mill	MSE245	φ2 ～ φ12	∞	2	45°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-046
	MUGEN COATING 3-Flute End Mill	MSE345	φ3 ～ φ20	∞	3	45°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-048
	MUGEN COATING 4-Flute Sharp Edge End Mill	MSE430P	φ1 ～ φ12	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	G-050
	MUGEN COATING 4-Flute End Mill	MSE430	φ1 ～ φ20	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-052
	MUGEN COATING 4-Flute End Mill	MSE445	φ2 ～ φ20	∞	4	45°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-054
	MUGEN COATING 4-Flute Medium End Mill	MSEM430	φ1 ～ φ20	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-056

Search from Series

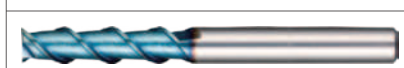
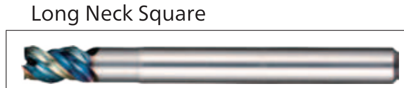
Regular Line MUGEN COATING

Photo	Product Name	Model	Size	Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H ～65HRC	H ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Square																													
	MUGEN COATING 4-Flute End Mill for Hardened Steel	MHD445	φ1 ～ φ4	∞	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	-	-	-	-	-	-	-	-	-	-	G-058
	MUGEN COATING 6-Flute End Mill for Hardened Steel	MHD645	φ5 ～ φ12	∞	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	-	-	-	-	-	-	-	-	-	-	G-060
Ball																													
	MUGEN COATING 2-Flute Ball End Mill	MSB230	R0.05 ～ R10	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-062
	MUGEN COATING 3-Flute Ball End Mill	MSB345	R0.5 ～ R6	∞	3	45°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-066
	MUGEN COATING Profit Ball End Mill	MSB230G2	R0.05 ～ R3	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-068
	MUGEN COATING 2-Flute Short Flute Ball End Mill	MSB230S	R0.1 ～ R6	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-070
	MUGEN COATING 2-Flute Ball End Mill with Short Shank	MSB230SF	R0.1 ～ R6	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-074
	MUGEN COATING 2-Flute Long Ball End Mill	MSBL230	R0.1 ～ R5	∞	2	30°	-	-	-	-	3D	-	-	-	○	○	-	-	-	-	-	-	○	○	-	○	-	-	G-078
	MUGEN COATING 2-Flute Extra Long Ball End Mill	MSBXL230	R0.5 ～ R5	∞	2	30°	-	-	-	-	3D	-	-	-	○	○	-	-	-	-	-	-	○	○	-	○	-	-	G-079
Corner Radius																													
	MUGEN COATING 2-Flute Radius End Mill	MSRS230	φ1 × R0.1 ～ φ6 × R2	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-080
	MUGEN COATING 4-Flute Radius End Mill	MSRS430	φ1 × R0.1 ～ φ12 × R3	∞	4	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-082
Long Neck Square																													
	MUGEN COATING 2-Flute Long Neck End Mill	MHR230	φ0.1 ～ φ6	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-084
	MUGEN COATING 4-Flute Long Neck End Mill	MHR430	φ1 ～ φ10	∞	4	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-096
	MUGEN COATING 2-Flute Long Neck End Mill (Shank Dia. 6)	MHRLN230-6	φ0.3 ～ φ2	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-104
Long Neck Ball																													
	MUGEN COATING 2-Flute Long Neck Ball End Mill	MRB230	R0.05 ～ R3	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-106
	MUGEN COATING 2-Flute Long Neck Ball End Mill with Short Shank	MRB230SF	R0.1 ～ R1.5	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-118
	MUGEN COATING 2-Flute Long Neck Ball End Mill (Shank Dia. 6)	MRBLN230-6	R0.15 ～ R1	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-122
Long Neck Tapered Ball																													
	MUGEN COATING 2-Flute Long Taper Neck Ball End Mill	MRBTN230	R0.1×neck taper angle30' ～ R2×neck taper angle1°	∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-124

Search from Series

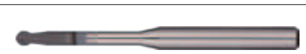
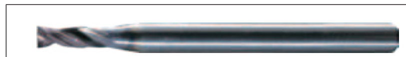
Photo	Product Name	Model	Size	Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Regular Line MUGEN COATING																													
Long Neck Tapered Ball																													
	MUGEN COATING 2-Flute Extra Long Taper Neck Ball End Mill	MRBTN230L	R0.1×neck taper angle30' ～ R5×neck taper angle1°30'	∞	2	30°	–	–	–	–	3D	–	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-134
Long Neck Corner Radius																													
	MUGEN COATING 2-Flute Long Neck Radius End Mill	MHR230R	ϕ0.2 × R0.05 ～ ϕ6 × R1	∞	2	30°	Side	Slot	Face	–	–	–	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-138
	MUGEN COATING 4-Flute Long Neck Radius End Mill	MHR430R	ϕ1 × R0.05 ～ ϕ6 × R1	∞	4	30°	Side	Slot	Face	–	–	–	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-152
Long Neck Tapered Corner Radius																													
	MUGEN COATING 2-Flute Long Taper Neck Radius End Mill	MSTNR230	ϕ0.2×R0.05×neck taper angle1° ～ ϕ3×R0.5×neck taper angle1°	∞	2	30°	Side	Slot	Face	–	–	–	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-158
Tapered																													
Tapered Square																													
	MUGEN COATING 2-Flute Taper End Mill	MTE230	ϕ0.2×taper angle30' ～ ϕ10×taper angle5°	∞	2	30°	Side	Slot	–	–	–	–	–	–	◎	◎	◎	○	–	–	–	–	○	○	–	○	–	–	H-006
	MUGEN COATING 4-Flute Taper End Mill for Deep Rib	MRT425	ϕ0.2×taper angle30' ～ ϕ3×taper angle2°	∞	4	25°	–	Slot	–	–	–	–	–	–	◎	◎	◎	○	–	–	–	–	–	–	–	–	–	–	H-012
Tapered Ball																													
	MUGEN COATING 2-Flute Taper Ball End Mill	MTB230	R0.1×taper angle1° ～ R2×taper angle15°	∞	2	30°	Side	Slot	–	–	3D	–	–	–	◎	◎	◎	○	–	–	–	–	○	○	–	○	–	–	H-016
High Efficient Milling																													
Square																													
	MUGEN COATING PREMIUM 4-Flute High Efficient "Z" End Mill for Stainless Steels	MSUSZ440	ϕ1 ～ ϕ6	∞ Premium	4	40°/42°	Side	Slot	Face	Plunge	–	–	–	–	–	–	–	–	–	–	◎	◎	–	–	–	–	–	–	I-006
	MUGEN COATING 4-Flute High Efficient "Z" End Mill for Carbon Steels	MSCZ440	ϕ1 ～ ϕ6	∞	4	40°/42°	Side	Slot	Face	Plunge	–	–	–	–	◎	◎	◎	–	–	–	–	–	–	–	–	–	–	–	I-008
	MUGEN COATING 3-Flute POWER"Z"End Mill	MSZ345	ϕ1 ～ ϕ12	∞	3	45°	Side	Slot	Face	Plunge	–	–	–	–	◎	◎	◎	–	–	–	○	–	–	–	–	–	–	–	I-010
	High efficient 3-Flute End Mill for Aluminium L/D=3	AL3D-345 ※Listed at "Aluminium Milling"	ϕ1 ～ ϕ12	WC	3	45°	Side	Slot	Face	Plunge	–	–	–	–	–	–	–	–	–	–	–	–	◎	○	–	○	–	–	I-014
Long Neck Square																													
	MUGEN COATING PREMIUM 4-Flute Long Neck High Efficient "Z" End Mill for Stainless Steels	MSUSZ440-LN	ϕ1 ～ ϕ6	∞ Premium	4	40°/42°	Side	Slot	Face	Plunge	–	–	–	–	–	–	–	–	–	–	◎	◎	–	–	–	–	–	–	I-016
	MUGEN COATING 4-Flute Long Neck High Efficient "Z" End Mill for Carbon Steels	MSCZ440-LN	ϕ1 ～ ϕ6	∞	4	40°/42°	Side	Slot	Face	Plunge	–	–	–	–	◎	◎	◎	–	–	–	–	–	–	–	–	–	–	–	I-018
	DLC COATING high efficient 3-Flute End Mill for Aluminium L/D=1.5	ALZ345-DLC ※Listed at "Aluminium Milling"	ϕ1 ～ ϕ12	DLC	3	45°	Side	Slot	Face	Plunge	–	–	–	–	–	–	–	–	–	–	–	–	◎	○	–	○	–	–	I-020
Square / Long Neck Square																													
	High efficient 3-Flute End Mill for Aluminium L/D=1.5	ALZ345 ※Listed at "Aluminium Milling"	ϕ1 ～ ϕ12	WC	3	45°	Side	Slot	Face	Plunge	–	–	–	–	–	–	–	–	–	–	–	–	◎	○	–	○	–	–	I-022

Search from Series

Photo	Product Name	Model	Size
High Efficient Milling			
Corner Radius			
	MUGEN COATING PREMIUM Power Radius End Mill	MSXH440R	ϕ3 × R0.3 ～ ϕ12 × R2
	MUGEN COATING Power Radius End Mill	MSX440	ϕ3 × R0.2 ～ ϕ20 × R1
Aluminium Milling			
Square			
	2-Flute L/D=2 End Mill for Aluminium	AL2D-2	ϕ0.5 ～ ϕ12
	DLC COATING 2-Flute L/D=2 End Mill for Aluminium	AL2D-2DLC	ϕ0.5 ～ ϕ12
	2-Flute L/D=3 End Mill for Aluminium	AL3D-2	ϕ1 ～ ϕ12
	DLC COATING 2-Flute L/D=3 End Mill for Aluminium	AL3D-2DLC	ϕ1 ～ ϕ12
	2-Flute L/D=4 End Mill for Aluminium	AL4D-2	ϕ1 ～ ϕ12
	DLC COATING 2-Flute L/D=4 End Mill for Aluminium	AL4D-2DLC	ϕ1 ～ ϕ12
	2-Flute L/D=5 End Mill for Aluminium	AL5D-2	ϕ1 ～ ϕ12
	DLC COATING 2-Flute L/D=5 End Mill for Aluminium	AL5D-2DLC	ϕ1 ～ ϕ12
	High efficient 3-Flute End Mill for Aluminium L/D=3	AL3D-345 ※Listed at "High Efficient Milling"	ϕ1 ～ ϕ12
	3-Flute Long Shank End Mill for Aluminium	AL-3LS	ϕ5 ～ ϕ12
Square / Long Neck Square			
	High efficient 3-Flute End Mill for Aluminium L/D=1.5	ALZ345 ※Listed at "High Efficient Milling"	ϕ1 ～ ϕ12
Long Neck Square			
	DLC COATING high efficient 3-Flute End Mill for Aluminium L/D=1.5	ALZ345-DLC ※Listed at "High Efficient Milling"	ϕ1 ～ ϕ12
Ball / Long Neck Ball			
	Ball End Mill for Aluminium	ALB225	R0.3 ～ R6
	DLC COATING Ball End Mill for Aluminium	ALB225-DLC	R0.3 ～ R6

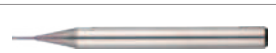
Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
High Efficient Milling																									
Corner Radius																									
∞ Premium	4	40°/42°	Side	Slot	Face	-	-	-	-	-	-	◎	◎	-	-	-	◎	◎	-	-	-	-	-	-	I-026
∞	4	35°/38°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	◎	-	-	-	-	-	-	-	I-028
Aluminium Milling																									
Square																									
WC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-006
DLC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-008
WC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-010
DLC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-012
WC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-014
DLC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-016
WC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-018
DLC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-020
WC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-022
WC	3	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-024
Square / Long Neck Square																									
WC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-026
Long Neck Square																									
DLC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-030
Ball / Long Neck Ball																									
WC	2	25°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-032
DLC	2	25°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-034

Search from Series

Photo	Product Name	Model	Size
Copper Electrode Milling			
Long Neck Square			
	Long Neck Square End Mill for Copper Electrode	DHR237	φ0.1 ~ φ6
Long Neck Ball			
	Long Neck Ball End Mill for Copper Electrode	DRB230	R0.05 ~ R3
Long Neck Corner Radius			
	Long Neck Radius End Mill for Copper Electrode	DHR237R	φ0.2 × R0.02 ~φ6 × R1
Resin Milling			
Square / Long Neck Square			
	Short Flute End Mill for Resin	RSES230	φ0.1 ~ φ6
	End Mill for Resin	RSE230	φ0.1 ~ φ6
Ball / Long Neck Ball			
	Ball End Mill for Resin	RSB230	R0.1 ~ R3
Hard Brittle Material Milling			
Long Neck Square			
	End Mill for Hard Brittle Materials	DCMS	φ0.3 ~ φ2
Ball / Long Neck Ball			
	Ball End Mill for Hard Brittle Materials	DCMB	R0.1 ~ R1
Graphite Milling			
Square			
	DIAMOND COATING 2-Flute End Mill	DCSE235	φ0.5 ~ φ6
Long Neck Square			
	DIAMOND COATING 2-Flute Long Neck End Mill	DCHR230	φ0.5 ~ φ6
Long Neck Ball			
	DIAMOND COATING 2-Flute Long Neck Ball End Mill	DCRB230	R0.2 ~ R3
Drill			
Flat Drill			
	MUGEN COATING Flat Drill	MFD	φ0.1 ~ φ6
Micro Drill			
	MUGEN MICRO COATING Micro Drill Short	NSMD-MS	φ0.01 ~ φ0.05

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H ~65HRC	H ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Copper Electrode Milling																									
Long Neck Square																									
DLC	2	37.5°	Side	Slot	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	○	◎	◎	○	–	–	K-006
Long Neck Ball																									
DLC	2	30°	–	–	–	–	3D	–	–	–	–	–	–	–	–	–	–	–	○	◎	◎	○	–	–	K-010
Long Neck Corner Radius																									
DLC	2	37.5°	Side	Slot	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	○	◎	◎	○	–	–	K-016
Resin Milling																									
Square / Long Neck Square																									
MG	2	30°	Side	Slot	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	–	◎	–	–	L-006
MG	2	30°	Side	Slot	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	–	◎	–	–	L-014
Ball / Long Neck Ball																									
MG	2	30°	–	–	–	–	3D	–	–	–	–	–	–	–	–	–	–	–	○	○	–	◎	–	–	L-022
Hard Brittle Material Milling																									
Long Neck Square																									
DIA	6 8 10	30°	–	–	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	◎	N-006
Ball / Long Neck Ball																									
DIA	2	20°	–	–	–	–	3D	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	◎	N-008
Graphite Milling																									
Square																									
DIA	2	35°	Side	Slot	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	◎	–	M-006
Long Neck Square																									
DIA	2	30°	Side	Slot	Face	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	◎	–	M-008
Long Neck Ball																									
DIA	2	30°	–	–	–	–	3D	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	◎	–	M-010
Drill																									
Flat Drill																									
∞	2	20°/30° (D<0.5)/(D≧0.5)	–	–	–	–	–	Flat Drill	–	–	◎	◎	○	–	–	–	○	–	○	○	–	–	–	–	O-006
Micro Drill																									
∞ Micro	2	30°	–	–	–	–	–	Drill	–	–	○	○	○	–	–	–	○	○	○	–	–	–	–	–	O-010

Search from Series

Photo	Product Name	Model	Size
Drill			
Micro Drill			
	Micro Drill Short	NSMD-S	ϕ0.01 ～ ϕ0.05
	MUGEN MICRO COATING Micro Drill	NSMD-M	ϕ0.01 ～ ϕ0.1
	Micro Drill	NSMD	ϕ0.01 ～ ϕ0.1
	MUGEN MICRO COATING Micro Point Drill (Drill for Guide Hole)	NSPD-M	ϕ0.01 ～ ϕ0.1
	Micro Point Drill (Drill for Guide Hole)	NSPD	ϕ0.01 ～ ϕ0.1
Drill			
	MUGEN COATING Miniature Drill	MDR-R	ϕ0.1 ～ ϕ1
	MUGEN COATING Point Drill (Drill for Guide Hole)	MDR-PD	ϕ0.1 ～ ϕ1
	MUGEN COATING PREMIUM Precision Drill for Hardened Steel	MSDH	ϕ0.1 ～ ϕ1
Thread Mill			
Thread Mill			
	MUGEN COATING M-Thread Mill (for Internal Thread)	MMTM	M1 ～ M6
	MUGEN COATING PREMIUM Thread Cutting Tool (Unify : for Internal Thread)	MMTU	No.0-80UNF ～ 1/4-28UNF
	MUGEN COATING Micro Thread Cutting Tool (for Internal Thread)	MMTS	S0.1 ～ S1.4
Chamfering			
Chamfering			
	MUGEN COATING 2-Flute Inner Radius Cutter	MIR200	R0.1 ～ R5
	Chamfer Cutter	NSCV	ϕ4 ϕ6
	MUGEN COATING Chamfer Cutter	NSCV-M	ϕ4 ϕ6
Square End Mill			
CBN Square End Mill			
	CBN “MICRO EDGE Z”	SMEZ120	ϕ0.03 ～ ϕ0.1
	CBN Square End Mill	SSE400	ϕ0.1
	CBN Square End Mill	SSE600	ϕ0.2 ～ ϕ1

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Drill																									
Micro Drill																									
SMG	2	30°	-	-	-	-	-	Drill	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-012
∞ Micro	2	30°	-	-	-	-	-	Drill	-	-	○	○	○	-	-	-	○	○	○	-	-	-	-	-	O-014
SMG	2	30°	-	-	-	-	-	Drill	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-016
∞ Micro	2	30°	-	-	-	-	-	Drill	-	-	○	○	○	-	-	-	○	○	○	-	-	-	-	-	O-018
SMG	2	30°	-	-	-	-	-	Drill	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-020
Drill																									
∞	2	30°	-	-	-	-	-	Drill	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-022
∞	2	25°	-	-	-	-	-	Drill	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-026
∞ Premium	2	20°	-	-	-	-	-	Drill	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	O-028
Thread Mill																									
Thread Mill																									
∞	4 / 6	-	-	-	-	-	-	-	Thread	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	P-006
∞ Premium	4 / 6	-	-	-	-	-	-	-	Thread	-	○	○	◎	-	-	-	◎	◎	○	○	-	○	-	-	P-008
∞	2	-	-	-	-	-	-	-	Thread	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	P-010
Chamfering																									
Chamfering																									
∞	2	-	-	-	-	-	-	-	-	R	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	Q-006
MG	3	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	◎	◎	-	◎	-	-	Q-008
∞	3	-	-	-	-	-	-	-	-	C	◎	◎	◎	-	-	-	○	-	-	-	-	-	-	-	Q-010
Square End Mill																									
CBN Square End Mill																									
CBN	1	-20°	-	Slot	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	-	B-006 D-006
CBN	4	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-008
CBN	6	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-010

Search from Shape

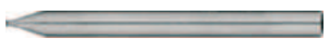
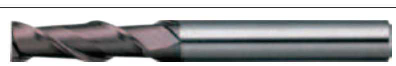
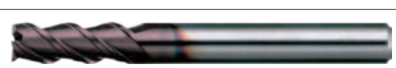
Photo	Product Name	Model	Size	Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Square End Mill																													
PCD Square End Mill																													
	PCD Square End Mill	PCDSE	φ0.1 ～ φ1	PCD	2, 6	0°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	C-006
DIAMOND COATING																													
	End Mill for Hard Brittle Materials	DCMS	φ0.3 ～ φ2	DIA	6, 8, 10	30°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	N-006
	2-Flute Long Neck End Mill	DCHR230	φ0.5 ～ φ6	DIA	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	M-008
	2-Flute End Mill	DCSE235	φ0.5 ～ φ6	DIA	2	35°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	M-006
MUGEN COATING PREMIUM Plus																													
	4-Flute Square End Mill for Hardened Steel	MHDSH445	φ1 ～ φ4	Plus	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-006
	6-Flute Square End Mill for Hardened Steel	MHDSH645	φ5 ～ φ6	Plus	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-008
MUGEN COATING PREMIUM																													
	2-Flute LEAD25 End Mill	MXH225	φ0.1 ～ φ6	Premium	2	25°	Side	Slot	Face	-	-	-	-	-	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	-	F-010
	2-Flute LEAD30 End Mill	MXH230	φ0.1 ～ φ6	Premium	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	-	F-012
	2-Flute LEAD35 End Mill	MXH235	φ0.1 ～ φ6	Premium	2	35°	Side	Slot	Face	-	-	-	-	-	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	-	F-014
	2-Flute LEAD40 End Mill	MXH240	φ0.3 ～ φ6	Premium	2	40°	Side	-	Face	-	-	-	-	-	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	-	F-016
	2-Flute LEAD45 End Mill	MXH245	φ0.3 ～ φ6	Premium	2	45°	Side	-	Face	-	-	-	-	-	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	-	F-018
	2-Flute Sharp Edge LEAD25 End Mill	MXH225P	φ0.1 ～ φ6	Premium	2	25°	Side	-	Face	-	-	-	-	-	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	-	F-020
	2-Flute Sharp Edge LEAD30 End Mill	MXH230P	φ0.1 ～ φ6	Premium	2	30°	Side	-	Face	-	-	-	-	-	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	-	F-022
	2-Flute Sharp Edge LEAD35 End Mill	MXH235P	φ0.1 ～ φ6	Premium	2	35°	Side	-	Face	-	-	-	-	-	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	-	F-024
	4-Flute Square End Mill for Hardened Steel	MHDH445	φ1 ～ φ4	Premium	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-026
	6-Flute Square End Mill for Hardened Steel	MHDH645	φ5 ～ φ12	Premium	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-028
	2-Flute Long Neck End Mill for Hardened Steel	MHRH230	φ0.1 ～ φ3	Premium	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-038
	4-Flute Long Neck End Mill for Hardened Steel	MHRH430	φ1 ～ φ6	Premium	4	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-044

Photo	Product Name	Model	Size	Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Square End Mill																													
MUGEN COATING PREMIUM																													
	4-Flute High Efficient "Z" End Mill for Stainless Steels	MSUSZ440	φ1 ~ φ6	∞ Premium	4	40°/42°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	◎	◎	-	-	-	-	-	-	I-006
	4-Flute Long Neck High Efficient "Z" End Mill for Stainless Steels	MSUSZ440-LN	φ1 ~ φ6	∞ Premium	4	40°/42°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	◎	◎	-	-	-	-	-	-	I-016
MUGEN COATING																													
	2-Flute LEAD25 End Mill	MX225	φ0.3 ~ φ12	∞	2	25°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-012
	2-Flute LEAD30 End Mill	MX230	φ0.1 ~ φ12	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-014
	2-Flute LEAD35 End Mill	MX235	φ0.1 ~ φ12	∞	2	35°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-016
	2-Flute LEAD40 End Mill	MX240	φ0.3 ~ φ12	∞	2	40°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-018
	2-Flute LEAD45 End Mill	MX245	φ0.3 ~ φ12	∞	2	45°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-020
	4-Flute LEAD25 End Mill	MX425	φ1 ~ φ12	∞	4	25°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-022
	4-Flute LEAD30 End Mill	MX430	φ1 ~ φ12	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-024
	4-Flute LEAD35 End Mill	MX435	φ1 ~ φ12	∞	4	35°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-026
	4-Flute LEAD40 End Mill	MX440	φ1 ~ φ12	∞	4	40°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-028
	4-Flute LEAD45 End Mill	MX445	φ1 ~ φ12	∞	4	45°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-030
	2-Flute Super Short End Mill	MSE230SS	φ0.1 ~ φ6	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-032
	2-Flute Sharp Edge Short End Mill	MSES230P	φ0.1 ~ φ12	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	G-036
	2-Flute End Mill	MSE230	φ0.1 ~ φ12	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-038
	2-Flute Medium End Mill	MSEM230	φ0.5 ~ φ12	∞	2	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-042
	2-Flute End Mill with Measured Diameter	MSE230M	φ0.1 ~ φ6	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-044
	2-Flute End Mill	MSE245	φ2 ~ φ12	∞	2	45°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-046
	3-Flute End Mill	MSE345	φ3 ~ φ20	∞	3	45°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-048

Square End Mill

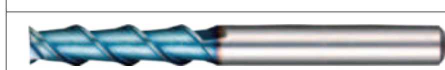
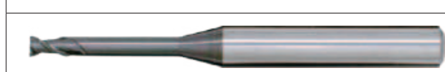
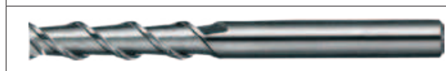
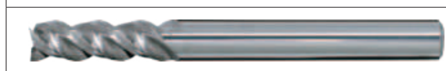
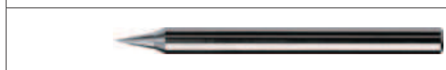
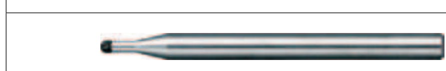
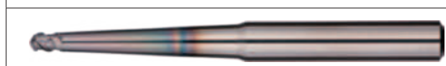
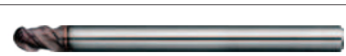
Photo	Product Name	Model	Size	Material · Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C · R Chamfering	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MUGEN COATING																													
	4-Flute Sharp Edge End Mill	MSE430P	φ1 ~ φ12	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	G-050
	4-Flute End Mill	MSE430	φ1 ~ φ20	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-052
	4-Flute End Mill	MSE445	φ2 ~ φ20	∞	4	45°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-054
	4-Flute Medium End Mill	MSEM430	φ1 ~ φ20	∞	4	30°	Side	-	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-056
	4-Flute End Mill for Hardened Steel	MHD445	φ1 ~ φ4	∞	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	-	-	-	-	-	-	-	-	-	-	G-058
	6-Flute End Mill for Hardened Steel	MHD645	φ5 ~ φ12	∞	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	-	-	-	-	-	-	-	-	-	-	G-060
	2-Flute Long Neck End Mill	MHR230	φ0.1 ~ φ6	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-084
	4-Flute Long Neck End Mill	MHR430	φ1 ~ φ10	∞	4	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-096
	2-Flute Long Neck End Mill (Shank Dia. 6)	MHRLN230-6	φ0.3 ~ φ2	∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-104
	4-Flute High Efficient "Z" End Mill for Carbon Steels	MSCZ440	φ1 ~ φ6	∞	4	40°/42°	Side	Slot	Face	Plunge	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	-	-	-	I-008
	4-Flute Long Neck High Efficient "Z" End Mill for Carbon Steels	MSCZ440-LN	φ1 ~ φ6	∞	4	40°/42°	Side	Slot	Face	Plunge	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	-	-	-	I-018
	3-Flute POWER"Z"End Mill	MSZ345	φ1 ~ φ12	∞	3	45°	Side	Slot	Face	Plunge	-	-	-	-	◎	◎	◎	-	-	-	○	-	-	-	-	-	-	-	I-010
DLC COATING																													
	2-Flute L/D=2 End Mill for Aluminium	AL2D-2DLC	φ0.5 ~ φ12	DLC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-008
	2-Flute L/D=3 End Mill for Aluminium	AL3D-2DLC	φ1 ~ φ12	DLC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-012
	2-Flute L/D=4 End Mill for Aluminium	AL4D-2DLC	φ1 ~ φ12	DLC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-016
	2-Flute L/D=5 End Mill for Aluminium	AL5D-2DLC	φ1 ~ φ12	DLC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-020
	High efficient 3-Flute End Mill for Aluminium L/D=1.5	ALZ345-DLC	φ1 ~ φ12	DLC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	I-020 J-030
	Long Neck Square End Mill for Copper Electrode	DHR237	φ0.1 ~ φ6	DLC	2	37.5°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	K-006

Photo	Product Name	Model	Size
Square End Mill			
Non-COATING			
	2-Flute L/D=2 End Mill for Aluminium	AL2D-2	ϕ0.5 ～ ϕ12
	2-Flute L/D=3 End Mill for Aluminium	AL3D-2	ϕ1 ～ ϕ12
	2-Flute L/D=4 End Mill for Aluminium	AL4D-2	ϕ1 ～ ϕ12
	2-Flute L/D=5 End Mill for Aluminium	AL5D-2	ϕ1 ～ ϕ12
	High efficient 3-Flute End Mill for Aluminium L/D=1.5	ALZ345	ϕ1 ～ ϕ12
	High efficient 3-Flute End Mill for Aluminium L/D=3	AL3D-345	ϕ1 ～ ϕ12
	3-Flute Long Shank End Mill for Aluminium	AL-3LS	ϕ5 ～ ϕ12
	Micro End Mill "MICRO EDGE"	NSME100	ϕ0.01 ～ ϕ0.05
	Micro End Mill "MICRO EDGE"	NSME230	ϕ0.03 ～ ϕ0.09
	Short Flute End Mill for Resin	RSES230	ϕ0.1 ～ ϕ6
	End Mill for Resin	RSE230	ϕ0.1 ～ ϕ6
Ball End Mill			
CBN Ball End Mill			
	CBN Ball End Mill for precision machining "CBN Micro Ball"	SMB120	R0.01 ～ R0.05
	CBN Super Finish Ball End Mill	SFB200	R0.1 ～ R1
	CBN Super Spiral Ball End Mill	SSPB220	R0.1 ～ R3
	CBN Super Spiral Long Neck Ball End Mill	SSPBL220	R0.1 ～ R1
	CBN Super Spiral Long Taper Neck Ball End Mill	SSPBTN220	R0.1×neck taper angle30′ ～ R1×neck taper angle2°
	CBN Super Speed Ball End Mill	SSB200	R0.1 ～ R1
	CBN Super Speed Long Neck Ball End Mill	SSBL200	R0.05 ～ R1

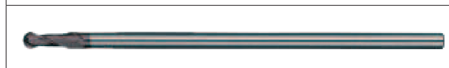
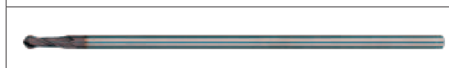
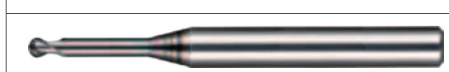
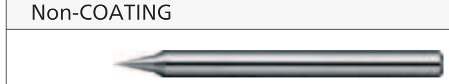
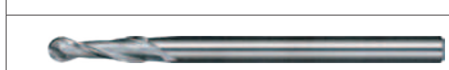
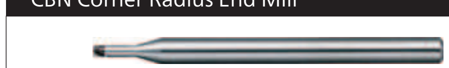
Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Square End Mill																									
Non-COATING																									
WC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-006
WC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-010
WC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-014
WC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-018
WC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	I-022 J-026
WC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	I-014 J-022
WC	3	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-024
SMG	1	0°	-	Slot	Face	-	-	-	-	-	○	○	○	-	-	-	○	-	○	○	-	○	-	-	D-008
SMG	2	30°	-	Slot	Face	-	-	-	-	-	○	○	○	-	-	-	○	-	○	○	-	○	-	-	D-010
MG	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	-	◎	-	-	L-006
MG	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	○	○	-	◎	-	-	L-014
Ball End Mill																									
CBN Ball End Mill																									
CBN	1	-20°	-	-	-	-	3D	-	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	-	B-012 D-012
CBN	2	0°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-014
CBN	2	20°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-016
CBN	2	20°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-020
CBN	2	20°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-024
CBN	2	0°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-018
CBN	2	0°	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-022

Search from Shape

Photo	Product Name	Model	Size
Ball End Mill			
PCD Ball End Mill			
	PCD Ball End Mill	PCDRB	R0.05 ～ R3
DIAMOND COATING			
	Ball End Mill for Hard Brittle Materials	DCMB	R0.1 ～ R1
	2-Flute Long Neck Ball End Mill	DCRB230	R0.2 ～ R3
MUGEN COATING PREMIUM Plus			
	2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel and High accuracy cutting	MRBSH230SF	R0.05 ～ R3
	High Efficient 3-Flute Small-Diameter Long Neck Ball End Mill for Hardened Steel	MRBSH330	R0.1 ～ R3
	3-Flute Ball End mill for 5-axis machining	MSBSH330-5X	R0.1 ～ R1
MUGEN COATING PREMIUM			
	2-Flute Ball End Mill for Hardened Steel	MSBH230	R0.05 ～ R6
	3-Flute Ball End Mill for Hardened Steel	MSBH345	R0.5 ～ R3
	2-Flute Long Neck Ball End Mill for Hardened Steel	MRBH230	R0.05 ～ R3
	2-Flute Ball End Mill with Short Shank for Hardened Steel	MACH225SF	R0.1 ～ R3
	2-Flute Ball End Mill for Hardened Steel	MACH225	R0.1 ～ R3
	2-Flute Long Taper Neck Ball End Mill	MRBTNH230	R0.05×neck taper angle3° ～ R2×neck taper angle1°
	3-Flute Long Taper Neck Ball End Mill	MRBTNH345	R0.5×neck taper angle30' ～ R2×neck taper angle1°
MUGEN COATING			
	2-Flute Ball End Mill	MSB230	R0.05 ～ R10
	3-Flute Ball End Mill	MSB345	R0.5 ～ R6
	Profit Ball End Mill	MSB230G2	R0.05 ～ R3

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material														Page
											P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H ～65HRC	H ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	
Ball End Mill																									
PCD Ball End Mill																									
PCD	-	-	-	-	-	-	3D	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	◎	C-008
DIAMOND COATING																									
DIA	2	20°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	N-008
DIA	2	30°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	M-010
MUGEN COATING PREMIUM Plus																									
∞ Plus	2	30°	-	-	-	-	3D	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-012
∞ Plus	3	30°	-	-	-	-	3D	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-016
∞ Plus	3	30°	-	-	-	-	3D	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-010
MUGEN COATING PREMIUM																									
∞ Premium	2	30°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-030
∞ Premium	3	45°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-032
∞ Premium	2	30°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-048
∞ Premium	2	25°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-058
∞ Premium	2	25°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-060
∞ Premium	2	30°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-062
∞ Premium	3	45°	-	-	-	-	3D	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-070
MUGEN COATING																									
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-062
∞	3	45°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-066
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-068

Search from Shape

Photo	Product Name	Model	Size
Ball End Mill			
MUGEN COATING			
	2-Flute Short Flute Ball End Mill	MSB230S	R0.1 ～ R6
	2-Flute Ball End Mill with Short Shank	MSB230SF	R0.1 ～ R6
	2-Flute Long Ball End Mill	MSBL230	R0.1 ～ R5
	2-Flute Extra Long Ball End Mill	MSBXL230	R0.5 ～ R5
	2-Flute Long Neck Ball End Mill	MRB230	R0.05 ～ R3
	2-Flute Long Neck Ball End Mill with Short Shank	MRB230SF	R0.1 ～ R1.5
	2-Flute Long Neck Ball End Mill (Shank Dia. 6)	MRBLN230-6	R0.15 ～ R1
	2-Flute Long Taper Neck Ball End Mill	MRBTN230	R0.1×neck taper angle30' ～ R2×neck taper angle1°
	2-Flute Extra Long Taper Neck Ball End Mill	MRBTN230L	R0.1×neck taper angle30' ～ R5×neck taper angle1°30
DLC COATING			
	Ball End Mill for Aluminium	ALB225-DLC	R0.3 ～ R6
	Long Neck Ball End Mill for Copper Electrode	DRB230	R0.05 ～ R3
Non-COATING			
	Ball End Mill for precision machining "Micro Ball"	NSMB100	R0.005 ～ R0.05
	Ball End Mill for Aluminium	ALB225	R0.3 ～ R6
	Ball End Mill for Resin	RSB230	R0.1 ～ R3
Corner Radius End Mill			
CBN Corner Radius End Mill			
	CBN Super Speed Radius End Mill	SSR200	ϕ0.1 × R0.02 ～ ϕ2 × R0.5
	CBN High Efficient Radius End Mill	SHR320	ϕ0.5 × R0.1 ～ ϕ2 × R0.3

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Ball End Mill																									
MUGEN COATING																									
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-070
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-074
∞	2	30°	-	-	-	-	3D	-	-	-	○	○	-	-	-	-	-	-	○	○	-	○	-	-	G-078
∞	2	30°	-	-	-	-	3D	-	-	-	○	○	-	-	-	-	-	-	○	○	-	○	-	-	G-079
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-106
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-118
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-122
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-124
∞	2	30°	-	-	-	-	3D	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-134
DLC COATING																									
DLC	2	25°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-034
DLC	2	30°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	K-010
Non-COATING																									
SMG	1	0°	-	-	-	-	3D	-	-	-	○	○	○	-	-	-	○	-	○	○	-	○	-	-	D-014
WC	2	25°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-032
MG	2	30°	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	○	○	-	◎	-	-	L-022
Corner Radius End Mill																									
CBN Corner Radius End Mill																									
CBN	2	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-028
CBN	2	20°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-034

Photo	Product Name	Model	Size
Corner Radius End Mill			
CBN Corner Radius End Mill			
	CBN Super High Precision Radius End Mill	SHPR400	φ0.1 × R0.01 ～ φ3 × R0.2
	CBN Super Surface End Mill	SSF120	φ0.2 × R0.05 ～ φ2 × R0.1
PCD Corner Radius End Mill			
	PCD Radius End Mill	PCDRS	φ0.3 × R0.05 ～ φ1 × R0.1
MUGEN COATING PREMIUM Plus			
	4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting	MHRSH430RSF	φ0.1 × R0.01 ～ φ6 × R1
MUGEN COATING PREMIUM			
	4-Flute Radius End Mill for Hardened Steel	MHDH445R	φ3 × R0.2 ～ φ4 × R0.5
	6-Flute Radius End Mill for Hardened Steel	MHDH645R	φ5 × R0.2 ～ φ12 × R2
	2-Flute Long Neck Radius End Mill for Hardened Steel	MHRH230R	φ0.2 × R0.02 ～ φ0.9 × R0.1
	4-Flute Long Neck Radius End Mill for Hardened Steel	MHRH430R	φ0.1 × R0.01 ～ φ6 × R1
	Power Radius End Mill	MSXH440R	φ3 × R0.3 ～ φ12 × R2
MUGEN COATING			
	2-Flute Radius End Mill	MSRS230	φ1 × R0.1 ～ φ6 × R2
	4-Flute Radius End Mill	MSRS430	φ1 × R0.1 ～ φ12 × R3
	2-Flute Long Neck Radius End Mill	MHR230R	φ0.2 × R0.05 ～ φ6 × R1
	4-Flute Long Neck Radius End Mill	MHR430R	φ1 × R0.05 ～ φ6 × R1
	2-Flute Long Taper Neck Radius End Mill	MSTNR230	φ0.2×R0.05×neck taper angle1° ～ φ3×R0.5×neck taper angle1°
	Power Radius End Mill	MSX440	φ3 × R0.2 ～ φ20 × R1
DLC COATING			
	Long Neck Radius End Mill for Copper Electrode	DHR237R	φ0.2 × R0.02 ～φ6 × R1

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Corner Radius End Mill																									
CBN Corner Radius End Mill																									
CBN	4	0°	-	Slot	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-036
CBN	1	-20°	-	-	Face	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-042
PCD Corner Radius End Mill																									
PCD	2 4 6	0°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	C-010
MUGEN COATING PREMIUM Plus																									
Plus	4	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-018
MUGEN COATING PREMIUM																									
Premium	4	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-034
Premium	6	45°	Side	Slot	Face	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-036
Premium	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-074
Premium	4	30°	Side	Slot	Face	-	-	-	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-078
Premium	4	40°/42°	Side	Slot	Face	-	-	-	-	-	-	◎	◎	-	-	-	◎	◎	-	-	-	-	-	-	I-026
MUGEN COATING																									
∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-080
∞	4	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-082
∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-138
∞	4	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-152
∞	2	30°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-158
∞	4	35°/38°	Side	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	◎	-	-	-	-	-	-	-	I-028
DLC COATING																									
DLC	2	37.5°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	K-016

Search from Shape

Photo	Product Name	Model	Size	Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
Tapered Square End Mill																													
MUGEN COATING																													
	2-Flute Taper End Mill	MTE230	φ0.2×taper angle30' ~ φ10×taper angle5°	∞	2	30°	Side	Slot	-	-	-	-	-	-	◎	◎	◎	○	-	-	-	-	○	○	-	○	-	-	H-006
	4-Flute Taper End Mill for Deep Rib	MRT425	φ0.2×taper angle30' ~ φ3×taper angle2°	∞	4	25°	-	Slot	-	-	-	-	-	-	◎	◎	◎	○	-	-	-	-	-	-	-	-	-	-	H-012
Tapered Ball End Mill																													
MUGEN COATING																													
	2-Flute Taper Ball End Mill	MTB230	R0.1×taper angle1° ~ R2×taper angle15°	∞	2	30°	Side	Slot	-	-	3D	-	-	-	◎	◎	◎	○	-	-	-		○	○	-	○	-	-	H-016
Drill																													
MUGEN COATING PREMIUM																													
	Precision Drill for Hardened Steel	MSDH	φ0.1 ~ φ1	∞ Premium	2	20°	-	-	-	-	-	Drill	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	O-028
MUGEN MICRO COATING																													
	Micro Drill	NSMD-M	φ0.01 ~ φ0.1	∞ Micro	2	30°	-	-	-	-	-	Drill	-	-	○	○	○	-	-	-	○	○	○	-	-	-	-	-	O-014
	Micro Drill Short	NSMD-MS	φ0.01 ~ φ0.05	∞ Micro	2	30°	-	-	-	-	-	Drill	-	-	○	○	○	-	-	-	○	○	○	-	-	-	-	-	O-010
	Micro Point Drill (Drill for Guide Hole)	NSPD-M	φ0.01 ~ φ0.1	∞ Micro	2	30°	-	-	-	-	-	Drill	-	-	○	○	○	-	-	-	○	○	○	-	-	-	-	-	O-018
MUGEN COATING																													
	Flat Drill	MFD	φ0.1 ~ φ6	∞	2	20°/30° (D<0.5)/(D≥0.5)	-	-	-	-	-	Flat Drill	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-006
	Miniature Drill	MDR-R	φ0.1 ~ φ1	∞	2	30°	-	-	-	-	-	Drill	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-022
	Point Drill (Drill for Guide Hole)	MDR-PD	φ0.1 ~ φ1	∞	2	25°	-	-	-	-	-	Drill	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-026
Non-COATING																													
	Micro Drill	NSMD	φ0.01 ~ φ0.1	SMG	2	30°	-	-	-	-	-	Drill	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-016
	Micro Drill Short	NSMD-S	φ0.01 ~ φ0.05	SMG	2	30°	-	-	-	-	-	Drill	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-012
	Micro Point Drill (Drill for Guide Hole)	NSPD	φ0.01 ~ φ0.1	SMG	2	30°	-	-	-	-	-	Drill	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-020

Photo	Product Name	Model	Size
Thread Mill			
MUGEN COATING PREMIUM			
	Thread Cutting Tool (Unify : for Internal Thread)	MMTU	No.0-80UNF ～ 1/4-28UNF
MUGEN COATING			
	M-Thread Mill (for Internal Thread)	MMTM	M1 ～ M6
	Micro Thread Cutting Tool (for Internal Thread)	MMTS	S0.1 ～ S1.4
Chamfering			
MUGEN COATING			
	MUGEN COATING Chamfer Cutter	NSCV-M	ϕ4 ϕ6
Non-COATING			
	Chamfer Cutter	NSCV	ϕ4 ϕ6
Inner Radius Cutter Chamfering			
MUGEN COATING			
	MUGEN COATING 2-Flute Inner Radius Cutter	MIR200	R0.1 ～ R5

Material・Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Drilling	Thread Milling	C・R Chamfering	Work Material														Page
											P	P	P	H			M	S	N	N	N	O	O	O	
											Carbon Steel	Alloy Steel	Prehardened Steel	Hardened Steel			Stainless Steel	Heat Resistant Alloy etc	Aluminium Alloy	Copper	Copper Tungsten	Resin	Graphite	Hard Brittle Material	
														～55HRC	～65HRC	～70HRC									
Thread Mill																									
MUGEN COATING PREMIUM																									
Premium	4 6	-	-	-	-	-	-	-	Thread	-	○	○	◎	-	-	-	◎	◎	○	○	-	○	-	-	P-008
MUGEN COATING																									
	4 6	-	-	-	-	-	-	-	Thread	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	P-006
	2	-	-	-	-	-	-	-	Thread	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	P-010
Chamfering																									
MUGEN COATING																									
	3	-	-	-	-	-	-	-	-	C	◎	◎	◎	-	-	-	○	-	-	-	-	-	-	-	Q-010
Non-COATING																									
MG	3	-	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-	-	◎	◎	-	◎	-	-	Q-008
Inner Radius Cutter Chamfering																									
MUGEN COATING																									
	2	-	-	-	-	-	-	-	-	R	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	Q-006

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
AL-3LS	Square	ϕ5 ~ ϕ12	WC	3	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-024
AL2D-2	Square	ϕ0.5 ~ ϕ12	WC	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-006
AL2D-2DLC	Square	ϕ0.5 ~ ϕ12	DLC	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-008
AL3D-2	Square	ϕ1 ~ ϕ12	WC	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-010
AL3D-2DLC	Square	ϕ1 ~ ϕ12	DLC	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-012
AL3D-345	Square	ϕ1 ~ ϕ12	WC	3	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	I-014 J-022
AL4D-2	Square	ϕ1 ~ ϕ12	WC	2	Side	-	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-014
AL4D-2DLC	Square	ϕ1 ~ ϕ12	DLC	2	Side	-	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-016
AL5D-2	Square	ϕ1 ~ ϕ12	WC	2	Side	-	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-018
AL5D-2DLC	Square	ϕ1 ~ ϕ12	DLC	2	Side	-	Face	-	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-020
ALB225	Ball / Long Neck Ball	R0.3 ~ R6	WC	2	-	-	-	-	3D	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-032
ALB225-DLC	Ball / Long Neck Ball	R0.3 ~ R6	DLC	2	-	-	-	-	3D	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	J-034
ALZ345	Square / Long Neck Square	ϕ1 ~ ϕ12	WC	3	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	I-022 J-026
ALZ345-DLC	Long Neck Square	ϕ1 ~ ϕ12	DLC	3	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	◎	○	-	○	-	-	I-020 J-030
DCHR230	Long Neck Square	ϕ0.5 ~ ϕ6	DIA	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	M-008

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
DCMB	Ball / Long Neck Ball	R0.1 ~ R1	DIA	2	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	N-008
DCMS	Long Neck Square	ϕ0.3 ~ ϕ2	DIA	6 8 10	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	N-006
DCRB230	Long Neck Ball	R0.2 ~ R3	DIA	2	-	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	M-010
DCSE235	Square	ϕ0.5 ~ ϕ6	DIA	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	M-006
DHR237	Long Neck Square	ϕ0.1 ~ ϕ6	DLC	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	K-006
DHR237R	Long Neck Corner Radius	ϕ0.2 × R0.02 ~ϕ6 × R1	DLC	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	K-016
DRB230	Long Neck Ball	R0.05 ~ R3	DLC	2	-	-	-	-	3D	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	K-010
MACH225	Long Neck Ball	R0.1 ~ R3	∞ Premium	2	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-060
MACH225SF	Long Neck Ball	R0.1 ~ R3	∞ Premium	2	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-058
MDR-PD	Drill	ϕ0.1 ~ ϕ1	∞	2	-	-	-	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-026
MDR-R	Drill	ϕ0.1 ~ ϕ1	∞	2	-	-	-	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-022
MFD	Flat Drill	ϕ0.1 ~ ϕ6	∞	2	-	-	-	-	-	◎	◎	○	-	-	-	○	-	○	○	-	-	-	-	O-006
MHD445	Square	ϕ1 ~ ϕ4	∞	4	Side	Slot	Face	-	-	-	-	○	◎	-	-	-	-	-	-	-	-	-	-	G-058
MHD645	Square	ϕ5 ~ ϕ12	∞	6	Side	Slot	Face	-	-	-	-	○	◎	-	-	-	-	-	-	-	-	-	-	G-060
MHDH445	Square	ϕ1 ~ ϕ4	∞ Premium	4	Side	Slot	Face	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-026

Search from Model

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MHDH445R	Corner Radius	ϕ3 × R0.2 ～ ϕ4 × R0.5	∞ Premium	4	Side	Slot	Face	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-034
MHDH645	Square	ϕ5 ～ ϕ12	∞ Premium	6	Side	Slot	Face	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-028
MHDH645R	Corner Radius	ϕ5 × R0.2 ～ ϕ12 × R2	∞ Premium	6	Side	Slot	Face	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	F-036
MHDSH445	Square	ϕ1 ～ ϕ4	∞ Plus	4	Side	Slot	Face	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-006
MHDSH645	Square	ϕ5 ～ ϕ6	∞ Plus	6	Side	Slot	Face	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-008
MHR230	Long Neck Square	ϕ0.1 ～ ϕ6	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-084
MHR230R	Long Neck Corner Radius	ϕ0.2 × R0.05 ～ ϕ6 × R1	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-138
MHR430	Long Neck Square	ϕ1 ～ ϕ10	∞	4	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-096
MHR430R	Long Neck Corner Radius	ϕ1 × R0.05 ～ ϕ6 × R1	∞	4	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-152
MHRH230	Long Neck Square	ϕ0.1 ～ ϕ3	∞ Premium	2	Side	Slot	Face	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-038
MHRH230R	Long Neck Corner Radius	ϕ0.2 × R0.02 ～ ϕ0.9 × R0.1	∞ Premium	2	Side	Slot	Face	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-074
MHRH430	Long Neck Square	ϕ1 ～ ϕ6	∞ Premium	4	Side	Slot	Face	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-044
MHRH430R	Long Neck Corner Radius	ϕ0.1 × R0.01 ～ ϕ6 × R1	∞ Premium	4	Side	Slot	Face	-	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-078
MHRLN230-6	Long Neck Square	ϕ0.3 ～ ϕ2	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-104
MHRSH430RSF	Long Neck Corner Radius	ϕ0.1×R0.01 ～ ϕ6×R1	∞ Plus	4	Side	Slot	Face	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-018

Search from Model

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MIR200	Chamfering	R0.1 ～ R5	∞	2	-	-	-	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	Q-006
MMTM	Thread Mill	M1 ～ M6	∞	4 / 6	-	-	-	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	P-006
MMTS	Thread Mill	S0.1 ～ S1.4	∞	2	-	-	-	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	P-010
MMTU	Thread Mill	No.0-80UNF ～ 1/4-28UNF	∞ Premium	4 / 6	-	-	-	-	-	○	○	◎	-	-	-	◎	◎	○	○	-	○	-	-	P-008
MRB230	Long Neck Ball	R0.05 ～ R3	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-106
MRB230SF	Long Neck Ball	R0.1 ～ R1.5	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-118
MRBH230	Long Neck Ball	R0.05 ～ R3	∞ Premium	2	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-048
MRBLN230-6	Long Neck Ball	R0.15 ～ R1	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-122
MRBSH230SF	Long Neck Ball	R0.05 ～ R3	∞ Plus	2	-	-	-	-	3D	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-012
MRBSH330	Long Neck Ball	R0.1 ～ R3	∞ Plus	3	-	-	-	-	3D	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-016
MRBTN230	Long Neck Tapered Ball	R0.1×neck taper angle30' ～ R2×neck taper angle1°	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-124
MRBTN230L	Long Neck Tapered Balll	R0.1×neck taper angle30' ～ R5×neck taper angle1°30'	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-134
MRBTNH230	Long Neck Tapered Ball	R0.05×neck taper angle3° ～ R2×neck taper angle1°	∞ Premium	2	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-062
MRBTNH345	Long Neck Tapered Ball	R0.5×neck taper angle30' ～ R2×neck taper angle1°	∞ Premium	3	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-070
MRT425	Tapered Square	ϕ0.2×taper angle30' ～ ϕ3×taper angle2°	∞	4	-	Slot	-	-	-	◎	◎	◎	○	-	-	-	-	-	-	-	-	-	-	H-012

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MSB230	Ball	R0.05～R10	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-062
MSB230G2	Ball	R0.05～R3	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-068
MSB230S	Ball	R0.1～R6	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-070
MSB230SF	Ball	R0.1～R6	∞	2	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-074
MSB345	Ball	R0.5～R6	∞	3	-	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-066
MSBH230	Ball	R0.05～R6	∞ Premium	2	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-030
MSBH345	Ball	R0.5～R3	∞ Premium	3	-	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	-	F-032
MSBL230	Ball	R0.1～R5	∞	2	-	-	-	-	3D	○	○	-	-	-	-	-	-	○	○	-	○	-	-	G-078
MSBSH330-5X	Ball	R0.1～R1	∞ Plus	3	-	-	-	-	3D	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	E-010
MSBXL230	Ball	R0.5～R5	∞	2	-	-	-	-	3D	○	○	-	-	-	-	-	-	○	○	-	○	-	-	G-079
MSCZ440	Square	φ1～φ6	∞	4	Side	Slot	Face	Plunge	-	◎	◎	◎	-	-	-	-	-	-	-	-	-	-	-	I-008
MSCZ440-LN	Long Neck Square	φ1～φ6	∞	4	Side	Slot	Face	Plunge	-	◎	◎	◎	-	-	-	-	-	-	-	-	-	-	-	I-018
MSDH	Drill	φ0.1～φ1	∞ Premium	2	-	-	-	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	-	O-028
MSE230	Square	φ0.1～φ12	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-038
MSE230M	Square	φ0.1～φ6	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-044

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MSE230SS	Square	φ0.1～φ6	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-032
MSE245	Square	φ2～φ12	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-046
MSE345	Square	φ3～φ20	∞	3	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-048
MSE430	Square	φ1～φ20	∞	4	Side	-	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-052
MSE430P	Square	φ1～φ12	∞	4	Side	-	Face	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	G-050
MSE445	Square	φ2～φ20	∞	4	Side	-	Face	-	-	◎	◎	◎	○	-	-	○	○	○	○	-	○	-	-	G-054
MSEM230	Square	φ0.5～φ12	∞	2	Side	-	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-042
MSEM430	Square	φ1～φ20	∞	4	Side	-	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-056
MSES230P	Square	φ0.1～φ12	∞	2	Side	Slot	Face	-	-	◎	◎	◎	-	-	-	○	-	○	○	-	○	-	-	G-036
MSRS230	Corner Radius	φ1×R0.1～φ6×R2	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-080
MSRS430	Corner Radius	φ1×R0.1～φ12×R3	∞	4	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-082
MSTNR230	Long Neck Tapered Corner Radius	φ0.2×R0.05×neck taper angle1°～φ3×R0.5×neck taper angle1°	∞	2	Side	Slot	Face	-	-	◎	◎	◎	○	-	-	○	-	○	○	-	○	-	-	G-158
MSUSZ440	Square	φ1～φ6	∞ Premium	4	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	◎	◎	-	-	-	-	-	-	I-006
MSUSZ440-LN	Long Neck Square	φ1～φ6	∞ Premium	4	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	◎	◎	-	-	-	-	-	-	I-016
MSX440	Corner Radius	φ3×R0.2～φ20×R1	∞	4	Side	Slot	Face	-	-	◎	◎	◎	-	-	-	◎	-	-	-	-	-	-	-	I-028

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55 HRC	H Hardened Steel ~65 HRC	H Hardened Steel ~70 HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MSXH440R	Corner Radius	ϕ3×R0.3 ~ϕ12×R2	∞ Premium	4	Side	Slot	Face	–	–	–	◎	◎	–	–	–	◎	◎	–	–	–	–	–	–	I-026
MSZ345	Square	ϕ1 ~ ϕ12	∞	3	Side	Slot	Face	Plunge	–	◎	◎	◎	–	–	–	○	–	–	–	–	–	–	–	I-010
MTB230	Tapered Ball	R0.1×taper angle1° ~R2×taper angle15°	∞	2	Side	Slot	–	–	3D	◎	◎	◎	○	–	–	–	–	○	○	–	○	–	–	H-016
MTE230	Tapered Square	ϕ0.2×taper angle30' ~ϕ10×taper angle5°	∞	2	Side	Slot	–	–	–	◎	◎	◎	○	–	–	–	–	○	○	–	○	–	–	H-006
MX225	Square	ϕ0.3 ~ ϕ12	∞	2	Side	Slot	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-012
MX230	Square	ϕ0.1 ~ ϕ12	∞	2	Side	Slot	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-014
MX235	Square	ϕ0.1 ~ ϕ12	∞	2	Side	Slot	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-016
MX240	Square	ϕ0.3 ~ ϕ12	∞	2	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-018
MX245	Square	ϕ0.3 ~ ϕ12	∞	2	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-020
MX425	Square	ϕ1 ~ ϕ12	∞	4	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-022
MX430	Square	ϕ1 ~ ϕ12	∞	4	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-024
MX435	Square	ϕ1 ~ ϕ12	∞	4	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-026
MX440	Square	ϕ1 ~ ϕ12	∞	4	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-028
MX445	Square	ϕ1 ~ ϕ12	∞	4	Side	–	Face	–	–	◎	◎	◎	○	–	–	○	–	○	○	–	○	–	–	G-030
MXH225	Square	ϕ0.1 ~ ϕ6	∞ Premium	2	Side	Slot	Face	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-010

Model	Shape	Size	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55 HRC	H Hardened Steel ~65 HRC	H Hardened Steel ~70 HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
MXH225P	Square	ϕ0.1 ~ ϕ6	∞ Premium	2	Side	–	Face	–	–	–	–	◎	–	–	–	◎	◎	–	–	–	–	–	–	F-020
MXH230	Square	ϕ0.1 ~ ϕ6	∞ Premium	2	Side	Slot	Face	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-012
MXH230P	Square	ϕ0.1 ~ ϕ6	∞ Premium	2	Side	–	Face	–	–	–	–	◎	–	–	–	◎	◎	–	–	–	–	–	–	F-022
MXH235	Square	ϕ0.1 ~ ϕ6	∞ Premium	2	Side	Slot	Face	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-014
MXH235P	Square	ϕ0.1 ~ ϕ6	∞ Premium	2	Side	–	Face	–	–	–	–	◎	–	–	–	◎	◎	–	–	–	–	–	–	F-024
MXH240	Square	ϕ0.3 ~ ϕ6	∞ Premium	2	Side	–	Face	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-016
MXH245	Square	ϕ0.3 ~ ϕ6	∞ Premium	2	Side	–	Face	–	–	–	–	◎	○	–	–	◎	◎	–	–	–	–	–	–	F-018
NSCV	Chamfering	ϕ4 ϕ6	MG	3	–	–	–	–	–	–	–	–	–	–	–	–	–	◎	◎	–	◎	–	–	Q-008
NSCV-M	Chamfering	ϕ4 ϕ6	∞	3	–	–	–	–	–	◎	◎	◎	–	–	–	○	–	–	–	–	–	–	–	Q-010
NSMB100	Ball	R0.005 ~ R0.05	SMG	1	–	–	–	–	3D	○	○	○	–	–	–	○	–	○	○	–	○	–	–	D-014
NSMD	Micro Drill	ϕ0.01 ~ ϕ0.1	SMG	2	–	–	–	–	–	–	–	–	–	–	–	○	–	○	○	–	○	–	–	O-016
NSMD-M	Micro Drill	ϕ0.01 ~ ϕ0.1	∞ Micro	2	–	–	–	–	–	○	○	○	–	–	–	○	○	○	–	–	–	–	–	O-014
NSMD-MS	Micro Drill	ϕ0.01 ~ ϕ0.05	∞ Micro	2	–	–	–	–	–	○	○	○	–	–	–	○	○	○	–	–	–	–	–	O-010
NSMD-S	Micro Drill	ϕ0.01 ~ ϕ0.05	SMG	2	–	–	–	–	–	–	–	–	–	–	–	○	–	○	○	–	○	–	–	O-012
NSME100	Square	ϕ0.01 ~ ϕ0.05	SMG	1	–	Slot	Face	–	–	○	○	○	–	–	–	○	–	○	○	–	○	–	–	D-008

Search from Model

Model	Shape	Size	Material • Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
NSME230	Square	ϕ0.03 ~ ϕ0.09	SMG	2	-	Slot	Face	-	-	○	○	○	-	-	-	○	-	○	○	-	○	-	-	D-010
NSPD	Micro Drill	ϕ0.01 ~ ϕ0.1	SMG	2	-	-	-	-	-	-	-	-	-	-	-	○	-	○	○	-	○	-	-	O-020
NSPD-M	Micro Drill	ϕ0.01 ~ ϕ0.1	Micro	2	-	-	-	-	-	○	○	○	-	-	-	○	○	○	-	-	-	-	-	O-018
PCDRB	Long Neck Ball	R0.05 ~ R3	PCD	-	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	◎	C-008
PCDRS	Long Neck Corner Radius	ϕ0.3 × R0.05 ~ ϕ1 × R0.1	PCD	2 / 4 / 6	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	C-010
PCDSE	Long Neck Square	ϕ0.1 ~ ϕ1	PCD	2 / 6	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	C-006
RSB230	Ball / Long Neck Ball	R0.1 ~ R3	MG	2	-	-	-	-	3D	-	-	-	-	-	-	-	-	○	○	-	◎	-	-	L-022
RSE230	Square / Long Neck Square	ϕ0.1 ~ ϕ6	MG	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	○	○	-	◎	-	-	L-014
RSES230	Square / Long Neck Square	ϕ0.1 ~ ϕ6	MG	2	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	○	○	-	◎	-	-	L-006
SFB200	Long Neck Ball	R0.1 ~ R1	CBN	2	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-014
SHPR400	Long Neck Corner Radius	ϕ0.1 × R0.01 ~ ϕ3 × R0.2	CBN	4	-	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-036
SHR320	Long Neck Corner Radius	ϕ0.5 × R0.1 ~ ϕ2 × R0.3	CBN	3	-	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-034
SMB120	Ball	R0.01 ~ R0.05	CBN	1	-	-	-	-	3D	-	-	○	◎	◎	○	-	-	-	-	-	-	-	-	B-012 D-012
SMEZ120	Square	ϕ0.03 ~ ϕ0.1	CBN	1	-	Slot	-	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	-	B-006 D-006
SSB200	Long Neck Ball	R0.1 ~ R1	CBN	2	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-018

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Model	Shape	Size	Material • Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Page
SSBL200	Long Neck Ball	R0.05 ~ R1	CBN	2	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-022
SSE400	Long Neck Square	ϕ0.1	CBN	4	-	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-008
SSE600	Long Neck Square	ϕ0.2 ~ ϕ1	CBN	6	-	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-010
SSF120	Long Neck Corner Radius	ϕ0.2 × R0.05 ~ ϕ2 × R0.1	CBN	1	-	-	Face	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-042
SSPB220	Long Neck Ball	R0.1 ~ R3	CBN	2	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-016
SSPBL220	Long Neck Ball	R0.1 ~ R1	CBN	2	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-020
SSPBTN220	Long Neck Tapered Ball	R0.1 × neck taper angle30' ~ R1 × neck taper angle2°	CBN	2	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-024
SSR200	Long Neck Corner Radius	ϕ0.1 × R0.02 ~ ϕ2 × R0.5	CBN	2	-	Slot	Face	-	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	-	B-028

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Code No.	Model	Size	Shape	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
01-00001	NSME100	φ0.01 ～ φ0.05	Micro Edge Square	SMG	1	-	Slot	Face	-	-	D-008
01-00002	NSME230	φ0.03 ～ φ0.09	Micro Edge Square	SMG	2	-	Slot	Face	-	-	D-010
01-00003	NSMB100	R0.005 ～ R0.05	Micro Edge Ball	SMG	1	-	-	-	-	3D	D-014
01-00440	SSE400	φ0.1	CBN CBN Long Neck Square	CBN	4	-	Slot	Face	-	-	B-008
01-00450	SSE600	φ0.2 ～ φ1	CBN CBN Long Neck Square	CBN	6	-	Slot	Face	-	-	B-010
01-00460	SMB120	R0.01 ～ R0.05	CBN CBN Micro Edge Ball	CBN	1	-	-	-	-	3D	B-012 D-012
01-00470	SSF120	φ0.2 × R0.05 ～ φ2 × R0.1	CBN CBN Long Neck Corner Radius	CBN	1	-	-	Face	-	-	B-042
01-00480	SMEZ120	φ0.03 ～ φ0.1	CBN CBN Micro Edge Square	CBN	1	-	Slot	-	-	-	B-006 D-006
01-00485	SHPR400	φ0.1 × R0.01 ～ φ3 × R0.2	CBN CBN Long Neck Corner Radius	CBN	4	-	Slot	Face	-	-	B-036
01-00490	SSR200	φ0.1 × R0.02 ～ φ2 × R0.5	CBN CBN Long Neck Corner Radius	CBN	2	-	Slot	Face	-	-	B-028
01-00495	SHR320	φ0.5 × R0.1 ～ φ2 × R0.3	CBN CBN Long Neck Corner Radius	CBN	3	-	Slot	Face	-	-	B-034
01-00500	SFB200	R0.1 ～ R1	CBN CBN Long Neck Ball	CBN	2	-	-	-	-	3D	B-014
01-00505	SSPB220	R0.1 ～ R3	CBN CBN Long Neck Ball	CBN	2	-	-	-	-	3D	B-016
01-00506	SSPBL220	R0.1 ～ R1	CBN CBN Long Neck Ball	CBN	2	-	-	-	-	3D	B-020
01-00507	SSPBTN220	R0.1×neck taper angle30' ～ R1×neck taper angle2°	CBN CBN Long Neck Tapered Ball	CBN	2	-	-	-	-	3D	B-024

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Code No.	Model	Size	Shape	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
01-00510	SSB200	R0.1 ～ R1	CBN CBN Long Neck Ball	CBN	2	-	-	-	-	3D	B-018
01-00511	SSBL200	R0.05 ～ R1	CBN CBN Long Neck Ball	CBN	2	-	-	-	-	3D	B-022
01-00631	AL2D-2	φ0.5 ～ φ12	Square	WC	2	Side	Slot	Face	-	-	J-006
01-00632	AL3D-2	φ1 ～ φ12	Square	WC	2	Side	Slot	Face	-	-	J-010
01-00633	AL4D-2	φ1 ～ φ12	Square	WC	2	Side	-	Face	-	-	J-014
01-00634	AL5D-2	φ1 ～ φ12	Square	WC	2	Side	-	Face	-	-	J-018
01-00635	AL3D-2DLC	φ1 ～ φ12	Square	DLC	2	Side	Slot	Face	-	-	J-012
01-00636	ALZ345	φ1 ～ φ12	Square / Long Neck Square	WC	3	Side	Slot	Face	Plunge	-	I-022 J-026
01-00637	AL-3LS	φ5 ～ φ12	Square	WC	3	Side	Slot	Face	-	-	J-024
01-00638	ALB225	R0.3 ～ R6	Ball / Long Neck Ball	WC	2	-	-	-	-	3D	J-032
01-00639	AL3D-345	φ1 ～ φ12	Square	WC	3	Side	Slot	Face	Plunge	-	I-014 J-022
01-00640	RSES230	φ0.1 ～ φ6	Square / Long Neck Square	MG	2	Side	Slot	Face	-	-	L-006
01-00644	RSE230	φ0.1 ～ φ6	Square / Long Neck Square	MG	2	Side	Slot	Face	-	-	L-014
01-00654	RSB230	R0.1 ～ R3	Ball / Long Neck Ball	MG	2	-	-	-	-	3D	L-022
01-00661	AL2D-2DLC	φ0.5 ～ φ12	Square	DLC	2	Side	Slot	Face	-	-	J-008

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Code No.	Model	Size	Shape	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
01-00663	AL4D-2DLC	ϕ1 ～ ϕ12	Square	DLC	2	Side	-	Face	-	-	J-016
01-00664	AL5D-2DLC	ϕ1 ～ ϕ12	Square	DLC	2	Side	-	Face	-	-	J-020
01-00666	ALZ345-DLC	ϕ1 ～ ϕ12	Long Neck Square	DLC	3	Side	Slot	Face	Plunge	-	I-020 J-030
01-00668	ALB225-DLC	R0.3 ～ R6	Ball / Long Neck Ball	DLC	2	-	-	-	-	3D	J-034
04-00001	NSMD	ϕ0.01 ～ ϕ0.1	Micro Drill	SMG	2	-	-	-	-	-	O-016
04-00002	NSMD-M	ϕ0.01 ～ ϕ0.1	Micro Drill	∞ Micro	2	-	-	-	-	-	O-014
04-00005	NSMD-S	ϕ0.01 ～ ϕ0.05	Micro Drill	SMG	2	-	-	-	-	-	O-012
04-00006	NSMD-MS	ϕ0.01 ～ ϕ0.05	Micro Drill	∞ Micro	2	-	-	-	-	-	O-010
04-00010	NSPD	ϕ0.01 ～ ϕ0.1	Micro Drill	SMG	2	-	-	-	-	-	O-020
04-00012	NSPD-M	ϕ0.01 ～ ϕ0.1	Micro Drill	∞ Micro	2	-	-	-	-	-	O-018
04-00050	MSDH	ϕ0.1 ～ ϕ1	Drill	∞ Premium	2	-	-	-	-	-	O-028
04-00200	MDR-R	ϕ0.1 ～ ϕ1	Drill	∞	2	-	-	-	-	-	O-022
04-00210	MDR-PD	ϕ0.1 ～ ϕ1	Drill	∞	2	-	-	-	-	-	O-026
04-00230	MFD	ϕ0.1 ～ ϕ6	Flat Drill	∞	2	-	-	-	-	-	O-006
04-00250	NSCV	ϕ4 ϕ6	Chamfering	MG	3	-	-	-	-	-	Q-008

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Code No.	Model	Size	Shape	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
04-00260	NSCV-M	ϕ4 ϕ6	Chamfering	∞	3	-	-	-	-	-	Q-010
04-00300	PCDSE	ϕ0.1 ～ ϕ1	PCD PCD Long Neck Square	PCD	2 6	-	-	Face	-	-	C-006
04-00500	PCDRB	R0.05 ～ R3	PCD PCD Long Neck Ball	PCD	-	-	-	-	-	3D	C-008
04-00700	PCDRS	ϕ0.3 × R0.05 ～ ϕ1 × R0.1	PCD PCD Long Neck Corner Radius	PCD	2 4 6	-	-	Face	-	-	C-010
05-00035	DCSE235	ϕ0.5 ～ ϕ6	Square	DIA	2	Side	Slot	Face	-	-	M-006
05-00100	DCMS	ϕ0.3 ～ ϕ2	Long Neck Square	DIA	6 8 10	-	-	Face	-	-	N-006
05-00200	DCHR230	ϕ0.5 ～ ϕ6	Long Neck Square	DIA	2	Side	Slot	Face	-	-	M-008
05-00500	DCMB	R0.1 ～ R1	Ball / Long Neck Ball	DIA	2	-	-	-	-	3D	N-008
05-00520	DCRB230	R0.2 ～ R3	Long Neck Ball	DIA	2	-	-	-	-	3D	M-010
06-00001	MMTS	S0.1 ～ S1.4	Thread Mill	∞	2	-	-	-	-	-	P-010
06-00002	MMTM	M1 ～ M6	Thread Mill	∞	4 6	-	-	-	-	-	P-006
06-00003	MMTU	No.0-80UNF ～ 1/4-28UNF	Thread Mill	∞ Premium	4 6	-	-	-	-	-	P-008
07-00100	DHR237	ϕ0.1 ～ ϕ6	Long Neck Square	DLC	2	Side	Slot	Face	-	-	K-006
07-00110	DHR237R	ϕ0.2 × R0.02 ～ϕ6 × R1	Long Neck Corner Radius	DLC	2	Side	Slot	Face	-	-	K-016
07-00530	DRB230	R0.05 ～ R3	Long Neck Ball	DLC	2	-	-	-	-	3D	K-010

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Code No.	Model	Size	Shape	Material • Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
08-00005	MXH225	ϕ0.1 ～ ϕ6	Square	∞ Premium	2	Side	Slot	Face	-	-	F-010
08-00006	MXH230	ϕ0.1 ～ ϕ6	Square	∞ Premium	2	Side	Slot	Face	-	-	F-012
08-00007	MXH235	ϕ0.1 ～ ϕ6	Square	∞ Premium	2	Side	Slot	Face	-	-	F-014
08-00008	MXH240	ϕ0.3 ～ ϕ6	Square	∞ Premium	2	Side	-	Face	-	-	F-016
08-00009	MXH245	ϕ0.3 ～ ϕ6	Square	∞ Premium	2	Side	-	Face	-	-	F-018
08-00015	MXH225P	ϕ0.1 ～ ϕ6	Square	∞ Premium	2	Side	-	Face	-	-	F-020
08-00016	MXH230P	ϕ0.1 ～ ϕ6	Square	∞ Premium	2	Side	-	Face	-	-	F-022
08-00017	MXH235P	ϕ0.1 ～ ϕ6	Square	∞ Premium	2	Side	-	Face	-	-	F-024
08-00025	MX225	ϕ0.3 ～ ϕ12	Square	∞	2	Side	Slot	Face	-	-	G-012
08-00030	MX230	ϕ0.1 ～ ϕ12	Square	∞	2	Side	Slot	Face	-	-	G-014
08-00035	MX235	ϕ0.1 ～ ϕ12	Square	∞	2	Side	Slot	Face	-	-	G-016
08-00040	MX240	ϕ0.3 ～ ϕ12	Square	∞	2	Side	-	Face	-	-	G-018
08-00045	MX245	ϕ0.3 ～ ϕ12	Square	∞	2	Side	-	Face	-	-	G-020
08-00075	MX425	ϕ1 ～ ϕ12	Square	∞	4	Side	-	Face	-	-	G-022
08-00080	MX430	ϕ1 ～ ϕ12	Square	∞	4	Side	-	Face	-	-	G-024

Search from Code No.

Code No.	Model	Size	Shape	Material • Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
08-00085	MX435	ϕ1 ～ ϕ12	Square	∞	4	Side	-	Face	-	-	G-026
08-00090	MX440	ϕ1 ～ ϕ12	Square	∞	4	Side	-	Face	-	-	G-028
08-00095	MX445	ϕ1 ～ ϕ12	Square	∞	4	Side	-	Face	-	-	G-030
08-00100	MSE230	ϕ0.1 ～ ϕ12	Square	∞	2	Side	Slot	Face	-	-	G-038
08-00101	MSEM230	ϕ0.5 ～ ϕ12	Square	∞	2	Side	-	Face	-	-	G-042
08-00102	MSES230P	ϕ0.1 ～ ϕ12	Square	∞	2	Side	Slot	Face	-	-	G-036
08-00103	MSE230SS	ϕ0.1 ～ ϕ6	Square	∞	2	Side	Slot	Face	-	-	G-032
08-00105	MSE230M	ϕ0.1 ～ ϕ6	Square	∞	2	Side	Slot	Face	-	-	G-044
08-00110	MSE430	ϕ1 ～ ϕ20	Square	∞	4	Side	-	Face	-	-	G-052
08-00111	MSEM430	ϕ1 ～ ϕ20	Square	∞	4	Side	-	Face	-	-	G-056
08-00112	MSE430P	ϕ1 ～ ϕ12	Square	∞	4	Side	-	Face	-	-	G-050
08-00120	MSE245	ϕ2 ～ ϕ12	Square	∞	2	Side	Slot	Face	-	-	G-046
08-00130	MSE345	ϕ3 ～ ϕ20	Square	∞	3	Side	Slot	Face	-	-	G-048
08-00133	MSZ345	ϕ1 ～ ϕ12	Square	∞	3	Side	Slot	Face	Plunge	-	I-010
08-00135	MSCZ440	ϕ1 ～ ϕ6	Square	∞	4	Side	Slot	Face	Plunge	-	I-008

Code No.	Model	Size	Shape	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
08-00136	MSCZ440-LN	φ1 ～ φ6	Long Neck Square	∞	4	Side	Slot	Face	Plunge	-	I-018
08-00140	MSE445	φ2 ～ φ20	Square	∞	4	Side	-	Face	-	-	G-054
08-00144	MSX440	φ3 × R0.2 ～ φ20 × R1	Corner Radius	∞	4	Side	Slot	Face	-	-	I-028
08-00150	MSXH440R	φ3 × R0.3 ～ φ12 × R2	Corner Radius	∞ Premium	4	Side	Slot	Face	-	-	I-026
08-00152	MSUSZ440	φ1 ～ φ6	Square	∞ Premium	4	Side	Slot	Face	Plunge	-	I-006
08-00153	MSUSZ440-LN	φ1 ～ φ6	Long Neck Square	∞ Premium	4	Side	Slot	Face	Plunge	-	I-016
08-00200	MHR230	φ0.1 ～ φ6	Long Neck Square	∞	2	Side	Slot	Face	-	-	G-084
08-00202	MHRLN230-6	φ0.3 ～ φ2	Long Neck Square	∞	2	Side	Slot	Face	-	-	G-104
08-00207	MHRH230	φ0.1 ～ φ3	Long Neck Square	∞ Premium	2	Side	Slot	Face	-	-	F-038
08-00210	MHR430	φ1 ～ φ10	Long Neck Square	∞	4	Side	Slot	Face	-	-	G-096
08-00217	MHRH430	φ1 ～ φ6	Long Neck Square	∞ Premium	4	Side	Slot	Face	-	-	F-044
08-00220 08-00221	MHR230R	φ0.2 × R0.05 ～ φ6 × R1	Long Neck Corner Radius	∞	2	Side	Slot	Face	-	-	G-138
08-00227	MHRH230R	φ0.2 × R0.02 ～ φ0.9 × R0.1	Long Neck Corner Radius	∞ Premium	2	Side	Slot	Face	-	-	F-074
08-00230	MHR430R	φ1 × R0.05 ～ φ6 × R1	Long Neck Corner Radius	∞	4	Side	Slot	Face	-	-	G-152
08-00237	MHRH430R	φ0.1 × R0.01 ～ φ6 × R1	Long Neck Corner Radius	∞ Premium	4	Side	Slot	Face	-	-	F-078

Search from Code No.

Code No.	Model	Size	Shape	Material・Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
08-00239	MHRSH430RSF	φ0.1 × R0.01 ～ φ6 × R1	Long Neck Corner Radius	∞ Plus	4	Side	Slot	Face	-	-	E-018
08-00300	MTE230	φ0.2×taper angle30′ ～φ10×taper angle5°	Tapered Square	∞	2	Side	Slot	-	-	-	H-006
08-00310	MRT425	φ0.2×taper angle30′ ～φ3×taper angle2°	Tapered Square	∞	4	-	Slot	-	-	-	H-012
08-00400	MHD445	φ1 ～ φ4	Square	∞	4	Side	Slot	Face	-	-	G-058
08-00410	MHD645	φ5 ～ φ12	Square	∞	6	Side	Slot	Face	-	-	G-060
08-00427	MHDH445	φ1 ～ φ4	Square	∞ Premium	4	Side	Slot	Face	-	-	F-026
08-00428	MHDH645	φ5 ～ φ12	Square	∞ Premium	6	Side	Slot	Face	-	-	F-028
08-00429	MHDSH445	φ1 ～ φ4	Square	∞ Plus	4	Side	Slot	Face	-	-	E-006
08-00430	MHDSH645	φ5 ～ φ6	Square	∞ Plus	6	Side	Slot	Face	-	-	E-008
08-00437	MHDH445R	φ3 × R0.2 ～ φ4 × R0.5	Corner Radius	∞ Premium	4	Side	Slot	Face	-	-	F-034
08-00438	MHDH645R	φ5 × R0.2 ～ φ12 × R2	Corner Radius	∞ Premium	6	Side	Slot	Face	-	-	F-036
08-00500 08-00501	MSB230	R0.05 ～ R10	Ball	∞	2	-	-	-	-	3D	G-062
08-00504	MSB230SF	R0.1 ～ R6	Ball	∞	2	-	-	-	-	3D	G-074
08-00505	MSB230G2	R0.05 ～ R3	Ball	∞	2	-	-	-	-	3D	G-068
08-00507	MSBH230	R0.05 ～ R6	Ball	∞ Premium	2	-	-	-	-	3D	F-030

Search from Code No.

Code No.	Model	Size	Shape	Material • Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
08-00510	MSBL230	R0.1 ～ R5	Ball	∞	2	-	-	-	-	3D	G-078
08-00511	MSBXL230	R0.5 ～ R5	Ball	∞	2	-	-	-	-	3D	G-079
08-00520 08-00521	MRB230	R0.05 ～ R3	Long Neck Ball	∞	2	-	-	-	-	3D	G-106
08-00522	MRBLN230-6	R0.15 ～ R1	Long Neck Ball	∞	2	-	-	-	-	3D	G-122
08-00525	MRB230SF	R0.1 ～ R1.5	Long Neck Ball	∞	2	-	-	-	-	3D	G-118
08-00527 08-00528	MRBH230	R0.05 ～ R3	Long Neck Ball	∞ Premium	2	-	-	-	-	3D	F-048
08-00530	MSB230S	R0.1 ～ R6	Ball	∞	2	-	-	-	-	3D	G-070
08-00537	MRBSH230SF	R0.05 ～ R3	Long Neck Ball	∞ Plus	2	-	-	-	-	3D	E-012
08-00540	MTB230	R0.1×taper angle1° ～R2×taper angle15°	Tapered Ball	∞	2	Side	Slot	-	-	3D	H-016
08-00554	MACH225SF	R0.1 ～ R3	Long Neck Ball	∞ Premium	2	-	-	-	-	3D	F-058
08-00555	MACH225	R0.1 ～ R3	Long Neck Ball	∞ Premium	2	-	-	-	-	3D	F-060
08-00570	MRBTN230	R0.1×neck taper angle30' ～ R2×neck taper angle1°	Long Neck Tapered Ball	∞	2	-	-	-	-	3D	G-124
08-00580	MRBTN230L	R0.1×neck taper angle30' ～ R5×neck taper angle1°30'	Long Neck Tapered Ball	∞	2	-	-	-	-	3D	G-134
08-00588	MRBTNH230	R0.05×neck taper angle3° ～ R2×neck taper angle1°	Long Neck Tapered Ball	∞ Premium	2	-	-	-	-	3D	F-062
08-00590	MRBTNH345	R0.5×neck taper angle30' ～ R2×neck taper angle1°	Long Neck Tapered Ball	∞ Premium	3	-	-	-	-	3D	F-070

Search from Code No.

Code No.	Model	Size	Shape	Material • Coating	Number of Flute	Side Milling	Slot Milling	Face Milling	Plunging	3D Milling	Page
08-00600	MSB345	R0.5 ～ R6	Ball	∞	3	-	-	-	-	3D	G-066
08-00607	MSBH345	R0.5 ～ R3	Ball	∞ Premium	3	-	-	-	-	3D	F-032
08-00610	MSBSH330-5X	R0.1 ～ R1	Ball	∞ Plus	3	-	-	-	-	3D	E-010
08-00634	MRBSH330	R0.1 ～ R3	Long Neck Ball	∞ Plus	3	-	-	-	-	3D	E-016
08-00700	MSRS230	ϕ1 × R0.1 ～ ϕ6 × R2	Corner Radius	∞	2	Side	Slot	Face	-	-	G-080
08-00710	MSRS430	ϕ1 × R0.1 ～ ϕ12 × R3	Corner Radius	∞	4	Side	Slot	Face	-	-	G-082
08-00770	MSTNR230	ϕ0.2×R0.05×neck taper angle1° ～ ϕ3×R0.5×neck taper angle1°	Long Neck Tapered Corner Radius	∞	2	Side	Slot	Face	-	-	G-158
08-00900	MIR200	R0.1 ～ R5	Chamfering	∞	2	-	-	-	-	-	Q-006

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
φ0.01				
NSME100	φ0.01	0.01	45	D-008
φ0.02				
NSME100	φ0.02	0.02	45	D-008
φ0.03				
NSME100	φ0.03	0.03	45	D-008
SMEZ120	φ0.03	0.03	50	B-006,D-006
NSME230	φ0.03	0.045	45	D-010
φ0.04				
NSME100	φ0.04	0.04	45	D-008
SMEZ120	φ0.04	0.04	50	B-006,D-006
NSME230	φ0.04	0.06	45	D-010
φ0.05				
NSME100	φ0.05	0.05	45	D-008
SMEZ120	φ0.05	0.05	50	B-006,D-006
NSME230	φ0.05	0.075	45	D-010
φ0.06				
SMEZ120	φ0.06	0.06	50	B-006,D-006
NSME230	φ0.06	0.09	45	D-010
φ0.07				
SMEZ120	φ0.07	0.07	50	B-006,D-006
NSME230	φ0.07	0.105	45	D-010
φ0.08				
SMEZ120	φ0.08	0.08	50	B-006,D-006
NSME230	φ0.08	0.12	45	D-010
φ0.09				
SMEZ120	φ0.09	0.09	50	B-006,D-006
NSME230	φ0.09	0.135	45	D-010
φ0.1				
MXH225	φ0.1	0.1	45	F-010
MXH225P	φ0.1	0.1	45	F-020
MSE230SS	φ0.1	0.1	45	G-032
SMEZ120	φ0.1	0.1	50	B-006,D-006
MSES230P	φ0.1	0.15	45	G-036
MSE230	φ0.1	0.15	45	G-038
MSE230M	φ0.1	0.15	45	G-044
RSES230	φ0.1	0.15	50	L-006
MXH230	φ0.1	0.2	45	F-012
MXH230P	φ0.1	0.2	45	F-022
MX230	φ0.1	0.2	45	G-014
MXH235	φ0.1	0.3	45	F-014
MXH235P	φ0.1	0.3	45	F-024
MX235	φ0.1	0.3	45	G-016
RSE230	φ0.1	0.3	45	L-014
PCDSE	φ0.1×0.1	0.02	48	C-006
SSE400	φ0.1×0.2	0.04	53	B-008
MHRH230	φ0.1×0.3	0.08	45	F-038
MHR230	φ0.1×0.3	0.15	45	G-084
RSES230	φ0.1×0.3	0.15	50	L-006
DHR237	φ0.1×0.3	0.2	45	K-006
SSE400	φ0.1×0.5	0.04	53	B-008
MHRH230	φ0.1×0.5	0.08	45	F-038
MHR230	φ0.1×0.5	0.15	45	G-084
RSES230	φ0.1×0.5	0.15	50	L-006
DHR237	φ0.1×0.5	0.2	45	K-006
MHRH230	φ0.1×0.75	0.08	45	F-038
MHR230	φ0.1×0.75	0.15	45	G-084
DHR237	φ0.1×0.75	0.2	45	K-006
RSES230	φ0.1×0.8	0.15	50	L-006
RSE230	φ0.1×0.8	0.3	45	L-014
MHRH230	φ0.1×1	0.08	45	F-038
MHR230	φ0.1×1	0.15	45	G-084
RSES230	φ0.1×1	0.15	50	L-006
DHR237	φ0.1×1	0.2	45	K-006
RSE230	φ0.1×1	0.3	45	L-014
φ0.15				
MSE230SS	φ0.15	0.15	45	G-032
MSES230P	φ0.15	0.2	45	G-036
MSE230	φ0.15	0.2	45	G-038
RSES230	φ0.15	0.23	50	L-006
RSE230	φ0.15	0.45	45	L-014
MHRH230	φ0.15×0.3	0.12	45	F-038
MHR230	φ0.15×0.3	0.2	45	G-084
MHRH230	φ0.15×0.5	0.12	45	F-038
MHR230	φ0.15×0.5	0.2	45	G-084
RSES230	φ0.15×0.5	0.23	50	L-006
MHRH230	φ0.15×0.75	0.12	45	F-038
MHR230	φ0.15×0.75	0.2	45	G-084
RSES230	φ0.15×0.8	0.23	50	L-006
MHRH230	φ0.15×1	0.12	45	F-038
MHR230	φ0.15×1	0.2	45	G-084
RSES230	φ0.15×1	0.23	50	L-006
RSE230	φ0.15×1	0.45	45	L-014
MHRH230	φ0.15×1.5	0.12	45	F-038
MHR230	φ0.15×1.5	0.2	45	G-084
RSES230	φ0.15×1.5	0.23	50	L-006
RSE230	φ0.15×1.5	0.45	45	L-014
φ0.2				
MXH225	φ0.2	0.2	45	F-010
MXH225P	φ0.2	0.2	45	F-020
MSE230SS	φ0.2	0.2	45	G-032
MSES230P	φ0.2	0.3	45	G-036
RSES230	φ0.2	0.3	50	L-006
MXH230	φ0.2	0.4	45	F-012
MXH230P	φ0.2	0.4	45	F-022
MX230	φ0.2	0.4	45	G-014
MSE230	φ0.2	0.4	45	G-038
MSE230M	φ0.2	0.4	45	G-044
MXH235	φ0.2	0.6	45	F-014
MXH235P	φ0.2	0.6	45	F-024
MX235	φ0.2	0.6	45	G-016
RSE230	φ0.2	0.6	45	L-014

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
RSE230	φ0.2	1	45	L-014
PCDSE	φ0.2×0.2	0.04	48	C-006
SSE600	φ0.2×0.4	0.08	53	B-010
MHRH230	φ0.2×0.5	0.15	45	F-038
MHR230	φ0.2×0.5	0.3	45	G-084
DHR237	φ0.2×0.5	0.4	45	K-006
RSES230	φ0.2×0.6	0.3	50	L-006
MHRH230	φ0.2×0.75	0.15	45	F-038
MHR230	φ0.2×0.75	0.3	45	G-084
SSE600	φ0.2×1	0.08	53	B-010
MHRH230	φ0.2×1	0.15	45	F-038
MHR230	φ0.2×1	0.3	45	G-084
RSES230	φ0.2×1	0.3	50	L-006
DHR237	φ0.2×1	0.4	45	K-006
RSE230	φ0.2×1	0.6	45	L-014
MHRH230	φ0.2×1.5	0.15	45	F-038
MHR230	φ0.2×1.5	0.3	45	G-084
RSES230	φ0.2×1.5	0.3	50	L-006
DHR237	φ0.2×1.5	0.4	45	K-006
RSE230	φ0.2×1.5	0.6	45	L-014
MHRH230	φ0.2×2	0.15	45	F-038
MHR230	φ0.2×2	0.3	45	G-084
RSES230	φ0.2×2	0.3	50	L-006
DHR237	φ0.2×2	0.4	45	K-006
RSE230	φ0.2×2	0.6	45	L-014
MHRH230	φ0.2×2.5	0.15	45	F-038
MHR230	φ0.2×2.5	0.3	45	G-084
RSES230	φ0.2×2.5	0.3	50	L-006
MHRH230	φ0.2×3	0.15	45	F-038
MHR230	φ0.2×3	0.3	45	G-084
RSES230	φ0.2×3	0.3	50	L-006
MHR230	φ0.2×3.5	0.3	45	G-084
RSES230	φ0.2×3.5	0.3	50	L-006
MHR230	φ0.2×4	0.3	45	G-084
RSES230	φ0.2×4	0.3	50	L-006
φ0.25				
MSES230P	φ0.25	0.3	45	G-036
MSE230	φ0.25	0.5	45	G-038
φ0.3				
MXH225	φ0.3	0.3	45	F-010
MXH225P	φ0.3	0.3	45	F-020
MX225	φ0.3	0.3	45	G-012
MSE230SS	φ0.3	0.3	45	G-032
MSES230P	φ0.3	0.4	45	G-036
RSES230	φ0.3	0.45	50	L-006
MXH230	φ0.3	0.6	45	F-012
MXH230P	φ0.3	0.6	45	F-022
MX230	φ0.3	0.6	45	G-014
MSE230	φ0.3	0.6	45	G-038
MSE230M	φ0.3	0.6	45	G-044
MXH235	φ0.3	0.9	45	F-014
MXH235P	φ0.3	0.9	45	F-024
MX235	φ0.3	0.9	45	G-016
RSE230	φ0.3	0.9	45	L-014
MXH240	φ0.3	1.2	45	F-016
MX240	φ0.3	1.2	45	G-018
MXH245	φ0.3	1.5	45	F-018
MX245	φ0.3	1.5	45	G-020
RSE230	φ0.3	1.5	45	L-014
RSE230	φ0.3	2	45	L-014
PCDSE	φ0.3×0.3	0.06	48	C-006
SSE600	φ0.3×0.5	0.12	49	B-010
DCMS	φ0.3×0.6	0.15	45	N-006
MHRH230	φ0.3×1	0.25	45	F-038
MHR230	φ0.3×1	0.4	45	G-084
RSES230	φ0.3×1	0.45	50	L-006
DHR237	φ0.3×1	0.6	45	K-006
DCMS	φ0.3×1.2	0.15	45	N-006
SSE600	φ0.3×1.5	0.12	50	B-010
MHRH230	φ0.3×1.5	0.25	45	F-038
MHR230	φ0.3×1.5	0.4	45	G-084
RSES230	φ0.3×1.5	0.45	50	L-006
DHR237	φ0.3×1.5	0.6	45	K-006
RSE230	φ0.3×1.5	0.9	45	L-014
MHRH230	φ0.3×2	0.25	45	F-038
MHR230	φ0.3×2	0.4	45	G-084
RSES230	φ0.3×2	0.45	50	L-007
DHR237	φ0.3×2	0.6	45	K-006
RSE230	φ0.3×2	0.9	45	L-014
MHRH230	φ0.3×2.5	0.25	45	F-038
MHR230	φ0.3×2.5	0.4	45	G-084
RSES230	φ0.3×2.5	0.45	50	L-007
RSE230	φ0.3×2.5	0.9	45	L-014
MHRH230	φ0.3×3	0.25	45	F-038
MHR230	φ0.3×3	0.4	45	G-084
MHRLN230-6	φ0.3×3	0.4	60	G-104
RSES230	φ0.3×3	0.45	50	L-007
DHR237	φ0.3×3	0.6	45	K-006
RSE230	φ0.3×3	0.9	45	L-014
MHR230	φ0.3×4	0.4	45	G-084
RSES230	φ0.3×4	0.45	50	L-007
MHR230	φ0.3×5	0.4	45	G-084
RSES230	φ0.3×5	0.45	50	L-007
MHR230	φ0.3×6	0.4	45	G-084
RSES230	φ0.3×6	0.45	50	L-007
MHR230	φ0.3×9	0.4	45	G-084
RSES230	φ0.3×9	0.45	50	L-007
φ0.35				
MSES230P	φ0.35	0.4	45	G-036
MSE230	φ0.35	0.7	45	G-038
φ0.4				
MXH225	φ0.4	0.4	45	F-010

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
MXH225P	φ0.4	0.4	45	F-020
MX225	φ0.4	0.4	45	G-012
MSE230SS	φ0.4	0.4	45	G-032
MSES230P	φ0.4	0.6	45	G-036
RSES230	φ0.4	0.6	60	L-007
MXH230	φ0.4	0.8	45	F-012
MXH230P	φ0.4	0.8	45	F-022
MX230	φ0.4	0.8	45	G-014
MSE230	φ0.4	0.8	45	G-038
MSE230M	φ0.4	0.8	45	G-044
MXH235	φ0.4	1.2	45	F-014
MXH235P	φ0.4	1.2	45	F-024
MX235	φ0.4	1.2	45	G-016
RSE230	φ0.4	1.2	45	L-014
MXH240	φ0.4	1.6	45	F-016
MX240	φ0.4	1.6	45	G-018
MXH245	φ0.4	2	45	F-018
MX245	φ0.4	2	45	G-020
RSE230	φ0.4	2	45	L-014
RSE230	φ0.4	3	45	L-014
PCDSE	φ0.4×0.4	0.08	48	C-006
SSE600	φ0.4×0.8	0.16	49	B-010
DCMS	φ0.4×0.8	0.2	45	N-006
MHRH230	φ0.4×1	0.3	45	F-038
MHR230	φ0.4×1	0.6	45	G-084
DHR237	φ0.4×1	0.8	45	K-006
MHRH230	φ0.4×1.5	0.3	45	F-038
MHR230	φ0.4×1.5	0.6	45	G-084
RSES230	φ0.4×1.5	0.6	60	L-007
DCMS	φ0.4×1.6	0.2	45	N-006
SSE600	φ0.4×2	0.16	50	B-010
MHRH230	φ0.4×2	0.3	45	F-038
MHR230	φ0.4×2	0.6	45	G-084
RSES230	φ0.4×2	0.6	60	L-007
DHR237	φ0.4×2	0.8	45	K-006
RSE230	φ0.4×2	1.2	45	L-014
MHRH230	φ0.4×2.5	0.3	45	F-038
MHR230	φ0.4×2.5	0.6	45	G-084
RSES230	φ0.4×2.5	0.6	60	L-007
RSE230	φ0.4×2.5	1.2	45	L-015
MHRH230	φ0.4×3	0.3	45	F-038
MHR230	φ0.4×3	0.6	45	G-084
RSES230	φ0.4×3	0.6	60	L-007
MHRLN230-6	φ0.4×3	0.6	60	G-104
DHR237	φ0.4×3	0.8	45	K-006
RSE230	φ0.4×3	1.2	45	L-015
MHRH230	φ0.4×3.5	0.3	45	F-038
MHR230	φ0.4 ×3.5	0.6	45	G-085
RSES230	φ0.4 ×3.5	0.6	60	L-007
MHRH230	φ0.4×4	0.3	45	F-038
MHR230	φ0.4×4	0.6	45	G-085

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
RSES230	φ0.4×4	0.6	60	L-007
MHRLN230-6	φ0.4×4	0.6	60	G-104
DHR237	φ0.4×4	0.8	45	K-006
RSE230	φ0.4×4	1.2	45	L-015
MHRH230	φ0.4×5	0.3	45	F-038
MHR230	φ0.4×5	0.6	45	G-085
MHRLN230-6	φ0.4×5	0.6	60	G-104
RSE230	φ0.4×5	1.2	45	L-015
MHRH230	φ0.4×6	0.3	45	F-038
MHR230	φ0.4×6	0.6	45	G-085
RSES230	φ0.4×6	0.6	60	L-007
MHR230	φ0.4×7	0.6	45	G-085
MHRH230	φ0.4×8	0.3	45	F-038
MHR230	φ0.4×8	0.6	45	G-085
RSES230	φ0.4×8	0.6	60	L-007
MHR230	φ0.4×9	0.6	45	G-085
MHRH230	φ0.4×10	0.3	45	F-038
MHR230	φ0.4×10	0.6	45	G-085
RSES230	φ0.4×10	0.6	60	L-007
MHR230	φ0.4×12	0.6	45	G-085
RSES230	φ0.4×12	0.6	60	L-007
φ0.45				
MSES230P	φ0.45	0.6	45	G-036
MSE230	φ0.45	0.9	45	G-038
φ0.5				
MXH225	φ0.5	0.5	45	F-010
MXH225P	φ0.5	0.5	45	F-020
MX225	φ0.5	0.5	45	G-012
MSE230SS	φ0.5	0.5	45	G-032
MSES230P	φ0.5	0.7	45	G-036
RSES230	φ0.5	0.75	60	L-007
MXH230	φ0.5	1	45	F-012
MXH230P	φ0.5	1	45	F-022
MX230	φ0.5	1	45	G-014
AL2D-2	φ0.5	1	45	J-006
AL2D-2DLC	φ0.5	1	45	J-008
MSE230	φ0.5	1.25	45	G-038
MSE230M	φ0.5	1.25	45	G-044
MXH235	φ0.5	1.5	45	F-014
MXH235P	φ0.5	1.5	45	F-024
MX235	φ0.5	1.5	45	G-016
RSE230	φ0.5	1.5	45	L-015
DCSE235	φ0.5	1.5	45	M-006
MXH240	φ0.5	2	45	F-016
MX240	φ0.5	2	45	G-018
MSEM230	φ0.5	2	50	G-042
MXH245	φ0.5	2.5	45	F-018
MX245	φ0.5	2.5	45	G-020
RSE230	φ0.5	2.5	45	L-015
RSE230	φ0.5	5	45	L-015
PCDSE	φ0.5×0.5	0.1	48	C-006

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
SSE600	φ0.5×1	0.2	49	B-010
DCMS	φ0.5×1	0.25	45	N-006
MHRH230	φ0.5×1	0.4	45	F-038
MHR230	φ0.5×1	0.7	45	G-085
MHRH230	φ0.5×1.5	0.4	45	F-038
MHR230	φ0.5×1.5	0.7	45	G-085
DHR237	φ0.5×1.5	1	45	K-006
DCMS	φ0.5×2	0.25	45	N-006
MHRH230	φ0.5×2	0.4	45	F-038
MHR230	φ0.5×2	0.7	45	G-085
RSES230	φ0.5×2	0.75	60	L-007
DHR237	φ0.5×2	1	45	K-006
DCHR230	φ0.5×2	1	45	M-008
SSE600	φ0.5×2.5	0.2	50	B-010
MHRH230	φ0.5×2.5	0.4	45	F-038
MHR230	φ0.5×2.5	0.7	45	G-085
MHRH230	φ0.5×3	0.4	45	F-039
MHR230	φ0.5×3	0.7	45	G-085
RSES230	φ0.5×3	0.75	60	L-007
DHR237	φ0.5×3	1	45	K-006
RSE230	φ0.5×3	1.5	45	L-015
MHRH230	φ0.5×3.5	0.4	45	F-039
MHR230	φ0.5×3.5	0.7	45	G-085
MHRH230	φ0.5×4	0.4	45	F-039
MHR230	φ0.5×4	0.7	45	G-085
MHRLN230-6	φ0.5×4	0.7	60	G-104
RSES230	φ0.5×4	0.75	60	L-007
DHR237	φ0.5×4	1	45	K-006
DCHR230	φ0.5×4	1	45	M-008
RSE230	φ0.5×4	1.5	45	L-015
MHRH230	φ0.5×4.5	0.4	45	F-039
MHR230	φ0.5×4.5	0.7	45	G-085
MHRH230	φ0.5×5	0.4	45	F-039
MHR230	φ0.5×5	0.7	45	G-085
MHRLN230-6	φ0.5×5	0.7	60	G-104
MHRH230	φ0.5×6	0.4	45	F-039
MHR230	φ0.5×6	0.7	45	G-085
MHRLN230-6	φ0.5×6	0.7	60	G-104
RSES230	φ0.5×6	0.75	60	L-007
DHR237	φ0.5×6	1	45	K-006
DCHR230	φ0.5×6	1	45	M-008
RSE230	φ0.5×6	1.5	45	L-015
MHRH230	φ0.5×7	0.4	45	F-039
MHR230	φ0.5×7	0.7	45	G-085
MHRH230	φ0.5×8	0.4	50	F-039
MHR230	φ0.5×8	0.7	50	G-085
RSES230	φ0.5×8	0.75	60	L-007
RSE230	φ0.5×8	1.5	50	L-015
MHRH230	φ0.5×9	0.4	50	F-039
MHR230	φ0.5×9	0.7	50	G-085
MHRH230	φ0.5×10	0.4	50	F-039

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
MHR230	φ0.5×10	0.7	50	G-085
RSES230	φ0.5×10	0.75	60	L-007
RSE230	φ0.5×10	1.5	50	L-015
MHR230	φ0.5×12	0.7	50	G-085
RSES230	φ0.5×12	0.75	60	L-007
RSE230	φ0.5×12	1.5	50	L-015
MHR230	φ0.5×15	0.7	50	G-085
RSES230	φ0.5×15	0.75	60	L-007
RSE230	φ0.5×15	1.5	50	L-015
RSES230	φ0.5×18	0.75	60	L-007
RSES230	φ0.5×20	0.75	60	L-007
RSE230	φ0.5×20	1.5	50	L-015
φ0.55				
MSE230	φ0.55	1.3	45	G-038
φ0.6				
MXH225	φ0.6	0.6	45	F-010
MXH225P	φ0.6	0.6	45	F-020
MSE230SS	φ0.6	0.6	45	G-032
RSES230	φ0.6	0.9	60	L-007
MSES230P	φ0.6	1	45	G-036
MXH230	φ0.6	1.2	45	F-012
MXH230P	φ0.6	1.2	45	F-022
MX230	φ0.6	1.2	45	G-014
AL2D-2	φ0.6	1.2	45	J-006
AL2D-2DLC	φ0.6	1.2	45	J-008
MSE230	φ0.6	1.5	45	G-038
MXH235	φ0.6	1.8	45	F-014
MXH235P	φ0.6	1.8	45	F-024
MX235	φ0.6	1.8	45	G-016
RSE230	φ0.6	1.8	45	L-015
MX240	φ0.6	2.4	45	G-018
MSEM230	φ0.6	2.4	50	G-042
RSE230	φ0.6	3	45	L-015
RSE230	φ0.6	4	45	L-015
PCDSE	φ0.6×0.6	0.12	48	C-006
SSE600	φ0.6×1.2	0.24	49	B-010
MHRH230	φ0.6×1.5	0.5	45	F-039
MHR230	φ0.6×1.5	0.9	45	G-085
MHRH230	φ0.6×2	0.5	45	F-039
MHR230	φ0.6×2	0.9	45	G-085
DHR237	φ0.6×2	1.2	45	K-006
SSE600	φ0.6×3	0.24	50	B-010
MHRH230	φ0.6×3	0.5	45	F-039
MHR230	φ0.6×3	0.9	45	G-085
RSES230	φ0.6×3	0.9	60	L-007
DHR237	φ0.6×3	1.2	45	K-006
MHRH230	φ0.6×4	0.5	45	F-039
MHR230	φ0.6×4	0.9	45	G-085
MHRLN230-6	φ0.6×4	0.9	60	G-104
RSES230	φ0.6×4	0.9	60	L-007
DHR237	φ0.6×4	1.2	45	K-006

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
RSE230	ϕ0.6×4	1.8	45	L-015
MHRH230	ϕ0.6×5	0.5	45	F-039
MHR230	ϕ0.6×5	0.9	45	G-085
MHRH230	ϕ0.6×6	0.5	45	F-039
MHR230	ϕ0.6×6	0.9	45	G-085
MHRLN230-6	ϕ0.6×6	0.9	60	G-104
RSES230	ϕ0.6×6	0.9	60	L-007
DHR237	ϕ0.6×6	1.2	45	K-006
RSE230	ϕ0.6×6	1.8	45	L-015
MHR230	ϕ0.6×7	0.9	45	G-085
MHR230	ϕ0.6×8	0.9	50	G-086
RSES230	ϕ0.6×8	0.9	60	L-007
RSE230	ϕ0.6×8	1.8	50	L-015
MHR230	ϕ0.6×9	0.9	50	G-086
MHR230	ϕ0.6×10	0.9	50	G-086
RSES230	ϕ0.6×10	0.9	60	L-008
RSE230	ϕ0.6×10	1.8	50	L-015
MHR230	ϕ0.6×12	0.9	50	G-086
RSES230	ϕ0.6×12	0.9	60	L-008
RSE230	ϕ0.6×12	1.8	50	L-015
MHR230	ϕ0.6×15	0.9	50	G-086
RSES230	ϕ0.6×15	0.9	60	L-008
MHR230	ϕ0.6×18	0.9	50	G-086
RSES230	ϕ0.6×18	0.9	60	L-008
ϕ0.65				
MSE230	ϕ0.65	1.5	45	G-038
ϕ0.7				
MXH225	ϕ0.7	0.7	45	F-010
MXH225P	ϕ0.7	0.7	45	F-020
MSE230SS	ϕ0.7	0.7	45	G-032
RSES230	ϕ0.7	1.05	60	L-008
MSES230P	ϕ0.7	1.2	45	G-036
MXH230	ϕ0.7	1.4	45	F-012
MXH230P	ϕ0.7	1.4	45	F-022
MX230	ϕ0.7	1.4	45	G-014
AL2D-2	ϕ0.7	1.4	45	J-006
AL2D-2DLC	ϕ0.7	1.4	45	J-008
MSE230	ϕ0.7	1.8	45	G-038
MXH235	ϕ0.7	2.1	45	F-014
MXH235P	ϕ0.7	2.1	45	F-024
MX235	ϕ0.7	2.1	45	G-016
MX240	ϕ0.7	2.8	45	G-018
MHRH230	ϕ0.7×2	0.55	45	F-039
MHR230	ϕ0.7×2	1	45	G-086
MHRH230	ϕ0.7×4	0.55	45	F-039
MHR230	ϕ0.7×4	1	45	G-086
RSES230	ϕ0.7×4	1.05	60	L-008
MHRH230	ϕ0.7×6	0.55	45	F-039
MHR230	ϕ0.7×6	1	45	G-086
RSES230	ϕ0.7×6	1.05	60	L-008
MHRH230	ϕ0.7×8	0.55	50	F-039

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230	ϕ0.7×8	1	50	G-086
RSES230	ϕ0.7×8	1.05	60	L-008
MHRH230	ϕ0.7×10	0.55	50	F-039
MHR230	ϕ0.7×10	1	50	G-086
RSES230	ϕ0.7×10	1.05	60	L-008
RSES230	ϕ0.7×12	1.05	60	L-008
RSES230	ϕ0.7×14	1.05	60	L-008
ϕ0.75				
MSE230	ϕ0.75	1.8	45	G-038
ϕ0.8				
MXH225	ϕ0.8	0.8	45	F-010
MXH225P	ϕ0.8	0.8	45	F-020
MX225	ϕ0.8	0.8	45	G-012
MSE230SS	ϕ0.8	0.8	45	G-032
RSES230	ϕ0.8	1.2	60	L-008
MSES230P	ϕ0.8	1.5	45	G-036
MXH230	ϕ0.8	1.6	45	F-012
MXH230P	ϕ0.8	1.6	45	F-022
MX230	ϕ0.8	1.6	45	G-014
AL2D-2	ϕ0.8	1.6	45	J-006
AL2D-2DLC	ϕ0.8	1.6	45	J-008
MSE230	ϕ0.8	2	45	G-038
MSE230M	ϕ0.8	2	45	G-044
MXH235	ϕ0.8	2.4	45	F-014
MXH235P	ϕ0.8	2.4	45	F-024
MX235	ϕ0.8	2.4	45	G-016
RSE230	ϕ0.8	2.4	45	L-015
MXH240	ϕ0.8	3.2	45	F-016
MX240	ϕ0.8	3.2	45	G-018
MSEM230	ϕ0.8	3.2	50	G-042
MXH245	ϕ0.8	4	45	F-018
MX245	ϕ0.8	4	45	G-020
RSE230	ϕ0.8	4	45	L-015
RSE230	ϕ0.8	6	45	L-015
PCDSE	ϕ0.8×0.8	0.16	48	C-006
SSE600	ϕ0.8×1.5	0.32	49	B-010
DCMS	ϕ0.8×1.6	0.4	45	N-006
MHRH230	ϕ0.8×3	0.65	45	F-039
MHR230	ϕ0.8×3	1.2	45	G-086
DHR237	ϕ0.8×3	1.6	45	K-007
DCMS	ϕ0.8×3.2	0.4	45	N-006
SSE600	ϕ0.8×4	0.32	52	B-010
MHRH230	ϕ0.8×4	0.65	45	F-039
MHR230	ϕ0.8×4	1.2	45	G-086
RSES230	ϕ0.8×4	1.2	60	L-008
DHR237	ϕ0.8×4	1.6	45	K-007
MHRH230	ϕ0.8×5	0.65	45	F-039
MHR230	ϕ0.8×5	1.2	45	G-086
MHRH230	ϕ0.8×6	0.65	45	F-039
MHR230	ϕ0.8×6	1.2	45	G-086
RSES230	ϕ0.8×6	1.2	60	L-008

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
DHR237	ϕ0.8×6	1.6	45	K-007
RSE230	ϕ0.8×6	2.4	45	L-015
MHRH230	ϕ0.8×8	0.65	50	F-039
MHR230	ϕ0.8×8	1.2	50	G-086
MHRLN230-6	ϕ0.8×8	1.2	60	G-104
RSES230	ϕ0.8×8	1.2	60	L-008
DHR237	ϕ0.8×8	1.6	50	K-007
RSE230	ϕ0.8×8	2.4	50	L-015
MHRH230	ϕ0.8×10	0.65	50	F-039
MHR230	ϕ0.8×10	1.2	50	G-086
RSES230	ϕ0.8×10	1.2	60	L-008
RSE230	ϕ0.8×10	2.4	50	L-015
MHRH230	ϕ0.8×12	0.65	50	F-039
MHR230	ϕ0.8×12	1.2	50	G-086
RSES230	ϕ0.8×12	1.2	60	L-008
RSE230	ϕ0.8×12	2.4	50	L-015
MHR230	ϕ0.8×14	1.2	50	G-086
RSES230	ϕ0.8×14	1.2	60	L-008
MHR230	ϕ0.8×16	1.2	50	G-086
RSES230	ϕ0.8×16	1.2	60	L-008
RSE230	ϕ0.8×16	2.4	60	L-015
RSES230	ϕ0.8×18	1.2	60	L-008
MHR230	ϕ0.8×20	1.2	60	G-086
RSES230	ϕ0.8×20	1.2	60	L-008
MHR230	ϕ0.8×24	1.2	60	G-086
RSES230	ϕ0.8×24	1.2	60	L-008
ϕ0.85				
MSE230	ϕ0.85	2	45	G-038
ϕ0.9				
MXH225	ϕ0.9	0.9	45	F-010
MXH225P	ϕ0.9	0.9	45	F-020
MSE230SS	ϕ0.9	0.9	45	G-032
RSES230	ϕ0.9	1.35	60	L-008
MXH230	ϕ0.9	1.8	45	F-012
MXH230P	ϕ0.9	1.8	45	F-022
MX230	ϕ0.9	1.8	45	G-014
AL2D-2	ϕ0.9	1.8	45	J-006
AL2D-2DLC	ϕ0.9	1.8	45	J-008
MSE230	ϕ0.9	2	45	G-038
MXH235	ϕ0.9	2.7	45	F-014
MXH235P	ϕ0.9	2.7	45	F-024
MX235	ϕ0.9	2.7	45	G-016
MX240	ϕ0.9	3.6	45	G-018
MHR230	ϕ0.9×4	1.4	45	G-086
RSES230	ϕ0.9×6	1.35	60	L-008
MHR230	ϕ0.9×6	1.4	45	G-086
RSES230	ϕ0.9×8	1.35	60	L-008
MHR230	ϕ0.9×8	1.4	50	G-086
RSES230	ϕ0.9×10	1.35	60	L-008
MHR230	ϕ0.9×10	1.4	50	G-086
RSES230	ϕ0.9×12	1.35	60	L-008

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230	ϕ0.9×12	1.4	50	G-086
MHR230	ϕ0.9×15	1.4	60	G-086
RSES230	ϕ0.9×16	1.35	60	L-008
RSES230	ϕ0.9×18	1.35	60	L-008
ϕ0.95				
MSE230	ϕ0.95	2	45	G-038
ϕ1				
MXH225	ϕ1	1	45	F-010
MXH225P	ϕ1	1	45	F-020
MX225	ϕ1	1	45	G-012
MX425	ϕ1	1	45	G-022
MSE230SS	ϕ1	1	45	G-032
MSZ345	ϕ1	1.5	45	I-010
MHD445	ϕ1	1.5	60	G-058
RSES230	ϕ1	1.5	70	L-008
MXH230	ϕ1	2	45	F-012
MXH230P	ϕ1	2	45	F-022
MX230	ϕ1	2	45	G-014
MX430	ϕ1	2	45	G-024
MSES230P	ϕ1	2	45	G-036
AL2D-2	ϕ1	2	45	J-006
AL2D-2DLC	ϕ1	2	45	J-008
MSUSZ440	ϕ1	2	50	I-006
MSCZ440	ϕ1	2	50	I-008
MHDSH445	ϕ1	2	60	E-006
MHDH445	ϕ1	2	60	F-026
MSE230	ϕ1	2.5	45	G-038
MSE230M	ϕ1	2.5	45	G-044
MSE430P	ϕ1	2.5	45	G-050
MSE430	ϕ1	2.5	45	G-052
MXH235	ϕ1	3	45	F-014
MXH235P	ϕ1	3	45	F-024
MX235	ϕ1	3	45	G-016
MX435	ϕ1	3	45	G-026
AL3D-2	ϕ1	3	45	J-010
AL3D-2DLC	ϕ1	3	45	J-012
RSE230	ϕ1	3	45	L-015
DCSE235	ϕ1	3	45	M-006
MSUSZ440	ϕ1	3	50	I-006
MSCZ440	ϕ1	3	50	I-008
AL3D-345	ϕ1	3	60	I-014,J-022
MHDSH445	ϕ1	3	60	E-006
MXH240	ϕ1	4	45	F-016
MX240	ϕ1	4	45	G-018
MX440	ϕ1	4	45	G-028
MSEM230	ϕ1	4	50	G-042
MSEM430	ϕ1	4	50	G-056
AL4D-2	ϕ1	4	50	J-014
AL4D-2DLC	ϕ1	4	50	J-016
MXH245	ϕ1	5	45	F-018
MX245	ϕ1	5	45	G-020

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MX445	ϕ1	5	45	G-030
AL5D-2	ϕ1	5	50	J-018
AL5D-2DLC	ϕ1	5	50	J-020
RSE230	ϕ1	5	50	L-015
RSE230	ϕ1	7.5	50	L-015
RSE230	ϕ1	10	50	L-016
PCDSE	ϕ1×1	0.2	48	C-006
SSE600	ϕ1×2	0.4	49	B-010
DCMS	ϕ1×2	0.5	45	N-006
MHRH230	ϕ1×2	0.8	50	F-039
MHR230	ϕ1×2	1.5	50	G-086
MHRH230	ϕ1×3	0.8	50	F-039
ALZ345-DLC	ϕ1×3	1.5	45	I-020,J-030
ALZ345	ϕ1×3	1.5	45	I-022,J-026
MHR230	ϕ1×3	1.5	50	G-086
MSUSZ440-LN	ϕ1×3	1.5	50	I-016
MSCZ440-LN	ϕ1×3	1.5	50	I-018
MHRLN230-6	ϕ1×3	1.5	60	G-104
DHR237	ϕ1×3	2	45	K-007
DCMS	ϕ1×4	0.5	45	N-006
MHRH230	ϕ1×4	0.8	50	F-039
MHRH430	ϕ1×4	0.8	50	F-044
MHR230	ϕ1×4	1.5	50	G-086
MHR430	ϕ1×4	1.5	50	G-096
MSUSZ440-LN	ϕ1×4	1.5	50	I-016
MSCZ440-LN	ϕ1×4	1.5	50	I-018
RSES230	ϕ1×4	1.5	70	L-008
DHR237	ϕ1×4	2	45	K-007
DCHR230	ϕ1×4	2	50	M-008
SSE600	ϕ1×5	0.4	52	B-010
MHRH230	ϕ1×5	0.8	50	F-039
MHR230	ϕ1×5	1.5	50	G-086
MSUSZ440-LN	ϕ1×5	1.5	50	I-016
MSCZ440-LN	ϕ1×5	1.5	50	I-018
ALZ345	ϕ1×5	1.5	60	I-022,J-026
DHR237	ϕ1×5	2	45	K-007
MHRH230	ϕ1×6	0.8	50	F-039
MHRH430	ϕ1×6	0.8	50	F-044
MHR230	ϕ1×6	1.5	50	G-087
MHR430	ϕ1×6	1.5	50	G-096
MHRLN230-6	ϕ1×6	1.5	60	G-104
RSES230	ϕ1×6	1.5	70	L-008
DHR237	ϕ1×6	2	45	K-007
DCHR230	ϕ1×6	2	50	M-008
RSE230	ϕ1×6	3	50	L-016
MHRH230	ϕ1×7	0.8	50	F-039
MHR230	ϕ1×7	1.5	50	G-087
MHRH230	ϕ1×8	0.8	50	F-039
MHRH430	ϕ1×8	0.8	50	F-044
MHR230	ϕ1×8	1.5	50	G-087
MHR430	ϕ1×8	1.5	50	G-096

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRLN230-6	ϕ1×8	1.5	60	G-104
RSES230	ϕ1×8	1.5	70	L-008
DHR237	ϕ1×8	2	50	K-007
DCHR230	ϕ1×8	2	50	M-008
RSE230	ϕ1×8	3	50	L-016
MHRH230	ϕ1×9	0.8	50	F-039
MHR230	ϕ1×9	1.5	50	G-087
MHRH230	ϕ1×10	0.8	50	F-039
MHRH430	ϕ1×10	0.8	50	F-044
MHR230	ϕ1×10	1.5	50	G-087
MHR430	ϕ1×10	1.5	50	G-096
MHRLN230-6	ϕ1×10	1.5	60	G-104
RSES230	ϕ1×10	1.5	70	L-008
DHR237	ϕ1×10	2	50	K-007
DCHR230	ϕ1×10	2	50	M-008
RSE230	ϕ1×10	3	50	L-016
MHRH230	ϕ1×12	0.8	50	F-039
MHR230	ϕ1×12	1.5	50	G-087
MHR430	ϕ1×12	1.5	50	G-096
RSES230	ϕ1×12	1.5	70	L-009
DHR237	ϕ1×12	2	50	K-007
RSE230	ϕ1×12	3	50	L-016
MHRH230	ϕ1×14	0.8	50	F-039
MHR230	ϕ1×14	1.5	50	G-087
RSES230	ϕ1×14	1.5	70	L-009
RSES230	ϕ1×15	1.5	70	L-009
RSE230	ϕ1×15	3	60	L-016
MHRH230	ϕ1×16	0.8	60	F-039
MHR430	ϕ1×16	1.5	50	G-096
MHR230	ϕ1×16	1.5	60	G-087
MHRH230	ϕ1×18	0.8	60	F-039
MHR230	ϕ1×18	1.5	60	G-087
RSES230	ϕ1×18	1.5	70	L-009
MHRH230	ϕ1×20	0.8	60	F-039
MHR230	ϕ1×20	1.5	60	G-087
RSES230	ϕ1×20	1.5	70	L-009
RSE230	ϕ1×20	3	60	L-016
MHRH230	ϕ1×22	0.8	60	F-039
MHR230	ϕ1×22	1.5	60	G-087
MHR230	ϕ1×25	1.5	70	G-087
RSES230	ϕ1×25	1.5	70	L-009
RSE230	ϕ1×25	3	70	L-016
MHR230	ϕ1×30	1.5	70	G-087
RSES230	ϕ1×30	1.5	70	L-009
RSE230	ϕ1×30	3	70	L-016
RSES230	ϕ1×35	1.5	70	L-009
RSE230	ϕ1×35	3	80	L-016
ϕ1.05				
MSE230	ϕ1.05	2.5	45	G-038
ϕ1.1				
MXH225	ϕ1.1	1.1	45	F-010

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MXH225P	ϕ1.1	1.1	45	F-020
MSE230SS	ϕ1.1	1.1	45	G-032
MSZ345	ϕ1.1	1.7	45	I-010
MXH230	ϕ1.1	2.2	45	F-012
MXH230P	ϕ1.1	2.2	45	F-022
MX230	ϕ1.1	2.2	45	G-014
AL2D-2	ϕ1.1	2.2	45	J-006
MSUSZ440	ϕ1.1	2.2	50	I-006
MSCZ440	ϕ1.1	2.2	50	I-008
MSE230	ϕ1.1	2.5	45	G-038
MXH235	ϕ1.1	3.3	45	F-014
MXH235P	ϕ1.1	3.3	45	F-024
MX235	ϕ1.1	3.3	45	G-016
MX240	ϕ1.1	4.4	45	G-018
ALZ345	ϕ1.1×3.3	1.7	45	I-022,J-026
MHR430	ϕ1.1×6	1.7	50	G-096
MHR430	ϕ1.1×10	1.7	50	G-096
MHR430	ϕ1.1×16	1.7	60	G-096
ϕ1.15				
MSE230	ϕ1.15	2.5	45	G-038
ϕ1.2				
MXH225	ϕ1.2	1.2	45	F-010
MXH225P	ϕ1.2	1.2	45	F-020
MX225	ϕ1.2	1.2	45	G-012
MSE230SS	ϕ1.2	1.2	45	G-032
MSZ345	ϕ1.2	1.8	45	I-010
MXH230	ϕ1.2	2.4	45	F-012
MXH230P	ϕ1.2	2.4	45	F-022
MX230	ϕ1.2	2.4	45	G-014
AL2D-2	ϕ1.2	2.4	45	J-006
MSUSZ440	ϕ1.2	2.4	50	I-006
MSCZ440	ϕ1.2	2.4	50	I-008
MSES230P	ϕ1.2	2.5	45	G-036
MSE230	ϕ1.2	3	45	G-038
MXH235	ϕ1.2	3.6	45	F-014
MXH235P	ϕ1.2	3.6	45	F-024
MX235	ϕ1.2	3.6	45	G-016
MXH240	ϕ1.2	4.8	45	F-016
MX240	ϕ1.2	4.8	45	G-018
MXH245	ϕ1.2	6	45	F-018
MX245	ϕ1.2	6	45	G-020
ALZ345	ϕ1.2×3.6	1.8	45	I-022,J-026
MHR230	ϕ1.2×4	1.8	50	G-087
MHRH230	ϕ1.2×6	1	50	F-039
MHRH430	ϕ1.2×6	1	50	F-044
MHR230	ϕ1.2×6	1.8	50	G-087
MHR430	ϕ1.2×6	1.8	50	G-096
MHRH230	ϕ1.2×8	1	50	F-039
MHRH430	ϕ1.2×8	1	50	F-044
MHR230	ϕ1.2×8	1.8	50	G-087
MHR430	ϕ1.2×8	1.8	50	G-096

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH230	ϕ1.2×10	1	50	F-039
MHRH430	ϕ1.2×10	1	50	F-044
MHR230	ϕ1.2×10	1.8	50	G-087
MHR430	ϕ1.2×10	1.8	50	G-096
MHRH230	ϕ1.2×12	1	50	F-039
MHRH430	ϕ1.2×12	1	50	F-044
MHR230	ϕ1.2×12	1.8	50	G-087
MHR430	ϕ1.2×12	1.8	50	G-096
MHRH230	ϕ1.2×16	1	60	F-039
MHR230	ϕ1.2×16	1.8	60	G-087
MHR430	ϕ1.2×16	1.8	60	G-096
MHR230	ϕ1.2×20	1.8	60	G-087
ϕ1.25				
MSE230	ϕ1.25	3	45	G-038
ϕ1.3				
MXH225	ϕ1.3	1.3	45	F-010
MXH225P	ϕ1.3	1.3	45	F-020
MSE230SS	ϕ1.3	1.3	45	G-032
MSZ345	ϕ1.3	2	45	I-010
MXH230	ϕ1.3	2.6	45	F-012
MXH230P	ϕ1.3	2.6	45	F-022
MX230	ϕ1.3	2.6	45	G-014
AL2D-2	ϕ1.3	2.6	45	J-006
MSUSZ440	ϕ1.3	2.6	50	I-006
MSCZ440	ϕ1.3	2.6	50	I-008
MSE230	ϕ1.3	3	45	G-038
MXH235	ϕ1.3	3.9	45	F-014
MXH235P	ϕ1.3	3.9	45	F-024
MX235	ϕ1.3	3.9	45	G-016
MX240	ϕ1.3	5.2	45	G-018
ALZ345	ϕ1.3×3.9	2	45	I-022,J-026
MHR430	ϕ1.3×6	1.9	50	G-096
MHR430	ϕ1.3×12	1.9	50	G-096
MHR430	ϕ1.3×18	1.9	60	G-096
ϕ1.35				
MSE230	ϕ1.35	3	45	G-038
ϕ1.4				
MXH225	ϕ1.4	1.4	45	F-010
MXH225P	ϕ1.4	1.4	45	F-020
MSE230SS	ϕ1.4	1.4	45	G-032
MSZ345	ϕ1.4	2.1	45	I-010
MXH230	ϕ1.4	2.8	45	F-012
MXH230P	ϕ1.4	2.8	45	F-022
MX230	ϕ1.4	2.8	45	G-014
AL2D-2	ϕ1.4	2.8	45	J-006
MSUSZ440	ϕ1.4	2.8	50	I-006
MSCZ440	ϕ1.4	2.8	50	I-008
MSE230	ϕ1.4	3.5	45	G-039
MXH235	ϕ1.4	4.2	45	F-014
MXH235P	ϕ1.4	4.2	45	F-024
MX235	ϕ1.4	4.2	45	G-016

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MX240	ϕ1.4	5.6	45	G-018
ALZ345	ϕ1.4×4.2	2.1	45	I-022,J-026
MHRH230	ϕ1.4×6	1.1	50	F-039
MHR230	ϕ1.4×6	2.1	50	G-087
MHR430	ϕ1.4×6	2.1	50	G-096
MHR230	ϕ1.4×8	2.1	50	G-087
MHR430	ϕ1.4×8	2.1	50	G-096
MHR230	ϕ1.4×10	2.1	50	G-087
MHR430	ϕ1.4×10	2.1	50	G-096
MHRH230	ϕ1.4×12	1.1	50	F-039
MHR230	ϕ1.4×12	2.1	50	G-087
MHR430	ϕ1.4×12	2.1	50	G-096
MHR230	ϕ1.4×14	2.1	60	G-087
MHR430	ϕ1.4×14	2.1	60	G-096
MHR230	ϕ1.4×16	2.1	60	G-087
MHR430	ϕ1.4×16	2.1	60	G-096
MHR230	ϕ1.4×22	2.1	60	G-087
MHR430	ϕ1.4×22	2.1	60	G-096
ϕ1.45				
MSE230	ϕ1.45	3.5	45	G-039
ϕ1.5				
MXH225	ϕ1.5	1.5	45	F-010
MXH225P	ϕ1.5	1.5	45	F-020
MX225	ϕ1.5	1.5	45	G-012
MX425	ϕ1.5	1.5	45	G-022
MSE230SS	ϕ1.5	1.5	45	G-032
RSES230	ϕ1.5	2.25	70	L-009
MSZ345	ϕ1.5	2.3	45	I-010
MHD445	ϕ1.5	2.5	60	G-058
MXH230	ϕ1.5	3	45	F-012
MXH230P	ϕ1.5	3	45	F-022
MX230	ϕ1.5	3	45	G-014
MX430	ϕ1.5	3	45	G-024
MSES230P	ϕ1.5	3	45	G-036
AL2D-2	ϕ1.5	3	45	J-006
AL2D-2DLC	ϕ1.5	3	45	J-008
MSUSZ440	ϕ1.5	3	50	I-006
MSCZ440	ϕ1.5	3	50	I-008
MHDSH445	ϕ1.5	3	60	E-006
MHDH445	ϕ1.5	3	60	F-026
MSE230	ϕ1.5	4	45	G-039
MSE230M	ϕ1.5	4	45	G-044
MSE430P	ϕ1.5	4	45	G-050
MSE430	ϕ1.5	4	45	G-052
MXH235	ϕ1.5	4.5	45	F-014
MXH235P	ϕ1.5	4.5	45	F-024
MX235	ϕ1.5	4.5	45	G-016
MX435	ϕ1.5	4.5	45	G-026
AL3D-2	ϕ1.5	4.5	45	J-010
AL3D-2DLC	ϕ1.5	4.5	45	J-012
RSE230	ϕ1.5	4.5	45	L-016

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
DCSE235	ϕ1.5	4.5	45	M-006
MSUSZ440	ϕ1.5	4.5	50	I-006
MSCZ440	ϕ1.5	4.5	50	I-008
MHDSH445	ϕ1.5	4.5	60	E-006
MXH240	ϕ1.5	6	45	F-016
MX240	ϕ1.5	6	45	G-018
MX440	ϕ1.5	6	45	G-028
MSEM230	ϕ1.5	6	50	G-042
MSEM430	ϕ1.5	6	50	G-056
AL4D-2	ϕ1.5	6	50	J-014
AL4D-2DLC	ϕ1.5	6	50	J-016
MXH245	ϕ1.5	7.5	45	F-018
MX245	ϕ1.5	7.5	45	G-020
MX445	ϕ1.5	7.5	45	G-030
AL5D-2	ϕ1.5	7.5	50	J-018
AL5D-2DLC	ϕ1.5	7.5	50	J-020
RSE230	ϕ1.5	7.5	50	L-016
RSE230	ϕ1.5	15	60	L-016
DCMS	ϕ1.5×3	0.75	45	N-006
MHRLN230-6	ϕ1.5×3	2.3	60	G-104
MHRH230	ϕ1.5×4	1.2	50	F-040
MHR230	ϕ1.5×4	2.3	50	G-087
DHR237	ϕ1.5×4	3	45	K-007
ALZ345-DLC	ϕ1.5×4.5	2.3	45	I-020,J-030
ALZ345	ϕ1.5×4.5	2.3	45	I-022,J-026
MSUSZ440-LN	ϕ1.5×4.5	2.3	50	I-016
MSCZ440-LN	ϕ1.5×4.5	2.3	50	I-018
MHRLN230-6	ϕ1.5×5	2.3	60	G-104
DCMS	ϕ1.5×6	0.75	45	N-006
MHRH230	ϕ1.5×6	1.2	50	F-040
MHRH430	ϕ1.5×6	1.2	50	F-044
RSES230	ϕ1.5×6	2.25	70	L-009
MHR230	ϕ1.5×6	2.3	50	G-087
MHR430	ϕ1.5×6	2.3	50	G-096
MSUSZ440-LN	ϕ1.5×6	2.3	50	I-016
MSCZ440-LN	ϕ1.5×6	2.3	50	I-018
DHR237	ϕ1.5×6	3	50	K-007
DCHR230	ϕ1.5×6	3	50	M-008
MSUSZ440-LN	ϕ1.5×7.5	2.3	50	I-016
MSCZ440-LN	ϕ1.5×7.5	2.3	50	I-018
MHRH230	ϕ1.5×8	1.2	50	F-040
MHRH430	ϕ1.5×8	1.2	50	F-044
RSES230	ϕ1.5×8	2.25	70	L-009
MHR230	ϕ1.5×8	2.3	50	G-087
MHR430	ϕ1.5×8	2.3	50	G-096
DHR237	ϕ1.5×8	3	50	K-007
MHRH230	ϕ1.5×10	1.2	50	F-040
MHRH430	ϕ1.5×10	1.2	50	F-044
RSES230	ϕ1.5×10	2.25	70	L-009
MHR230	ϕ1.5×10	2.3	50	G-087
MHR430	ϕ1.5×10	2.3	50	G-096

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRLN230-6	ϕ1.5×10	2.3	60	G-104
DHR237	ϕ1.5×10	3	50	K-007
RSE230	ϕ1.5×10	4.5	50	L-016
MHRH230	ϕ1.5×12	1.2	50	F-040
MHRH430	ϕ1.5×12	1.2	50	F-044
RSES230	ϕ1.5×12	2.25	70	L-009
MHR230	ϕ1.5×12	2.3	50	G-087
MHR430	ϕ1.5×12	2.3	50	G-096
DHR237	ϕ1.5×12	3	50	K-007
DCHR230	ϕ1.5×12	3	50	M-008
RSE230	ϕ1.5×12	4.5	50	L-016
MHRH230	ϕ1.5×14	1.2	60	F-040
MHRH430	ϕ1.5×14	1.2	60	F-044
MHR230	ϕ1.5×14	2.3	60	G-088
MHR430	ϕ1.5×14	2.3	60	G-096
RSES230	ϕ1.5×15	2.25	70	L-009
MHRLN230-6	ϕ1.5×15	2.3	60	G-104
RSE230	ϕ1.5×15	4.5	60	L-016
MHRH230	ϕ1.5×16	1.2	60	F-040
MHRH430	ϕ1.5×16	1.2	60	F-044
MHR230	ϕ1.5×16	2.3	60	G-088
MHR430	ϕ1.5×16	2.3	60	G-096
DHR237	ϕ1.5×16	3	60	K-007
MHRH230	ϕ1.5×18	1.2	60	F-040
RSES230	ϕ1.5×18	2.25	70	L-009
MHR230	ϕ1.5×18	2.3	60	G-088
MHR430	ϕ1.5×18	2.3	60	G-096
RSE230	ϕ1.5×18	4.5	60	L-016
MHRH230	ϕ1.5×20	1.2	60	F-040
RSES230	ϕ1.5×20	2.25	70	L-009
MHR230	ϕ1.5×20	2.3	60	G-088
MHR430	ϕ1.5×20	2.3	60	G-096
DCHR230	ϕ1.5×20	3	60	M-008
RSES230	ϕ1.5×23	2.25	70	L-009
RSE230	ϕ1.5×23	4.5	70	L-016
MHRH230	ϕ1.5×25	1.2	70	F-040
RSES230	ϕ1.5×25	2.25	70	L-009
MHR230	ϕ1.5×25	2.3	70	G-088
MHRH230	ϕ1.5×30	1.2	70	F-040
RSES230	ϕ1.5×30	2.25	70	L-009
MHR230	ϕ1.5×30	2.3	70	G-088
RSE230	ϕ1.5×30	4.5	70	L-016
MHRH230	ϕ1.5×35	1.2	80	F-040
RSES230	ϕ1.5×35	2.25	70	L-009
MHR230	ϕ1.5×35	2.3	80	G-088
MHR230	ϕ1.5×38	2.3	80	G-088
RSE230	ϕ1.5×38	4.5	80	L-016
RSES230	ϕ1.5×40	2.25	100	L-009
MHR230	ϕ1.5×40	2.3	80	G-088
RSES230	ϕ1.5×45	2.25	100	L-009
MHR230	ϕ1.5×45	2.3	80	G-088

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
RSE230	ϕ1.5×45	4.5	90	L-016
RSES230	ϕ1.5×53	2.25	100	L-009
RSE230	ϕ1.5×53	4.5	90	L-016
ϕ1.55				
MSE230	ϕ1.55	4	45	G-039
ϕ1.6				
MXH225	ϕ1.6	1.6	45	F-010
MXH225P	ϕ1.6	1.6	45	F-020
MSE230SS	ϕ1.6	1.6	45	G-032
MSZ345	ϕ1.6	2.4	45	I-010
MSES230P	ϕ1.6	3	45	G-036
MXH230	ϕ1.6	3.2	45	F-012
MXH230P	ϕ1.6	3.2	45	F-022
MX230	ϕ1.6	3.2	45	G-014
AL2D-2	ϕ1.6	3.2	45	J-006
MSUSZ440	ϕ1.6	3.2	50	I-006
MSCZ440	ϕ1.6	3.2	50	I-008
MSE230	ϕ1.6	4	45	G-039
MXH235	ϕ1.6	4.8	45	F-014
MXH235P	ϕ1.6	4.8	45	F-024
MX235	ϕ1.6	4.8	45	G-016
MX240	ϕ1.6	6.4	45	G-018
ALZ345	ϕ1.6×4.8	2.4	45	I-022,J-026
MHRH230	ϕ1.6×6	1.3	50	F-040
MHR230	ϕ1.6×6	2.4	50	G-088
MHR430	ϕ1.6×6	2.4	50	G-097
MHRH230	ϕ1.6×8	1.3	50	F-040
MHR230	ϕ1.6×8	2.4	50	G-088
MHR430	ϕ1.6×8	2.4	50	G-097
MHR230	ϕ1.6×10	2.4	50	G-088
MHR430	ϕ1.6×10	2.4	50	G-097
MHR230	ϕ1.6×12	2.4	50	G-088
MHR430	ϕ1.6×12	2.4	50	G-097
MHR230	ϕ1.6×14	2.4	60	G-088
MHR430	ϕ1.6×14	2.4	60	G-097
MHR230	ϕ1.6×16	2.4	60	G-088
MHR430	ϕ1.6×16	2.4	60	G-097
MHR230	ϕ1.6×18	2.4	60	G-088
MHR430	ϕ1.6×18	2.4	60	G-097
MHR230	ϕ1.6×20	2.4	60	G-088
MHR430	ϕ1.6×20	2.4	60	G-097
MHR230	ϕ1.6×26	2.4	60	G-088
MHR430	ϕ1.6×26	2.4	70	G-097
ϕ1.65				
MSE230	ϕ1.65	4	45	G-039
ϕ1.7				
MXH225	ϕ1.7	1.7	45	F-010
MXH225P	ϕ1.7	1.7	45	F-020
MSE230SS	ϕ1.7	1.7	45	G-032
MSZ345	ϕ1.7	2.6	45	I-010
MXH230	ϕ1.7	3.4	45	F-012

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MXH230P	φ1.7	3.4	45	F-022
MX230	φ1.7	3.4	45	G-014
AL2D-2	φ1.7	3.4	45	J-006
MSUSZ440	φ1.7	3.4	50	I-006
MSCZ440	φ1.7	3.4	50	I-008
MSE230	φ1.7	4.5	45	G-039
MXH235	φ1.7	5.1	45	F-014
MXH235P	φ1.7	5.1	45	F-024
MX235	φ1.7	5.1	45	G-016
MX240	φ1.7	6.8	45	G-018
ALZ345	φ1.7×5.1	2.6	45	I-022,J-026
MHR430	φ1.7×6	2.5	50	G-097
MHR430	φ1.7×14	2.5	60	G-097
MHR430	φ1.7×24	2.5	70	G-097
φ1.75				
MSE230	φ1.75	4.5	45	G-039
φ1.8				
MXH225	φ1.8	1.8	45	F-010
MXH225P	φ1.8	1.8	45	F-020
MSE230SS	φ1.8	1.8	45	G-032
MSZ345	φ1.8	2.7	45	I-010
MSES230P	φ1.8	3.5	45	G-036
MXH230	φ1.8	3.6	45	F-012
MXH230P	φ1.8	3.6	45	F-022
MX230	φ1.8	3.6	45	G-014
AL2D-2	φ1.8	3.6	45	J-006
MSUSZ440	φ1.8	3.6	50	I-006
MSCZ440	φ1.8	3.6	50	I-008
MSE230	φ1.8	4.5	45	G-039
MXH235	φ1.8	5.4	45	F-014
MXH235P	φ1.8	5.4	45	F-024
MX235	φ1.8	5.4	45	G-016
MXH240	φ1.8	7.2	45	F-016
MX240	φ1.8	7.2	45	G-018
MXH245	φ1.8	9	50	F-018
MX245	φ1.8	9	50	G-020
ALZ345	φ1.8×5.4	2.7	45	I-022,J-026
MHRH230	φ1.8×6	1.4	50	F-040
MHRH430	φ1.8×6	1.4	50	F-044
MHR230	φ1.8×6	2.7	50	G-088
MHR430	φ1.8×6	2.7	50	G-097
MHRH230	φ1.8×8	1.4	50	F-040
MHRH430	φ1.8×8	1.4	50	F-044
MHR230	φ1.8×8	2.7	50	G-088
MHR430	φ1.8×8	2.7	50	G-097
MHRH230	φ1.8×10	1.4	50	F-040
MHRH430	φ1.8×10	1.4	50	F-044
MHR230	φ1.8×10	2.7	50	G-088
MHR430	φ1.8×10	2.7	50	G-097
MHRH230	φ1.8×12	1.4	50	F-040
MHRH430	φ1.8×12	1.4	50	F-044

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230	φ1.8×12	2.7	50	G-088
MHR430	φ1.8×12	2.7	50	G-097
MHRH230	φ1.8×14	1.4	50	F-040
MHRH430	φ1.8×14	1.4	60	F-044
MHR230	φ1.8×14	2.7	50	G-088
MHR430	φ1.8×14	2.7	60	G-097
MHRH230	φ1.8×16	1.4	60	F-040
MHRH430	φ1.8×16	1.4	60	F-044
MHR230	φ1.8×16	2.7	60	G-088
MHR430	φ1.8×16	2.7	60	G-097
MHRH230	φ1.8×18	1.4	60	F-040
MHRH430	φ1.8×18	1.4	60	F-044
MHR230	φ1.8×18	2.7	60	G-088
MHR430	φ1.8×18	2.7	60	G-097
MHR230	φ1.8×20	2.7	60	G-088
MHR430	φ1.8×20	2.7	60	G-097
MHR230	φ1.8×25	2.7	70	G-088
MHR430	φ1.8×25	2.7	70	G-097
φ1.85				
MSE230	φ1.85	4.5	45	G-039
φ1.9				
MXH225	φ1.9	1.9	45	F-010
MXH225P	φ1.9	1.9	45	F-020
MSE230SS	φ1.9	1.9	45	G-032
MSZ345	φ1.9	2.9	45	I-010
MXH230	φ1.9	3.8	45	F-012
MXH230P	φ1.9	3.8	45	F-022
MX230	φ1.9	3.8	45	G-014
AL2D-2	φ1.9	3.8	45	J-006
MSUSZ440	φ1.9	3.8	50	I-006
MSCZ440	φ1.9	3.8	50	I-008
MSE230	φ1.9	5	45	G-039
MXH235	φ1.9	5.7	45	F-014
MXH235P	φ1.9	5.7	45	F-024
MX235	φ1.9	5.7	45	G-016
MX240	φ1.9	7.6	45	G-018
ALZ345	φ1.9×5.7	2.9	45	I-022,J-026
MHR430	φ1.9×6	2.8	50	G-097
MHR430	φ1.9×16	2.8	60	G-097
MHR430	φ1.9×28	2.8	70	G-097
φ1.95				
MSE230	φ1.95	5	45	G-039
φ2				
MXH225	φ2	2	45	F-010
MXH225P	φ2	2	45	F-020
MX225	φ2	2	45	G-012
MX425	φ2	2	45	G-022
MSE230SS	φ2	2	45	G-032
MSZ345	φ2	3	45	I-010
RSES230	φ2	3	60	L-009
MXH230	φ2	4	45	F-012

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MXH230P	φ2	4	45	F-022
MX230	φ2	4	45	G-014
MX430	φ2	4	45	G-024
MSES230P	φ2	4	45	G-036
AL2D-2	φ2	4	45	J-006
AL2D-2DLC	φ2	4	45	J-008
MSUSZ440	φ2	4	50	I-006
MSCZ440	φ2	4	50	I-008
MHDSH445	φ2	4	60	E-006
MHDH445	φ2	4	60	F-026
MHD445	φ2	4	60	G-058
MSE230	φ2	5	45	G-039
MSE230M	φ2	5	45	G-044
MSE245	φ2	5	45	G-046
MSE430P	φ2	5	45	G-050
MSE430	φ2	5	45	G-052
MSE445	φ2	5	45	G-054
MXH235	φ2	6	45	F-014
MXH235P	φ2	6	45	F-024
MX235	φ2	6	45	G-016
MX435	φ2	6	45	G-026
AL3D-2	φ2	6	45	J-010
AL3D-2DLC	φ2	6	45	J-012
DCSE235	φ2	6	45	M-006
RSE230	φ2	6	50	L-016
MHDSH445	φ2	6	60	E-006
MSUSZ440	φ2	6	60	I-006
MSCZ440	φ2	6	60	I-008
AL3D-345	φ2	6	60	I-014,J-022
MXH240	φ2	8	45	F-016
MX240	φ2	8	45	G-018
MX440	φ2	8	45	G-028
MSEM230	φ2	8	50	G-042
MSEM430	φ2	8	50	G-056
AL4D-2	φ2	8	50	J-014
AL4D-2DLC	φ2	8	50	J-016
MXH245	φ2	10	50	F-018
MX245	φ2	10	50	G-020
MX445	φ2	10	50	G-030
AL5D-2	φ2	10	50	J-018
AL5D-2DLC	φ2	10	50	J-020
RSE230	φ2	10	50	L-016
RSE230	φ2	15	60	L-016
RSE230	φ2	20	60	L-016
DCMS	φ2×4	1	45	N-006
MHRH230	φ2×4	1.6	50	F-040
MHR230	φ2×4	3	50	G-088
MHRH230	φ2×6	1.6	50	F-040
MHRH430	φ2×6	1.6	50	F-045
ALZ345-DLC	φ2×6	3	45	I-020,J-030
ALZ345	φ2×6	3	45	I-022,J-026

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230	φ2×6	3	50	G-088
MHR430	φ2×6	3	50	G-097
MSUSZ440-LN	φ2×6	3	50	I-016
MSCZ440-LN	φ2×6	3	50	I-018
RSES230	φ2×6	3	60	L-009
DHR237	φ2×6	4	50	K-007
DCHR230	φ2×6	4	50	M-008
DCMS	φ2×8	1	45	N-006
MHRH230	φ2×8	1.6	50	F-040
MHRH430	φ2×8	1.6	50	F-045
MHR230	φ2×8	3	50	G-088
MHR430	φ2×8	3	50	G-097
MSUSZ440-LN	φ2×8	3	50	I-016
MSCZ440-LN	φ2×8	3	50	I-018
RSES230	φ2×8	3	60	L-009
DHR237	φ2×8	4	50	K-007
MHRH230	φ2×10	1.6	50	F-040
MHRH430	φ2×10	1.6	50	F-045
MHR230	φ2×10	3	50	G-088
MHR430	φ2×10	3	50	G-097
MSUSZ440-LN	φ2×10	3	50	I-016
MSCZ440-LN	φ2×10	3	50	I-018
ALZ345	φ2×10	3	60	I-022,J-026
RSES230	φ2×10	3	60	L-009
DHR237	φ2×10	4	50	K-007
DCHR230	φ2×10	4	50	M-008
MHRH230	φ2×12	1.6	50	F-040
MHRH430	φ2×12	1.6	50	F-045
MHR230	φ2×12	3	50	G-089
MHR430	φ2×12	3	50	G-097
RSES230	φ2×12	3	60	L-009
DHR237	φ2×12	4	50	K-007
RSE230	φ2×12	6	60	L-016
MHRH230	φ2×14	1.6	60	F-040
MHRH430	φ2×14	1.6	60	F-045
MHR230	φ2×14	3	60	G-089
MHR430	φ2×14	3	60	G-097
DHR237	φ2×14	4	50	K-007
RSES230	φ2×15	3	60	L-009
RSE230	φ2×15	6	60	L-016
MHRH230	φ2×16	1.6	60	F-040
MHRH430	φ2×16	1.6	60	F-045
MHR230	φ2×16	3	60	G-089
MHR430	φ2×16	3	60	G-097
DHR237	φ2×16	4	60	K-007
DCHR230	φ2×16	4	60	M-008
MHRH230	φ2×18	1.6	60	F-040
MHRH430	φ2×18	1.6	60	F-045
MHR230	φ2×18	3	60	G-089
MHR430	φ2×18	3	60	G-097
MHRH230	φ2×20	1.6	60	F-040

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH430	φ2×20	1.6	60	F-045
MHR230	φ2×20	3	60	G-089
MHR430	φ2×20	3	60	G-097
MHRLN230-6	φ2×20	3	60	G-104
RSES230	φ2×20	3	80	L-009
DHR237	φ2×20	4	60	K-007
DCHR230	φ2×20	4	60	M-008
RSE230	φ2×20	6	60	L-016
RSES230	φ2×24	3	80	L-009
RSE230	φ2×24	6	70	L-016
MHRH230	φ2×25	1.6	70	F-040
MHR230	φ2×25	3	70	G-089
MHR430	φ2×25	3	70	G-098
MHRH230	φ2×30	1.6	70	F-040
MHR230	φ2×30	3	70	G-089
MHR430	φ2×30	3	70	G-098
RSES230	φ2×30	3	80	L-009
RSE230	φ2×30	6	80	L-016
MHRH230	φ2×35	1.6	80	F-040
MHR230	φ2×35	3	80	G-089
MHRH230	φ2×40	1.6	90	F-040
MHR230	φ2×40	3	90	G-089
RSES230	φ2×40	3	100	L-009
RSE230	φ2×40	6	90	L-016
MHRH230	φ2×50	1.6	100	F-040
MHR230	φ2×50	3	100	G-089
RSES230	φ2×50	3	100	L-009
RSE230	φ2×50	6	110	L-016
MHR230	φ2×60	3	110	G-089
RSES230	φ2×60	3	120	L-010
RSE230	φ2×60	6	110	L-016
RSES230	φ2×70	3	150	L-010
RSE230	φ2×70	6	110	L-016
φ2.05				
MSE230	φ2.05	5	45	G-039
φ2.1				
MSE230SS	φ2.1	2.1	45	G-032
MSZ345	φ2.1	3.2	45	I-010
MXH230	φ2.1	4.2	45	F-012
MXH230P	φ2.1	4.2	45	F-022
MX230	φ2.1	4.2	45	G-014
AL2D-2	φ2.1	4.2	45	J-006
MSUSZ440	φ2.1	4.2	50	I-006
MSCZ440	φ2.1	4.2	50	I-008
MSE230	φ2.1	5.5	45	G-039
MXH235	φ2.1	6.3	45	F-014
MXH235P	φ2.1	6.3	45	F-024
MX235	φ2.1	6.3	45	G-016
MX240	φ2.1	8.4	45	G-018
ALZ345	φ2.1×6.3	3.2	45	I-022,J-026
φ2.15				

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSE230	φ2.15	5.5	45	G-039
φ2.2				
MSE230SS	φ2.2	2.2	45	G-032
MSZ345	φ2.2	3.3	45	I-010
MXH230	φ2.2	4.4	45	F-012
MXH230P	φ2.2	4.4	45	F-022
MX230	φ2.2	4.4	45	G-014
AL2D-2	φ2.2	4.4	45	J-006
MSUSZ440	φ2.2	4.4	50	I-006
MSCZ440	φ2.2	4.4	50	I-008
MSE230	φ2.2	5.5	45	G-039
MXH235	φ2.2	6.6	45	F-014
MXH235P	φ2.2	6.6	45	F-024
MX235	φ2.2	6.6	45	G-016
MX240	φ2.2	8.8	45	G-018
ALZ345	φ2.2×6.6	3.3	45	I-022,J-026
φ2.25				
MSE230	φ2.25	5.5	45	G-039
φ2.3				
MSE230SS	φ2.3	2.3	45	G-032
MSZ345	φ2.3	3.5	45	I-010
MXH230	φ2.3	4.6	45	F-012
MXH230P	φ2.3	4.6	45	F-022
MX230	φ2.3	4.6	45	G-014
AL2D-2	φ2.3	4.6	45	J-006
MSUSZ440	φ2.3	4.6	50	I-006
MSCZ440	φ2.3	4.6	50	I-008
MSE230	φ2.3	6	45	G-039
MXH235	φ2.3	6.9	45	F-014
MXH235P	φ2.3	6.9	45	F-024
MX235	φ2.3	6.9	45	G-016
MX240	φ2.3	9.2	45	G-018
ALZ345	φ2.3×6.9	3.5	45	I-022,J-026
φ2.35				
MSE230	φ2.35	6	45	G-039
φ2.4				
MSE230SS	φ2.4	2.4	45	G-032
MSZ345	φ2.4	3.6	45	I-010
MXH230	φ2.4	4.8	45	F-012
MXH230P	φ2.4	4.8	45	F-022
MX230	φ2.4	4.8	45	G-014
AL2D-2	φ2.4	4.8	45	J-006
MSUSZ440	φ2.4	4.8	50	I-006
MSCZ440	φ2.4	4.8	50	I-008
MSE230	φ2.4	6	45	G-039
MXH235	φ2.4	7.2	45	F-014
MXH235P	φ2.4	7.2	45	F-024
MX235	φ2.4	7.2	45	G-016
MX240	φ2.4	9.6	45	G-018
ALZ345	φ2.4×7.2	3.6	45	I-022,J-026
φ2.45				

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSE230	φ2.45	6	45	G-039
φ2.5				
MXH225	φ2.5	2.5	45	F-010
MXH225P	φ2.5	2.5	45	F-020
MX225	φ2.5	2.5	45	G-012
MX425	φ2.5	2.5	45	G-022
MSE230SS	φ2.5	2.5	45	G-032
MSZ345	φ2.5	3.8	45	I-010
MXH230	φ2.5	5	45	F-012
MXH230P	φ2.5	5	45	F-022
MX230	φ2.5	5	45	G-014
MX430	φ2.5	5	45	G-024
MSES230P	φ2.5	5	45	G-036
AL2D-2	φ2.5	5	45	J-006
AL2D-2DLC	φ2.5	5	45	J-008
MSUSZ440	φ2.5	5	50	I-006
MSCZ440	φ2.5	5	50	I-008
MSE230	φ2.5	7	45	G-039
MSE230M	φ2.5	7	45	G-044
MSE245	φ2.5	7	45	G-046
MSE430P	φ2.5	7	45	G-050
MSE430	φ2.5	7	45	G-052
MSE445	φ2.5	7	45	G-054
MXH235	φ2.5	7.5	45	F-014
MXH235P	φ2.5	7.5	45	F-024
MX235	φ2.5	7.5	45	G-016
MX435	φ2.5	7.5	45	G-026
AL3D-2	φ2.5	7.5	45	J-010
AL3D-2DLC	φ2.5	7.5	45	J-012
MSUSZ440	φ2.5	7.5	60	I-006
MSCZ440	φ2.5	7.5	60	I-008
MXH240	φ2.5	10	45	F-016
MX240	φ2.5	10	45	G-018
MX440	φ2.5	10	45	G-028
MSEM230	φ2.5	10	50	G-042
MSEM430	φ2.5	10	50	G-056
AL4D-2	φ2.5	10	50	J-014
AL4D-2DLC	φ2.5	10	50	J-016
MXH245	φ2.5	12.5	50	F-018
MX245	φ2.5	12.5	50	G-020
MX445	φ2.5	12.5	50	G-030
AL5D-2	φ2.5	12.5	50	J-018
AL5D-2DLC	φ2.5	12.5	50	J-020
DHR237	φ2.5×6	5	45	K-007
ALZ345-DLC	φ2.5×7.5	3.8	45	I-020,J-030
ALZ345	φ2.5×7.5	3.8	45	I-022,J-026
MSUSZ440-LN	φ2.5×7.5	3.8	50	I-016
MSCZ440-LN	φ2.5×7.5	3.8	50	I-018
MHRH230	φ2.5×8	2	50	F-040
MHRH430	φ2.5×8	2	50	F-045
MHR230	φ2.5×8	3.7	50	G-089

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR430	φ2.5×8	3.7	50	G-098
DHR237	φ2.5×8	5	50	K-007
MHR230	φ2.5×10	3.7	50	G-089
MSUSZ440-LN	φ2.5×10	3.8	50	I-016
MSCZ440-LN	φ2.5×10	3.8	50	I-018
DHR237	φ2.5×10	5	50	K-007
MHRH230	φ2.5×12	2	50	F-040
MHRH430	φ2.5×12	2	50	F-045
MHR230	φ2.5×12	3.7	50	G-089
MHR430	φ2.5×12	3.7	50	G-098
DHR237	φ2.5×12	5	50	K-007
MSUSZ440-LN	φ2.5×12.5	3.8	60	I-016
MSCZ440-LN	φ2.5×12.5	3.8	60	I-018
DHR237	φ2.5×14	2.4	50	K-007
MHR230	φ2.5×14	3.7	50	G-089
MHRH230	φ2.5×16	2	60	F-040
MHRH430	φ2.5×16	2	60	F-045
MHR230	φ2.5×16	3.7	60	G-089
MHR430	φ2.5×16	3.7	60	G-098
DHR237	φ2.5×16	5	50	K-007
MHR230	φ2.5×18	3.7	60	G-089
MHRH230	φ2.5×20	2	60	F-040
MHRH430	φ2.5×20	2	60	F-045
MHR230	φ2.5×20	3.7	60	G-089
MHR430	φ2.5×20	3.7	60	G-098
DHR237	φ2.5×20	5	60	K-007
MHRH430	φ2.5×25	2	70	F-045
MHR230	φ2.5×25	3.7	70	G-089
MHR430	φ2.5×25	3.7	70	G-098
MHRH230	φ2.5×30	2	70	F-040
MHR230	φ2.5×30	3.7	70	G-089
MHRH230	φ2.5×40	2	90	F-040
MHR230	φ2.5×40	3.7	90	G-089
MHRH230	φ2.5×50	2	100	F-040
MHR230	φ2.5×50	3.7	100	G-089
φ2.55				
MSE230	φ2.55	7	45	G-039
φ2.6				
MSE230SS	φ2.6	2.6	45	G-032
MSZ345	φ2.6	3.9	45	I-010
MXH230	φ2.6	5.2	45	F-012
MXH230P	φ2.6	5.2	45	F-022
MX230	φ2.6	5.2	45	G-014
AL2D-2	φ2.6	5.2	45	J-006
MSUSZ440	φ2.6	5.2	50	I-006
MSCZ440	φ2.6	5.2	50	I-008
MSE230	φ2.6	7	45	G-039
MXH235	φ2.6	7.8	45	F-014
MXH235P	φ2.6	7.8	45	F-024
MX235	φ2.6	7.8	45	G-016
MX240	φ2.6	10.4	50	G-018

Search from Square Dia.

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
ALZ345	φ2.6×7.8	3.9	55	I-022,J-026
φ2.65				
MSE230	φ2.65	7	45	G-039
φ2.7				
MSE230SS	φ2.7	2.7	45	G-032
MSZ345	φ2.7	4.1	45	I-010
MXH230	φ2.7	5.4	45	F-012
MXH230P	φ2.7	5.4	45	F-022
MX230	φ2.7	5.4	45	G-014
AL2D-2	φ2.7	5.4	45	J-006
MSUSZ440	φ2.7	5.4	50	I-006
MSCZ440	φ2.7	5.4	50	I-008
MSE230	φ2.7	7	45	G-039
MXH235	φ2.7	8.1	45	F-014
MXH235P	φ2.7	8.1	45	F-024
MX235	φ2.7	8.1	45	G-016
MX240	φ2.7	10.8	50	G-018
ALZ345	φ2.7×8.1	4.1	55	I-022,J-026
φ2.75				
MSE230	φ2.75	7	45	G-039
φ2.8				
MSE230SS	φ2.8	2.8	45	G-032
MSZ345	φ2.8	4.2	45	I-010
MXH230	φ2.8	5.6	45	F-012
MXH230P	φ2.8	5.6	45	F-022
MX230	φ2.8	5.6	45	G-014
AL2D-2	φ2.8	5.6	45	J-006
MSUSZ440	φ2.8	5.6	50	I-006
MSCZ440	φ2.8	5.6	50	I-008
MSE230	φ2.8	7	45	G-039
MXH235	φ2.8	8.4	45	F-014
MXH235P	φ2.8	8.4	45	F-024
MX235	φ2.8	8.4	45	G-016
MX240	φ2.8	11.2	50	G-018
ALZ345	φ2.8×8.4	4.2	55	I-022,J-026
φ2.85				
MSE230	φ2.85	8	50	G-039
φ2.9				
MSE230SS	φ2.9	2.9	50	G-032
MSZ345	φ2.9	4.5	45	I-010
MXH230	φ2.9	5.8	45	F-012
MXH230P	φ2.9	5.8	45	F-022
MX230	φ2.9	5.8	45	G-014
MSUSZ440	φ2.9	5.8	50	I-006
MSCZ440	φ2.9	5.8	50	I-008
AL2D-2	φ2.9	5.8	50	J-006
MSE230	φ2.9	8	50	G-039
MXH235	φ2.9	8.7	45	F-014
MXH235P	φ2.9	8.7	45	F-024
MX235	φ2.9	8.7	45	G-016
MX240	φ2.9	11.6	50	G-018

Unit [Size : mm]

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
ALZ345	φ2.9×8.7	4.4	55	I-022,J-026
φ2.95				
MSE230	φ2.95	8	50	G-039
φ3				
MXH225	φ3	3	45	F-010
MXH225P	φ3	3	45	F-020
MX225	φ3	3	45	G-012
MX425	φ3	3	45	G-022
MSE230SS	φ3	3	50	G-032
RSES230	φ3	4.5	80	L-010
MXH230	φ3	6	45	F-012
MXH230P	φ3	6	45	F-022
MX230	φ3	6	45	G-014
MX430	φ3	6	45	G-024
MSES230P	φ3	6	50	G-036
MSUSZ440	φ3	6	50	I-006
MSCZ440	φ3	6	50	I-008
MSZ345	φ3	6	50	I-010
AL2D-2	φ3	6	50	J-006
AL2D-2DLC	φ3	6	50	J-008
MHDSH445	φ3	6	60	E-006
MHDH445	φ3	6	60	F-026
MHD445	φ3	6	60	G-058
MSE430P	φ3	8	50	G-050
MSE230	φ3	8	50	G-039
MSE230M	φ3	8	50	G-044
MSE245	φ3	8	50	G-046
MSE345	φ3	8	50	G-048
MSE430	φ3	8	50	G-052
MSE445	φ3	8	50	G-054
MSX440	φ3	8	55	I-028
MXH235	φ3	9	45	F-014
MXH235P	φ3	9	45	F-024
MX235	φ3	9	45	G-016
MX435	φ3	9	45	G-026
DCSE235	φ3	9	45	M-006
AL3D-2	φ3	9	50	J-010
AL3D-2DLC	φ3	9	50	J-012
RSE230	φ3	9	50	L-017
MHDSH445	φ3	9	60	E-006
MSUSZ440	φ3	9	60	I-006
MSCZ440	φ3	9	60	I-008
AL3D-345	φ3	9	60	I-014,J-022
RSE230	φ3	9	100	L-017
MXH240	φ3	12	50	F-016
MX240	φ3	12	50	G-018
MX440	φ3	12	50	G-028
MSEM230	φ3	12	55	G-042
MSEM430	φ3	12	55	G-056
AL4D-2	φ3	12	55	J-014
AL4D-2DLC	φ3	12	55	J-016

Search from Square Dia.

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
MXH245	φ3	15	55	F-018
MX245	φ3	15	55	G-020
MX445	φ3	15	55	G-030
AL5D-2	φ3	15	55	J-018
AL5D-2DLC	φ3	15	55	J-020
RSE230	φ3	15	60	L-017
RSE230	φ3	15	100	L-017
RSE230	φ3	20	60	L-017
RSE230	φ3	25	70	L-017
RSE230	φ3	30	70	L-017
MHRH230	φ3×8	4.5	50	F-040
MHRH430	φ3×8	4.5	50	F-045
MHR230	φ3×8	4.5	50	G-089
MHR430	φ3×8	4.5	50	G-098
DHR237	φ3×8	6	50	K-007
MSUSZ440-LN	φ3×9	4.5	50	I-016
MSCZ440-LN	φ3×9	4.5	50	I-018
ALZ345-DLC	φ3×9	4.5	55	I-020,J-030
ALZ345	φ3×9	4.5	55	I-022,J-026
MHR230	φ3×10	4.5	50	G-089
RSES230	φ3×10	4.5	80	L-010
DHR237	φ3×10	6	50	K-007
MHRH230	φ3×12	4.5	50	F-040
MHRH430	φ3×12	4.5	50	F-045
MHR230	φ3×12	4.5	50	G-089
MHR430	φ3×12	4.5	50	G-098
MSUSZ440-LN	φ3×12	4.5	50	I-016
MSCZ440-LN	φ3×12	4.5	50	I-018
RSES230	φ3×12	4.5	80	L-010
MHR230	φ3×14	4.5	50	G-089
MSUSZ440-LN	φ3×15	4.5	60	I-016
MSCZ440-LN	φ3×15	4.5	60	I-018
ALZ345	φ3×15	4.5	60	I-022,J-026
RSES230	φ3×15	4.5	80	L-010
DHR237	φ3×15	6	60	K-007
RSE230	φ3×15	9	60	L-017
MHRH230	φ3×16	4.5	60	F-040
MHRH430	φ3×16	4.5	60	F-045
MHR230	φ3×16	4.5	60	G-089
MHR430	φ3×16	4.5	60	G-098
DCHR230	φ3×16	6	60	M-008
MHR230	φ3×18	4.5	60	G-089
MHRH230	φ3×20	4.5	60	F-040
MHRH430	φ3×20	4.5	60	F-045
MHR230	φ3×20	4.5	60	G-089
MHR430	φ3×20	4.5	60	G-098
RSES230	φ3×20	4.5	80	L-010
DHR237	φ3×20	6	60	K-007
RSE230	φ3×20	9	60	L-017
RSES230	φ3×24	4.5	80	L-010
RSE230	φ3×24	9	70	L-017

Unit [Size : mm]

Model	Dia. (×Under neck Length)	Length of Cut	Overall Length	Page
MHRH230	φ3×25	4.5	70	F-040
MHRH430	φ3×25	4.5	70	F-045
MHR230	φ3×25	4.5	70	G-089
MHR430	φ3×25	4.5	70	G-098
DHR237	φ3×25	6	70	K-007
MHRH230	φ3×30	4.5	70	F-040
MHRH430	φ3×30	4.5	70	F-045
MHR230	φ3×30	4.5	70	G-089
MHR430	φ3×30	4.5	70	G-098
RSES230	φ3×30	4.5	80	L-010
DCHR230	φ3×30	6	70	M-008
RSE230	φ3×30	9	70	L-017
MHR230	φ3×35	4.5	80	G-089
RSES230	φ3×36	4.5	80	L-010
RSE230	φ3×36	9	80	L-017
MHR230	φ3×40	4.5	90	G-090
RSES230	φ3×45	4.5	100	L-010
RSE230	φ3×45	9	90	L-017
MHR230	φ3×50	4.5	100	G-090
RSES230	φ3×60	4.5	120	L-010
RSE230	φ3×60	9	110	L-017
RSES230	φ3×75	4.5	150	L-010
RSE230	φ3×75	9	120	L-017
φ3.1				
MSE230SS	φ3.1	3.1	50	G-032
MX230	φ3.1	6.2	45	G-014
MSUSZ440	φ3.1	6.2	50	I-006
MSCZ440	φ3.1	6.2	50	I-008
MSZ345	φ3.1	6.2	50	I-010
MSE230	φ3.1	8	50	G-039
MX235	φ3.1	9.3	45	G-016
MX240	φ3.1	12.4	50	G-018
ALZ345	φ3.1×9.3	4.7	55	I-022,J-026
φ3.2				
MSE230SS	φ3.2	3.2	50	G-032
MX230	φ3.2	6.4	45	G-014
MSUSZ440	φ3.2	6.4	50	I-006
MSCZ440	φ3.2	6.4	50	I-008
MSZ345	φ3.2	6.4	50	I-010
MSE230	φ3.2	8	50	G-039
MX235	φ3.2	9.6	45	G-016
MX240	φ3.2	12.8	50	G-018
ALZ345	φ3.2×9.6	4.8	55	I-022,J-026
φ3.3				
MSE230SS	φ3.3	3.3	50	G-032
MX230	φ3.3	6.6	45	G-014
MSUSZ440	φ3.3	6.6	50	I-006
MSCZ440	φ3.3	6.6	50	I-008
MSZ345	φ3.3	6.6	50	I-010
MSE230	φ3.3	9	50	G-039
MX235	φ3.3	9.9	45	G-016

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MX240	φ3.3	13.2	50	G-018
ALZ345	φ3.3×9.9	5	55	I-023,J-027
φ3.4				
MSE230SS	φ3.4	3.4	50	G-032
MX230	φ3.4	6.8	45	G-014
MSUSZ440	φ3.4	6.8	50	I-006
MSCZ440	φ3.4	6.8	50	I-008
MSZ345	φ3.4	6.8	50	I-010
MSE230	φ3.4	9	50	G-039
MX235	φ3.4	10.2	45	G-016
MX240	φ3.4	13.6	50	G-018
ALZ345	φ3.4×10.2	5.1	55	I-023,J-027
φ3.5				
MX425	φ3.5	3.5	45	G-022
MSE230SS	φ3.5	3.5	50	G-032
MXH230	φ3.5	7	45	F-012
MXH230P	φ3.5	7	45	F-022
MX230	φ3.5	7	45	G-014
MX430	φ3.5	7	45	G-024
MSUSZ440	φ3.5	7	50	I-006
MSCZ440	φ3.5	7	50	I-008
MSZ345	φ3.5	7	50	I-010
AL2D-2	φ3.5	7	50	J-006
AL2D-2DLC	φ3.5	7	50	J-008
MSE230	φ3.5	9	50	G-039
MSE430	φ3.5	9	50	G-052
MXH235	φ3.5	10.5	45	F-014
MXH235P	φ3.5	10.5	45	F-024
MX235	φ3.5	10.5	45	G-016
MX435	φ3.5	10.5	45	G-026
MSUSZ440	φ3.5	10.5	60	I-006
MSCZ440	φ3.5	10.5	60	I-008
MX240	φ3.5	14	50	G-018
MX440	φ3.5	14	50	G-028
MX445	φ3.5	17.5	60	G-030
MSUSZ440-LN	φ3.5×10.5	5.3	50	I-016
MSCZ440-LN	φ3.5×10.5	5.3	50	I-018
ALZ345-DLC	φ3.5×10.5	5.3	55	I-020,J-030
ALZ345	φ3.5×10.5	5.3	55	I-023,J-027
MSUSZ440-LN	φ3.5×14	5.3	60	I-016
MSCZ440-LN	φ3.5×14	5.3	60	I-018
MHR430	φ3.5×15	5.5	60	G-098
MSUSZ440-LN	φ3.5×17.5	5.3	60	I-016
MSCZ440-LN	φ3.5×17.5	5.3	60	I-018
MHR430	φ3.5×25	5.5	70	G-098
MHR430	φ3.5×35	5.5	80	G-098
φ3.6				
MSE230SS	φ3.6	3.6	50	G-032
MX230	φ3.6	7.2	45	G-014
MSUSZ440	φ3.6	7.2	50	I-006
MSCZ440	φ3.6	7.2	50	I-008

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSZ345	φ3.6	7.2	50	I-010
MSE230	φ3.6	9	50	G-039
MX235	φ3.6	10.8	45	G-016
MX240	φ3.6	14.4	50	G-018
ALZ345	φ3.6×10.8	5.4	55	I-023,J-027
φ3.7				
MSE230SS	φ3.7	3.7	50	G-032
MX230	φ3.7	7.4	45	G-014
MSUSZ440	φ3.7	7.4	50	I-006
MSCZ440	φ3.7	7.4	50	I-008
MSZ345	φ3.7	7.4	50	I-010
MSE230	φ3.7	10	50	G-039
MX235	φ3.7	11.1	45	G-016
MX240	φ3.7	14.8	50	G-018
ALZ345	φ3.7×11.1	5.6	55	I-023,J-027
φ3.8				
MSE230SS	φ3.8	3.8	50	G-032
MX230	φ3.8	7.6	45	G-014
MSUSZ440	φ3.8	7.6	50	I-006
MSCZ440	φ3.8	7.6	50	I-008
MSZ345	φ3.8	7.6	50	I-010
MSE230	φ3.8	10	50	G-039
MX235	φ3.8	11.4	45	G-016
MX240	φ3.8	15.2	50	G-018
ALZ345	φ3.8×11.4	5.7	55	I-023,J-027
φ3.9				
MSE230SS	φ3.9	3.9	50	G-032
MX230	φ3.9	7.8	45	G-014
MSUSZ440	φ3.9	7.8	50	I-006
MSCZ440	φ3.9	7.8	50	I-008
MSZ345	φ3.9	7.8	50	I-010
MSE230	φ3.9	10	50	G-039
MX235	φ3.9	11.7	45	G-016
MX240	φ3.9	15.6	50	G-018
ALZ345	φ3.9×11.7	5.9	55	I-023,J-027
φ4				
MXH225	φ4	4	45	F-010
MXH225P	φ4	4	45	F-020
MX225	φ4	4	45	G-012
MX425	φ4	4	45	G-022
MSE230SS	φ4	4	50	G-032
RSES230	φ4	6	80	L-010
MXH230	φ4	8	45	F-012
MXH230P	φ4	8	45	F-022
MX230	φ4	8	45	G-014
MX430	φ4	8	45	G-024
MSES230P	φ4	8	50	G-036
MSUSZ440	φ4	8	50	I-006
MSCZ440	φ4	8	50	I-008
MSZ345	φ4	8	50	I-010
AL2D-2	φ4	8	50	J-006

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
AL2D-2DLC	φ4	8	50	J-008
MHDSH445	φ4	8	60	E-006
MHDH445	φ4	8	60	F-026
MHD445	φ4	8	60	G-058
MSE230	φ4	10	50	G-039
MSE230M	φ4	10	50	G-044
MSE245	φ4	10	50	G-046
MSE345	φ4	10	50	G-048
MSE430P	φ4	10	50	G-050
MSE430	φ4	10	50	G-052
MSE445	φ4	10	50	G-054
MSX440	φ4	11	55	I-028
MXH235	φ4	12	50	F-014
MXH235P	φ4	12	50	F-024
MX235	φ4	12	50	G-016
MX435	φ4	12	50	G-026
AL3D-2	φ4	12	50	J-010
AL3D-2DLC	φ4	12	50	J-012
RSE230	φ4	12	50	L-017
DCSE235	φ4	12	50	M-006
MHDSH445	φ4	12	60	E-006
MSUSZ440	φ4	12	60	I-006
MSCZ440	φ4	12	60	I-008
AL3D-345	φ4	12	70	I-014,J-022
RSE230	φ4	12	120	L-017
MXH240	φ4	16	55	F-016
MX240	φ4	16	55	G-018
MX440	φ4	16	55	G-028
MSEM230	φ4	16	60	G-042
MSEM430	φ4	16	60	G-056
AL4D-2	φ4	16	60	J-014
AL4D-2DLC	φ4	16	60	J-016
MXH245	φ4	20	60	F-018
MX245	φ4	20	60	G-020
MX445	φ4	20	60	G-030
AL5D-2	φ4	20	60	J-018
AL5D-2DLC	φ4	20	60	J-020
RSE230	φ4	20	60	L-017
RSE230	φ4	20	120	L-017
RSE230	φ4	30	70	L-017
RSE230	φ4	40	90	L-017
RSES230	φ4×10	6	80	L-010
DHR237	φ4×10	8	50	K-007
MHRH430	φ4×12	6	50	F-045
MHR230	φ4×12	6	50	G-090
MHR430	φ4×12	6	50	G-098
MSUSZ440-LN	φ4×12	6	50	I-016
MSCZ440-LN	φ4×12	6	50	I-018
ALZ345-DLC	φ4×12	6	55	I-020,J-030
ALZ345	φ4×12	6	55	I-023,J-027
RSES230	φ4×15	6	80	L-010

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
DHR237	φ4×15	8	60	K-007
MHRH430	φ4×16	6	60	F-045
MHR230	φ4×16	6	60	G-090
MHR430	φ4×16	6	60	G-098
MSUSZ440-LN	φ4×16	6	60	I-016
MSCZ440-LN	φ4×16	6	60	I-018
MHRH430	φ4×20	6	60	F-045
MHR230	φ4×20	6	60	G-090
MHR430	φ4×20	6	60	G-098
MSUSZ440-LN	φ4×20	6	60	I-016
MSCZ440-LN	φ4×20	6	60	I-018
ALZ345	φ4×20	6	70	I-023,J-027
RSES230	φ4×20	6	80	L-010
DHR237	φ4×20	8	60	K-007
DCHR230	φ4×20	8	60	M-008
RSE230	φ4×20	12	60	L-017
MHRH430	φ4×25	6	70	F-045
MHR230	φ4×25	6	70	G-090
MHR430	φ4×25	6	70	G-098
DHR237	φ4×25	8	70	K-007
MHRH430	φ4×30	6	70	F-045
MHR230	φ4×30	6	70	G-090
MHR430	φ4×30	6	70	G-098
RSES230	φ4×30	6	80	L-010
DHR237	φ4×30	8	70	K-007
RSE230	φ4×30	12	70	L-017
MHRH430	φ4×35	6	80	F-045
MHR230	φ4×35	6	80	G-090
MHR430	φ4×35	6	80	G-098
MHRH430	φ4×40	6	90	F-045
MHR230	φ4×40	6	90	G-090
MHR430	φ4×40	6	90	G-098
RSES230	φ4×40	6	100	L-010
DCHR230	φ4×40	8	90	M-008
RSE230	φ4×40	12	90	L-017
MHR230	φ4×45	6	90	G-090
MHR430	φ4×45	6	90	G-098
MHR230	φ4×50	6	100	G-090
MHR430	φ4×50	6	100	G-098
RSES230	φ4×55	6	120	L-010
RSE230	φ4×55	12	110	L-017
MHR230	φ4×60	6	110	G-090
RSES230	φ4×70	6	150	L-010
RSE230	φ4×70	12	120	L-017
φ4.1				
MSE230SS	φ4.1	4.1	50	G-032
MX230	φ4.1	8.2	45	G-014
MSUSZ440	φ4.1	8.2	50	I-006
MSCZ440	φ4.1	8.2	50	I-008
MSZ345	φ4.1	8.2	50	I-010
MSE230	φ4.1	11	50	G-039

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MX235	ϕ4.1	12.3	50	G-016
MX240	ϕ4.1	16.4	55	G-018
ALZ345	ϕ4.1×12.3	6.2	55	I-023,J-027
ϕ4.2				
MSE230SS	ϕ4.2	4.2	50	G-032
MX230	ϕ4.2	8.4	45	G-014
MSUSZ440	ϕ4.2	8.4	50	I-006
MSCZ440	ϕ4.2	8.4	50	I-008
MSZ345	ϕ4.2	8.4	50	I-010
MSE230	ϕ4.2	11	50	G-039
MX235	ϕ4.2	12.6	50	G-016
MX240	ϕ4.2	16.8	55	G-018
ALZ345	ϕ4.2×12.6	6.3	55	I-023,J-027
ϕ4.3				
MSE230SS	ϕ4.3	4.3	50	G-032
MX230	ϕ4.3	8.6	45	G-014
MSUSZ440	ϕ4.3	8.6	50	I-006
MSCZ440	ϕ4.3	8.6	50	I-008
MSZ345	ϕ4.3	8.6	50	I-010
MSE230	ϕ4.3	11	50	G-039
MX235	ϕ4.3	12.9	50	G-016
MX240	ϕ4.3	17.2	55	G-018
ALZ345	ϕ4.3×12.9	6.5	55	I-023,J-027
ϕ4.4				
MSE230SS	ϕ4.4	4.4	50	G-032
MX230	ϕ4.4	8.8	45	G-014
MSUSZ440	ϕ4.4	8.8	50	I-006
MSCZ440	ϕ4.4	8.8	50	I-008
MSZ345	ϕ4.4	8.8	50	I-010
MSE230	ϕ4.4	11	50	G-039
MX235	ϕ4.4	13.2	50	G-016
MX240	ϕ4.4	17.6	55	G-018
ALZ345	ϕ4.4×13.2	6.6	55	I-023,J-027
ϕ4.5				
MX425	ϕ4.5	4.5	50	G-022
MSE230SS	ϕ4.5	4.5	55	G-032
MXH230	ϕ4.5	9	50	F-012
MXH230P	ϕ4.5	9	50	F-022
MX230	ϕ4.5	9	50	G-014
MX430	ϕ4.5	9	50	G-024
MSUSZ440	ϕ4.5	9	50	I-006
MSCZ440	ϕ4.5	9	50	I-008
MSZ345	ϕ4.5	9	50	I-010
AL2D-2	ϕ4.5	9	55	J-006
AL2D-2DLC	ϕ4.5	9	55	J-008
MSE230	ϕ4.5	12	55	G-039
MSE430	ϕ4.5	12	55	G-052
MXH235	ϕ4.5	13.5	50	F-014
MXH235P	ϕ4.5	13.5	50	F-024
MX235	ϕ4.5	13.5	50	G-016
MX435	ϕ4.5	13.5	50	G-026
MSUSZ440	ϕ4.5	13.5	60	I-006
MSCZ440	ϕ4.5	13.5	60	I-008
MX240	ϕ4.5	18	55	G-018
MX440	ϕ4.5	18	55	G-028
MX445	ϕ4.5	22.5	65	G-030
MSUSZ440-LN	ϕ4.5×13.5	6.8	50	I-016
MSCZ440-LN	ϕ4.5×13.5	6.8	50	I-018
ALZ345-DLC	ϕ4.5×13.5	6.8	55	I-020,J-030
ALZ345	ϕ4.5×13.5	6.8	55	I-023,J-027
MSUSZ440-LN	ϕ4.5×18	6.8	60	I-016
MSCZ440-LN	ϕ4.5×18	6.8	60	I-018
MSUSZ440-LN	ϕ4.5×22.5	6.8	60	I-016
MSCZ440-LN	ϕ4.5×22.5	6.8	60	I-018
ϕ4.6				
MSE230SS	ϕ4.6	4.6	55	G-032
MX230	ϕ4.6	9.2	50	G-014
MSUSZ440	ϕ4.6	9.2	50	I-006
MSCZ440	ϕ4.6	9.2	50	I-008
MSZ345	ϕ4.6	9.2	50	I-010
MSE230	ϕ4.6	12	55	G-039
MX235	ϕ4.6	13.8	55	G-016
MX240	ϕ4.6	18.4	55	G-018
ALZ345	ϕ4.6×13.8	6.9	55	I-023,J-027
ϕ4.7				
MSE230SS	ϕ4.7	4.7	55	G-032
MX230	ϕ4.7	9.4	50	G-014
MSUSZ440	ϕ4.7	9.4	50	I-006
MSCZ440	ϕ4.7	9.4	50	I-008
MSZ345	ϕ4.7	9.4	50	I-010
MSE230	ϕ4.7	12	55	G-039
MX235	ϕ4.7	14.1	55	G-016
MX240	ϕ4.7	18.8	55	G-018
ALZ345	ϕ4.7×14.1	7.1	55	I-023,J-027
ϕ4.8				
MSE230SS	ϕ4.8	4.8	55	G-032
MX230	ϕ4.8	9.6	50	G-014
MSUSZ440	ϕ4.8	9.6	50	I-006
MSCZ440	ϕ4.8	9.6	50	I-008
MSZ345	ϕ4.8	9.6	50	I-010
MSE230	ϕ4.8	12	55	G-039
MX235	ϕ4.8	14.4	55	G-016
MX240	ϕ4.8	19.2	55	G-018
ALZ345	ϕ4.8×14.4	7.2	55	I-023,J-027
ϕ4.9				
MSE230SS	ϕ4.9	4.9	55	G-032
MX230	ϕ4.9	9.8	50	G-014
MSUSZ440	ϕ4.9	9.8	50	I-006
MSCZ440	ϕ4.9	9.8	50	I-008
MSZ345	ϕ4.9	9.8	50	I-010
MSE230	ϕ4.9	13	55	G-039
MX235	ϕ4.9	14.7	55	G-016

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MX240	ϕ4.9	19.6	55	G-018
ALZ345	ϕ4.9×14.7	7.4	55	I-023,J-027
ϕ5				
MXH225	ϕ5	5	50	F-010
MXH225P	ϕ5	5	50	F-020
MX225	ϕ5	5	50	G-012
MX425	ϕ5	5	50	G-022
MSE230SS	ϕ5	5	55	G-032
AL-3LS	ϕ5	7.5	80	J-024
RSES230	ϕ5	7.5	80	L-010
MXH230	ϕ5	10	50	F-012
MXH230P	ϕ5	10	50	F-022
MX230	ϕ5	10	50	G-014
MX430	ϕ5	10	50	G-024
MSUSZ440	ϕ5	10	50	I-006
MSCZ440	ϕ5	10	50	I-008
MSZ345	ϕ5	10	50	I-010
MSES230P	ϕ5	10	55	G-036
AL2D-2	ϕ5	10	55	J-006
AL2D-2DLC	ϕ5	10	55	J-008
MHDSH645	ϕ5	10	60	E-008
MHDH645	ϕ5	10	60	F-028
MHD645	ϕ5	10	60	G-060
RSE230	ϕ5	10	60	L-017
MSE230	ϕ5	13	55	G-039
MSE230M	ϕ5	13	55	G-044
MSE245	ϕ5	13	55	G-046
MSE345	ϕ5	13	55	G-048
MSE430P	ϕ5	13	55	G-050
MSE430	ϕ5	13	55	G-052
MSE445	ϕ5	13	55	G-054
MSX440	ϕ5	13	55	I-028
MXH235	ϕ5	15	55	F-014
MXH235P	ϕ5	15	55	F-024
MX235	ϕ5	15	55	G-016
MX435	ϕ5	15	55	G-026
AL3D-2	ϕ5	15	55	J-010
AL3D-2DLC	ϕ5	15	55	J-012
DCSE235	ϕ5	15	55	M-006
MSUSZ440	ϕ5	15	60	I-006
MSCZ440	ϕ5	15	60	I-008
MHDSH645	ϕ5	15	65	E-008
MHDH645	ϕ5	15	65	F-028
RSE230	ϕ5	15	70	L-017
AL3D-345	ϕ5	15	80	I-014,J-022
MXH240	ϕ5	20	60	F-016
MX240	ϕ5	20	60	G-018
MX440	ϕ5	20	60	G-028
MSEM230	ϕ5	20	65	G-042
MSEM430	ϕ5	20	65	G-056
AL4D-2	ϕ5	20	65	J-014
AL4D-2DLC	ϕ5	20	65	J-016
MXH245	ϕ5	25	65	F-018
MX245	ϕ5	25	65	G-020
MX445	ϕ5	25	65	G-030
AL5D-2	ϕ5	25	65	J-018
AL5D-2DLC	ϕ5	25	65	J-020
RSE230	ϕ5	25	80	L-017
RSE230	ϕ5	35	90	L-017
RSE230	ϕ5	40	100	L-017
MSUSZ440-LN	ϕ5×15	7.5	50	I-016
MSCZ440-LN	ϕ5×15	7.5	50	I-018
ALZ345-DLC	ϕ5×15	7.5	55	I-020,J-030
ALZ345	ϕ5×15	7.5	55	I-023,J-027
DHR237	ϕ5×15	10	50	K-007
MHRH430	ϕ5×16	7.5	60	F-045
MHR230	ϕ5×16	7.5	60	G-090
MHR430	ϕ5×16	7.5	60	G-098
MHR230	ϕ5×20	7.5	60	G-090
MSUSZ440-LN	ϕ5×20	7.5	60	I-016
MSCZ440-LN	ϕ5×20	7.5	60	I-018
DHR237	ϕ5×20	10	60	K-007
MSUSZ440-LN	ϕ5×25	7.5	60	I-016
MSCZ440-LN	ϕ5×25	7.5	60	I-018
MHRH430	ϕ5×25	7.5	70	F-045
MHR230	ϕ5×25	7.5	70	G-090
MHR430	ϕ5×25	7.5	70	G-098
ALZ345	ϕ5×25	7.5	80	I-023,J-027
DHR237	ϕ5×25	10	60	K-007
MHR230	ϕ5×30	7.5	80	G-090
RSES230	ϕ5×30	7.5	80	L-010
DHR237	ϕ5×30	10	70	K-007
RSE230	ϕ5×30	15	90	L-017
MHRH430	ϕ5×35	7.5	80	F-045
MHR230	ϕ5×35	7.5	80	G-090
MHR430	ϕ5×35	7.5	80	G-098
MHR230	ϕ5×40	7.5	90	G-090
RSES230	ϕ5×40	7.5	100	L-010
RSE230	ϕ5×40	15	100	L-017
MHRH430	ϕ5×50	7.5	110	F-045
MHR230	ϕ5×50	7.5	110	G-090
MHR430	ϕ5×50	7.5	110	G-098
RSES230	ϕ5×55	7.5	120	L-010
RSE230	ϕ5×55	15	120	L-017
MHR230	ϕ5×60	7.5	120	G-090
RSES230	ϕ5×70	7.5	150	L-010
RSE230	ϕ5×70	15	130	L-017
ϕ5.1				
MSE230SS	ϕ5.1	5.1	55	G-032
MX230	ϕ5.1	10.2	50	G-014
MSUSZ440	ϕ5.1	10.2	50	I-006
MSCZ440	ϕ5.1	10.2	50	I-008

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Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSZ345	φ5.1	10.2	55	I-010
MSE230	φ5.1	13	55	G-039
MX235	φ5.1	15.3	55	G-016
MX240	φ5.1	20.4	60	G-018
ALZ345	φ5.1×15.3	7.7	55	I-023,J-027
φ5.2				
MSE230SS	φ5.2	5.2	55	G-032
MX230	φ5.2	10.4	50	G-014
MSUSZ440	φ5.2	10.4	50	I-006
MSCZ440	φ5.2	10.4	50	I-008
MSZ345	φ5.2	10.4	55	I-010
MSE230	φ5.2	13	55	G-039
MX235	φ5.2	15.6	55	G-016
MX240	φ5.2	20.8	60	G-018
ALZ345	φ5.2×15.6	7.8	55	I-023,J-027
φ5.3				
MSE230SS	φ5.3	5.3	55	G-032
MX230	φ5.3	10.6	50	G-014
MSUSZ440	φ5.3	10.6	50	I-006
MSCZ440	φ5.3	10.6	50	I-008
MSZ345	φ5.3	10.6	55	I-010
MSE230	φ5.3	14	55	G-039
MX235	φ5.3	15.9	55	G-016
MX240	φ5.3	21.2	60	G-018
ALZ345	φ5.3×15.9	8	55	I-023,J-027
φ5.4				
MSE230SS	φ5.4	5.4	55	G-032
MX230	φ5.4	10.8	50	G-014
MSUSZ440	φ5.4	10.8	50	I-006
MSCZ440	φ5.4	10.8	50	I-008
MSZ345	φ5.4	10.8	55	I-010
MSE230	φ5.4	14	55	G-039
MX235	φ5.4	16.2	55	G-016
MX240	φ5.4	21.6	60	G-018
ALZ345	φ5.4×16.2	8.1	55	I-023,J-027
φ5.5				
MX425	φ5.5	5.5	50	G-022
MSE230SS	φ5.5	5.5	55	G-032
MXH230	φ5.5	11	50	F-012
MXH230P	φ5.5	11	50	F-022
MX230	φ5.5	11	50	G-014
MX430	φ5.5	11	50	G-024
MSUSZ440	φ5.5	11	50	I-006
MSCZ440	φ5.5	11	50	I-008
AL2D-2	φ5.5	11	55	J-006
AL2D-2DLC	φ5.5	11	55	J-008
MSZ345	φ5.5	11.2	55	I-010
MSE230	φ5.5	14	55	G-039
MSE430	φ5.5	14	55	G-052
MXH235	φ5.5	16.5	60	F-014
MXH235P	φ5.5	16.5	60	F-024
MX235	φ5.5	16.5	60	G-016
MX435	φ5.5	16.5	60	G-026
MSUSZ440	φ5.5	16.5	60	I-006
MSCZ440	φ5.5	16.5	60	I-008
MX240	φ5.5	22	65	G-018
MX440	φ5.5	22	65	G-028
MX445	φ5.5	27.5	75	G-030
MSUSZ440-LN	φ5.5×16.5	8.3	50	I-016
MSCZ440-LN	φ5.5×16.5	8.3	50	I-018
ALZ345-DLC	φ5.5×16.5	8.3	55	I-020,J-030
ALZ345	φ5.5×16.5	8.3	55	I-023,J-027
MSUSZ440-LN	φ5.5×22	8.3	60	I-016
MSCZ440-LN	φ5.5×22	8.3	60	I-018
MSUSZ440-LN	φ5.5×27.5	8.3	60	I-016
MSCZ440-LN	φ5.5×27.5	8.3	60	I-018
φ5.6				
MSE230SS	φ5.6	5.6	55	G-032
MX230	φ5.6	11.2	50	G-014
MSUSZ440	φ5.6	11.2	50	I-006
MSCZ440	φ5.6	11.2	50	I-008
MSZ345	φ5.6	11.4	55	I-010
MSE230	φ5.6	14	55	G-039
MX235	φ5.6	16.8	60	G-016
MX240	φ5.6	22.4	65	G-018
ALZ345	φ5.6×16.8	8.4	55	I-023,J-027
φ5.7				
MSE230SS	φ5.7	5.7	55	G-032
MX230	φ5.7	11.4	50	G-014
MSUSZ440	φ5.7	11.4	50	I-006
MSCZ440	φ5.7	11.4	50	I-008
MSZ345	φ5.7	11.6	55	I-010
MSE230	φ5.7	15	55	G-039
MX235	φ5.7	17.1	60	G-016
MX240	φ5.7	22.8	65	G-018
ALZ345	φ5.7×17.1	8.6	55	I-023,J-027
φ5.8				
MSE230SS	φ5.8	5.8	55	G-032
MX230	φ5.8	11.6	50	G-014
MSUSZ440	φ5.8	11.6	50	I-006
MSCZ440	φ5.8	11.6	50	I-008
MSZ345	φ5.8	12	55	I-010
MSE230	φ5.8	15	55	G-039
MX235	φ5.8	17.4	60	G-016
MX240	φ5.8	23.2	65	G-018
ALZ345	φ5.8×17.4	8.7	55	I-023,J-027
φ5.9				
MSE230SS	φ5.9	5.9	55	G-032
MX230	φ5.9	11.8	50	G-014
MSUSZ440	φ5.9	11.8	50	I-006
MSCZ440	φ5.9	11.8	50	I-008
MSZ345	φ5.9	12.4	55	I-010

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSE230	φ5.9	15	55	G-039
MX235	φ5.9	17.7	60	G-016
MX240	φ5.9	23.6	65	G-018
ALZ345	φ5.9×17.7	8.9	55	I-023,J-027
φ6				
MXH225	φ6	6	50	F-010
MXH225P	φ6	6	50	F-020
MX225	φ6	6	50	G-012
MX425	φ6	6	50	G-022
MSE230SS	φ6	6	55	G-032
AL-3LS	φ6	9	80	J-024
RSES230	φ6	9	90	L-010
ALZ345	φ6	9	110	I-023,J-027
MXH230	φ6	12	50	F-012
MXH230P	φ6	12	50	F-022
MX230	φ6	12	50	G-014
MX430	φ6	12	50	G-024
MSES230P	φ6	12	55	G-036
AL2D-2	φ6	12	55	J-006
AL2D-2DLC	φ6	12	55	J-008
MHDSH645	φ6	12	60	E-008
MHDH645	φ6	12	60	F-028
MSUSZ440	φ6	12	60	I-006
MSCZ440	φ6	12	60	I-008
RSE230	φ6	12	70	L-017
MSZ345	φ6	13	55	I-010
MSX440	φ6	13	55	I-028
MSE230	φ6	15	55	G-039
MSE230M	φ6	15	55	G-044
MSE245	φ6	15	55	G-046
MSE345	φ6	15	55	G-048
MSE430	φ6	15	55	G-052
MSE430P	φ6	15	55	G-050
MSE445	φ6	15	55	G-054
MHD645	φ6	15	60	G-060
MXH235	φ6	18	60	F-014
MXH235P	φ6	18	60	F-024
MX235	φ6	18	60	G-016
MX435	φ6	18	60	G-026
MSUSZ440	φ6	18	60	I-006
MSCZ440	φ6	18	60	I-008
AL3D-2	φ6	18	60	J-010
AL3D-2DLC	φ6	18	60	J-012
DCSE235	φ6	18	60	M-006
MHDSH645	φ6	18	65	E-008
MHDH645	φ6	18	65	F-028
AL3D-345	φ6	18	80	I-014,J-022
RSE230	φ6	18	80	L-017
MXH240	φ6	24	65	F-016
MX240	φ6	24	65	G-018
MX440	φ6	24	65	G-028
MSEM230	φ6	24	75	G-042
MSEM430	φ6	24	75	G-056
AL4D-2	φ6	24	75	J-014
AL4D-2DLC	φ6	24	75	J-016
RSE230	φ6	25	80	L-017
MXH245	φ6	30	75	F-018
MX245	φ6	30	75	G-020
MX445	φ6	30	75	G-030
AL5D-2	φ6	30	75	J-018
AL5D-2DLC	φ6	30	75	J-020
RSE230	φ6	30	90	L-017
RSE230	φ6	40	100	L-017
RSE230	φ6	50	120	L-017
DHR237	φ6×15	12	50	K-007
MSUSZ440-LN	φ6×18	9	60	I-016
MSCZ440-LN	φ6×18	9	60	I-018
ALZ345-DLC	φ6×18	9	60	I-020,J-030
ALZ345	φ6×18	9	60	I-023,J-027
MHRH430	φ6×20	9	80	F-045
MHR230	φ6×20	9	80	G-090
MHR430	φ6×20	9	80	G-098
DHR237	φ6×20	12	60	K-007
MSUSZ440-LN	φ6×24	9	60	I-016
MSCZ440-LN	φ6×24	9	60	I-018
MSUSZ440-LN	φ6×30	9	70	I-016
MSCZ440-LN	φ6×30	9	70	I-018
ALZ345	φ6×30	9	80	I-023,J-027
MHRH430	φ6×30	9	90	F-045
MHR230	φ6×30	9	90	G-090
MHR430	φ6×30	9	90	G-098
DHR237	φ6×30	12	70	K-007
DCHR230	φ6×30	12	90	M-008
RSES230	φ6×40	9	90	L-010
MHRH430	φ6×40	9	100	F-045
MHR230	φ6×40	9	100	G-090
MHR430	φ6×40	9	100	G-098
RSE230	φ6×40	18	100	L-017
MHRH430	φ6×50	9	110	F-045
MHR230	φ6×50	9	110	G-090
MHR430	φ6×50	9	110	G-099
DHR237	φ6×50	12	90	K-007
MHR230	φ6×60	9	120	G-090
RSES230	φ6×60	9	120	L-010
RSE230	φ6×60	18	120	L-017
RSES230	φ6×80	9	150	L-010
RSE230	φ6×80	18	130	L-017
φ6.1				
MSZ345	φ6.1	13	65	I-011
ALZ345	φ6.1×18.3	9.2	70	I-023,J-027
φ6.2				
MSZ345	φ6.2	13	65	I-011

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
ALZ345	φ6.2×18.6	9.3	70	I-023,J-027
φ6.3				
MSZ345	φ6.3	13.5	65	I-011
ALZ345	φ6.3×18.9	9.5	70	I-023,J-027
φ6.4				
MSZ345	φ6.4	13.5	65	I-011
ALZ345	φ6.4×19.2	9.6	70	I-023,J-027
φ6.5				
MSZ345	φ6.5	13.5	65	I-011
MSE230	φ6.5	17	60	G-039
MSE430	φ6.5	17	60	G-052
MSZ345	φ6.6	14	65	I-011
ALZ345	φ6.6×19.8	9.9	70	I-023,J-027
φ6.7				
MSZ345	φ6.7	14	65	I-011
ALZ345	φ6.7×20.1	10.1	70	I-023,J-027
φ6.8				
MSZ345	φ6.8	15	65	I-011
ALZ345	φ6.8×20.4	10.2	70	I-023,J-027
φ6.9				
MSZ345	φ6.9	15	65	I-011
ALZ345	φ6.9×20.7	10.4	70	I-023,J-027
φ7				
MX225	φ7	7	65	G-012
MX230	φ7	14	65	G-014
AL2D-2	φ7	14	70	J-006
AL2D-2DLC	φ7	14	70	J-008
MSZ345	φ7	16	65	I-011
MSE230	φ7	18	65	G-039
MSE430	φ7	18	65	G-052
MSX440	φ7	19	60	I-028
MX235	φ7	21	65	G-016
AL3D-2	φ7	21	70	J-010
AL3D-2DLC	φ7	21	70	J-012
MX240	φ7	28	90	G-018
AL4D-2	φ7	28	90	J-014
AL4D-2DLC	φ7	28	90	J-016
MX245	φ7	35	90	G-020
AL5D-2	φ7	35	90	J-018
AL5D-2DLC	φ7	35	90	J-020
ALZ345-DLC	φ7×21	10.5	70	I-020,J-030
ALZ345	φ7×21	10.5	70	I-023,J-027
φ7.1				
MSZ345	φ7.1	16	65	I-011
ALZ345	φ7.1×21.3	10.7	70	I-023,J-027
φ7.2				
MSZ345	φ7.2	16	65	I-011
ALZ345	φ7.2×21.6	10.8	70	I-023,J-027
φ7.3				
MSZ345	φ7.3	16	65	I-011
ALZ345	φ7.3×21.9	11	70	I-023,J-027

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
φ7.4				
MSZ345	φ7.4	16	65	I-011
ALZ345	φ7.4×22.2	11.1	70	I-023,J-027
φ7.5				
MSZ345	φ7.5	16	65	I-011
MSE230	φ7.5	19	65	G-039
MSE430	φ7.5	19	65	G-052
ALZ345	φ7.5×22.5	11.3	70	I-023,J-027
φ7.6				
MSZ345	φ7.6	17	65	I-011
ALZ345	φ7.6×22.8	11.4	70	I-023,J-027
φ7.7				
MSZ345	φ7.7	17	65	I-011
ALZ345	φ7.7×23.1	11.6	70	I-023,J-027
φ7.8				
MSZ345	φ7.8	17	65	I-011
ALZ345	φ7.8×23.4	11.7	70	I-023,J-027
φ7.9				
MSZ345	φ7.9	17	65	I-011
ALZ345	φ7.9×23.7	11.9	70	I-024,J-028
φ8				
MX225	φ8	8	65	G-012
MX425	φ8	8	65	G-022
AL-3LS	φ8	12	110	J-024
ALZ345	φ8	12	120	I-024,J-028
MX230	φ8	16	65	G-014
MSES230P	φ8	16	65	G-036
MX430	φ8	16	65	G-024
MHDH645	φ8	16	65	F-028
AL2D-2	φ8	16	70	J-006
AL2D-2DLC	φ8	16	70	J-008
MSX440	φ8	19	60	I-028
MSZ345	φ8	19	65	I-011
MSE230	φ8	20	65	G-039
MSE245	φ8	20	65	G-046
MSE345	φ8	20	65	G-048
MSE430P	φ8	20	65	G-050
MSE430	φ8	20	65	G-052
MSE445	φ8	20	65	G-054
MHD645	φ8	20	65	G-060
MX235	φ8	24	65	G-016
MX435	φ8	24	65	G-026
MHDH645	φ8	24	70	F-028
AL3D-2	φ8	24	70	J-010
AL3D-2DLC	φ8	24	70	J-012
AL3D-345	φ8	24	90	I-014,J-022
MX240	φ8	32	90	G-018
MX440	φ8	32	90	G-028
MSEM230	φ8	32	90	G-042
MSEM430	φ8	32	90	G-056
AL4D-2	φ8	32	90	J-014

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
AL4D-2DLC	φ8	32	90	J-016
MX245	φ8	40	90	G-020
MX445	φ8	40	90	G-030
AL5D-2	φ8	40	90	J-018
AL5D-2DLC	φ8	40	90	J-020
ALZ345-DLC	φ8×24	12	70	I-020,J-030
ALZ345	φ8×24	12	70	I-024,J-028
MHR430	φ8×30	12	100	G-099
ALZ345	φ8×40	12	90	I-024,J-028
MHR430	φ8×50	12	120	G-099
MHR430	φ8×60	12	130	G-099
φ8.1				
MSZ345	φ8.1	18	75	I-011
ALZ345	φ8.1×24.3	12.2	75	I-024,J-028
φ8.2				
MSZ345	φ8.2	18	75	I-011
ALZ345	φ8.2×24.6	12.3	75	I-024,J-028
φ8.3				
MSZ345	φ8.3	18	75	I-011
ALZ345	φ8.3×24.9	12.5	75	I-024,J-028
φ8.4				
MSZ345	φ8.4	18	75	I-011
ALZ345	φ8.4×25.2	12.6	75	I-024,J-028
φ8.5				
MSZ345	φ8.5	18	75	I-011
MSE230	φ8.5	22	70	G-039
MSE430	φ8.5	22	70	G-052
ALZ345	φ8.5×25.5	12.8	75	I-024,J-028
φ8.6				
MSZ345	φ8.6	19	75	I-011
ALZ345	φ8.6×25.8	12.9	75	I-024,J-028
φ8.7				
MSZ345	φ8.7	19	75	I-011
ALZ345	φ8.7×26.1	13.1	75	I-024,J-028
φ8.8				
MSZ345	φ8.8	19	75	I-011
ALZ345	φ8.8×26.4	13.2	75	I-024,J-028
φ8.9				
MSZ345	φ8.9	19	75	I-011
ALZ345	φ8.9×26.7	13.4	75	I-024,J-028
φ9				
MX225	φ9	9	75	G-012
MX230	φ9	18	75	G-014
AL2D-2	φ9	18	75	J-006
AL2D-2DLC	φ9	18	75	J-008
MSZ345	φ9	19	75	I-011
MSX440	φ9	22	70	I-028
MSE230	φ9	23	70	G-039
MSE430	φ9	23	70	G-052
MX235	φ9	27	75	G-016
AL3D-2	φ9	27	75	J-010

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
AL3D-2DLC	φ9	27	75	J-012
MX240	φ9	36	100	G-018
AL4D-2	φ9	36	100	J-014
AL4D-2DLC	φ9	36	100	J-016
MX245	φ9	45	100	G-020
AL5D-2	φ9	45	100	J-018
AL5D-2DLC	φ9	45	100	J-020
ALZ345-DLC	φ9×27	13.5	75	I-020,J-030
ALZ345	φ9×27	13.5	75	I-024,J-028
φ9.1				
MSZ345	φ9.1	20	75	I-011
ALZ345	φ9.1×27.3	13.7	75	I-024,J-028
φ9.2				
MSZ345	φ9.2	20	75	I-011
ALZ345	φ9.2×27.6	13.8	75	I-024,J-028
φ9.3				
MSZ345	φ9.3	20	75	I-011
ALZ345	φ9.3×27.9	14	75	I-024,J-028
φ9.4				
MSZ345	φ9.4	20	75	I-011
ALZ345	φ9.4×28.2	14.1	75	I-024,J-028
φ9.5				
MSZ345	φ9.5	20	75	I-011
MSE230	φ9.5	24	75	G-039
MSE430	φ9.5	24	75	G-052
ALZ345	φ9.5×28.5	14.3	75	I-024,J-028
φ9.6				
MSZ345	φ9.6	21	75	I-011
ALZ345	φ9.6×28.8	14.4	75	I-024,J-028
φ9.7				
MSZ345	φ9.7	21	75	I-011
ALZ345	φ9.7×29.1	14.6	75	I-024,J-028
φ9.8				
MSZ345	φ9.8	21	75	I-011
ALZ345	φ9.8×29.4	14.7	75	I-024,J-028
φ9.9				
MSZ345	φ9.9	21	75	I-011
ALZ345	φ9.9×29.7	14.9	75	I-024,J-028
φ10				
MX225	φ10	10	75	G-012
MX425	φ10	10	75	G-022
ALZ345	φ10	15	130	I-024,J-028
AL-3LS	φ10	15	130	J-024
MHDH645	φ10	20	75	F-028
MX230	φ10	20	75	G-014
MSES230P	φ10	20	75	G-036
MX430	φ10	20	75	G-024
AL2D-2	φ10	20	75	J-006
AL2D-2DLC	φ10	20	75	J-008
MSX440	φ10	22	70	I-028
MSZ345	φ10	22	75	I-011

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSE230	ϕ10	25	75	G-039
MSE245	ϕ10	25	75	G-046
MSE345	ϕ10	25	75	G-048
MSE430P	ϕ10	25	75	G-050
MSE430	ϕ10	25	75	G-052
MSE445	ϕ10	25	75	G-054
MHD645	ϕ10	25	75	G-060
MX235	ϕ10	30	75	G-016
MX435	ϕ10	30	75	G-026
AL3D-2	ϕ10	30	75	J-010
AL3D-2DLC	ϕ10	30	75	J-012
MHDH645	ϕ10	30	80	F-028
AL3D-345	ϕ10	30	100	I-014,J-022
MX240	ϕ10	40	100	G-018
MX440	ϕ10	40	100	G-028
MSEM230	ϕ10	40	100	G-042
MSEM430	ϕ10	40	100	G-056
AL4D-2	ϕ10	40	100	J-014
AL4D-2DLC	ϕ10	40	100	J-016
MX245	ϕ10	50	100	G-020
MX445	ϕ10	50	100	G-030
AL5D-2	ϕ10	50	100	J-018
AL5D-2DLC	ϕ10	50	100	J-020
ALZ345-DLC	ϕ10×30	15	75	I-020,J-030
ALZ345	ϕ10×30	15	75	I-024,J-028
MHR430	ϕ10×40	15	110	G-099
ALZ345	ϕ10×50	15	100	I-024,J-028
MHR430	ϕ10×60	15	130	G-099
MHR430	ϕ10×80	15	150	G-099
ϕ10.1				
MSZ345	ϕ10.1	22	80	I-011
ALZ345	ϕ10.1×30.3	15.2	80	I-024,J-028
ϕ10.2				
MSZ345	ϕ10.2	22	80	I-011
ALZ345	ϕ10.2×30.6	15.3	80	I-024,J-028
ϕ10.3				
MSZ345	ϕ10.3	22	80	I-011
ALZ345	ϕ10.3×30.9	15.5	80	I-024,J-028
ϕ10.4				
MSZ345	ϕ10.4	22	80	I-011
ALZ345	ϕ10.4×31.2	15.6	80	I-024,J-028
ϕ10.5				
MSZ345	ϕ10.5	22	80	I-011
MSE230	ϕ10.5	27	80	G-039
ALZ345	ϕ10.5×31.5	15.8	80	I-024,J-028
ϕ10.6				
MSZ345	ϕ10.6	22	80	I-011
ALZ345	ϕ10.6×31.8	15.9	80	I-024,J-028
ϕ10.7				
MSZ345	ϕ10.7	22	80	I-011
ALZ345	ϕ10.7×32.1	16.1	80	I-024,J-028

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
ϕ10.8				
MSZ345	ϕ10.8	22	80	I-011
ALZ345	ϕ10.8×32.4	16.2	80	I-024,J-028
ϕ10.9				
MSZ345	ϕ10.9	22	80	I-011
ALZ345	ϕ10.9×32.7	16.4	80	I-024,J-028
ϕ11				
MSZ345	ϕ11	22	80	I-011
AL2D-2	ϕ11	22	80	J-006
AL2D-2DLC	ϕ11	22	80	J-008
MSX440	ϕ11	26	80	I-028
MSE230	ϕ11	28	80	G-039
AL3D-2	ϕ11	33	90	J-010
AL3D-2DLC	ϕ11	33	90	J-012
AL4D-2	ϕ11	44	110	J-014
AL4D-2DLC	ϕ11	44	110	J-016
AL5D-2	ϕ11	55	110	J-018
AL5D-2DLC	ϕ11	55	110	J-020
ALZ345-DLC	ϕ11×33	16.5	80	I-020,J-030
ALZ345	ϕ11×33	16.5	80	I-024,J-028
ϕ11.1				
MSZ345	ϕ11.1	25	80	I-011
ALZ345	ϕ11.1×33.3	16.7	80	I-024,J-028
ϕ11.2				
MSZ345	ϕ11.2	25	80	I-011
ALZ345	ϕ11.2×33.6	16.8	80	I-024,J-028
ϕ11.3				
MSZ345	ϕ11.3	25	80	I-011
ALZ345	ϕ11.3×33.9	17	80	I-024,J-028
ϕ11.4				
MSZ345	ϕ11.4	25	80	I-011
ALZ345	ϕ11.4×34.2	17.1	80	I-024,J-028
ϕ11.5				
MSZ345	ϕ11.5	25	80	I-011
MSE230	ϕ11.5	29	80	G-039
ALZ345	ϕ11.5×34.5	17.3	80	I-024,J-028
ϕ11.6				
MSZ345	ϕ11.6	25	80	I-011
ALZ345	ϕ11.6×34.8	17.4	80	I-024,J-028
ϕ11.7				
MSZ345	ϕ11.7	25	80	I-011
ALZ345	ϕ11.7×35.1	17.6	80	I-024,J-028
ϕ11.8				
MSZ345	ϕ11.8	25	80	I-011
ALZ345	ϕ11.8×35.4	17.7	80	I-024,J-028
ϕ11.9				
MSZ345	ϕ11.9	25	80	I-011
ALZ345	ϕ11.9×35.7	17.9	80	I-024,J-028
ϕ12				
MX225	ϕ12	12	80	G-012
MX425	ϕ12	12	80	G-022

Search from Square Dia.

Unit [Size : mm]

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
ALZ345	ϕ12	18	150	I-024,J-028
AL-3LS	ϕ12	18	150	J-024
MHDH645	ϕ12	24	80	F-028
MX230	ϕ12	24	80	G-014
MX430	ϕ12	24	80	G-024
MSES230P	ϕ12	24	80	G-036
AL2D-2	ϕ12	24	80	J-006
AL2D-2DLC	ϕ12	24	80	J-008
MSZ345	ϕ12	26	80	I-011
MSX440	ϕ12	26	80	I-028
MSE230	ϕ12	30	80	G-039
MSE245	ϕ12	30	80	G-046
MSE345	ϕ12	30	80	G-048
MSE430P	ϕ12	30	80	G-050
MSE430	ϕ12	30	80	G-052
MSE445	ϕ12	30	80	G-054
MHD645	ϕ12	30	80	G-060
MX235	ϕ12	36	80	G-016
MX435	ϕ12	36	80	G-026
MHDH645	ϕ12	36	90	F-028
AL3D-2	ϕ12	36	90	J-010
AL3D-2DLC	ϕ12	36	90	J-012
AL3D-345	ϕ12	36	110	I-014,J-022
MX240	ϕ12	48	105	G-018
MX440	ϕ12	48	105	G-028
MSEM230	ϕ12	48	110	G-042
MSEM430	ϕ12	48	110	G-056
AL4D-2	ϕ12	48	110	J-014
AL4D-2DLC	ϕ12	48	110	J-016
MX245	ϕ12	60	105	G-020
MX445	ϕ12	60	105	G-030
AL5D-2	ϕ12	60	110	J-018
AL5D-2DLC	ϕ12	60	110	J-020
ALZ345-DLC	ϕ12×36	18	80	I-020,J-030
ALZ345	ϕ12×36	18	80	I-024,J-028
ALZ345	ϕ12×60	18	110	I-024,J-028
ϕ13				
MSX440	ϕ13	26	90	I-028
ϕ14				
MSX440	ϕ14	26	90	I-028
MSE430	ϕ14	35	100	G-052
ϕ15				
MSX440	ϕ15	32	90	I-028
MSE430	ϕ15	40	110	G-052
ϕ16				
MSX440	ϕ16	32	90	I-028
MSE345	ϕ16	40	110	G-048
MSE430	ϕ16	40	110	G-052
MSE445	ϕ16	40	110	G-054
MSEM430	ϕ16	64	130	G-056
ϕ18				

Model	Dia. (xUnder neck Length)	Length of Cut	Overall Length	Page
MSX440	ϕ18	32	105	I-028
MSE430	ϕ18	45	120	G-052
ϕ20				
MSX440	ϕ20	38	105	I-028
MSE345	ϕ20	50	135	G-048
MSE430	ϕ20	50	135	G-052
MSE445	ϕ20	50	135	G-054
MSEM430	ϕ20	80	140	G-056

Search from Ball R

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
R0.005				
NSMB100	R0.005	0.01	45	D-014
R0.01				
NSMB100	R0.01	0.02	45	D-014
SMB120	R0.01	0.02	50	B-012,D-012
R0.015				
NSMB100	R0.015	0.03	45	D-014
SMB120	R0.015	0.03	50	B-012,D-012
R0.02				
NSMB100	R0.02	0.04	45	D-014
SMB120	R0.02	0.04	50	B-012,D-012
R0.025				
NSMB100	R0.025	0.05	45	D-014
SMB120	R0.025	0.05	50	B-012,D-012
R0.03				
NSMB100	R0.03	0.06	45	D-014
SMB120	R0.03	0.06	50	B-012,D-012
R0.04				
NSMB100	R0.04	0.08	45	D-014
SMB120	R0.04	0.08	50	B-012,D-012
R0.05				
NSMB100	R0.05	0.1	45	D-014
SMB120	R0.05	0.1	50	B-012,D-012
MSBH230	R0.05	0.1	50	F-030
MSB230	R0.05	0.1	50	G-062
MSB230G2	R0.05	0.1	50	G-068
PCDRB	R0.05×0.15	0.05	48	C-008
MRBSH230SF	R0.05×0.2	0.07	35	E-012
MRBH230	R0.05×0.2	0.07	45	F-048
PCDRB	R0.05×0.25	0.05	48	C-008
MRBSH230SF	R0.05×0.3	0.07	35	E-012
MRBH230	R0.05×0.3	0.07	45	F-048
MRB230	R0.05×0.3	0.07	45	G-106
DRB230	R0.05×0.3	0.07	45	K-010
SSBL200	R0.05×0.3	0.08	50	B-022
MRBSH230SF	R0.05×0.5	0.07	35	E-012
MRBH230	R0.05×0.5	0.07	45	F-048
MRB230	R0.05×0.5	0.07	45	G-106
DRB230	R0.05×0.5	0.07	45	K-010
MRBTNH230	R0.05×0.5	0.07	50	F-062
SSBL200	R0.05×0.5	0.08	50	B-022
MRBTNH230	R0.05×0.75	0.07	50	F-062
R0.075				
MSBH230	R0.075	0.15	50	F-030
MSB230	R0.075	0.15	50	G-062
PCDRB	R0.075×0.23	0.075	48	C-008
MRBSH230SF	R0.075×0.3	0.1	35	E-012
MRBH230	R0.075×0.3	0.1	45	F-048
MRB230	R0.075×0.3	0.1	45	G-106
DRB230	R0.075×0.3	0.1	45	K-010
PCDRB	R0.075×0.38	0.075	48	C-008

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
SSBL200	R0.075×0.45	0.12	50	B-022
MRBSH230SF	R0.075×0.5	0.1	35	E-012
MRBH230	R0.075×0.5	0.1	45	F-048
MRB230	R0.075×0.5	0.1	45	G-106
DRB230	R0.075×0.5	0.1	45	K-010
SSBL200	R0.075×0.75	0.12	50	B-022
MRBH230	R0.075×1	0.1	45	F-048
MRB230	R0.075×1	0.1	45	G-106
DRB230	R0.075×1	0.1	45	K-010
MRBTNH230	R0.075×1	0.1	50	F-062
MRBTNH230	R0.075×1.5	0.1	50	F-062
R0.1				
MSBSH330-5X	R0.1	0.12	50	E-010
DCMB	R0.1	0.15	45	N-008
MSB230SF	R0.1	0.2	35	G-074
MSBH230	R0.1	0.2	50	F-030
MSB230	R0.1	0.2	50	G-062
MSB230G2	R0.1	0.2	50	G-068
MSB230S	R0.1	0.2	50	G-070
MSBL230	R0.1	0.5	70	G-078
RSB230	R0.1	0.6	50	L-022
RSB230	R0.1	1	50	L-022
MRBSH230SF	R0.1×0.3	0.15	35	E-012
MRBSH330	R0.1×0.3	0.15	45	E-016
MRBH230	R0.1×0.3	0.15	45	F-048
SSPB220	R0.1×0.3	0.15	50	B-016
SSB200	R0.1×0.3	0.15	50	B-018
PCDRB	R0.1×0.5	0.1	48	C-008
DCMB	R0.1×0.5	0.12	45	N-008
MRBSH230SF	R0.1×0.5	0.15	35	E-012
MRB230SF	R0.1×0.5	0.15	35	G-118
MRBSH330	R0.1×0.5	0.15	45	E-016
MRBH230	R0.1×0.5	0.15	45	F-048
MRB230	R0.1×0.5	0.15	45	G-106
DRB230	R0.1×0.5	0.15	45	K-010
SFB200	R0.1×0.5	0.15	50	B-014
MRB230	R0.1×0.5	0.15	50	G-106
MACH225SF	R0.1×0.5	0.2	35	F-058
MACH225	R0.1×0.5	0.2	50	F-060
SSPB220	R0.1×0.6	0.15	50	B-016
SSBL200	R0.1×0.6	0.15	50	B-022
MRBSH230SF	R0.1×0.75	0.15	35	E-012
MRB230SF	R0.1×0.75	0.15	35	G-118
MRBH230	R0.1×0.75	0.15	45	F-048
MRB230	R0.1×0.75	0.15	45	G-106
DRB230	R0.1×0.75	0.15	45	K-010
MRBSH230SF	R0.1×1	0.15	35	E-012
MRB230SF	R0.1×1	0.15	35	G-118
DRB230	R0.1×1	0.15	45	K-010
MRBH230	R0.1×1	0.15	45	F-048
MRB230	R0.1×1	0.15	45	G-106

Search from Ball R

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
SSPBL220	R0.1×1	0.15	50	B-020
SSBL200	R0.1×1	0.15	50	B-022
MRBH230	R0.1×1	0.15	50	F-048
MRB230	R0.1×1	0.15	50	G-106
MRBTN230	R0.1×1	0.2	50	G-124
MRB230SF	R0.1×1.25	0.15	35	G-118
MRBH230	R0.1×1.25	0.15	45	F-048
MRB230	R0.1×1.25	0.15	45	G-106
MRBH230	R0.1×1.5	0.15	45	F-048
MRB230	R0.1×1.5	0.15	45	G-106
DRB230	R0.1×1.5	0.15	45	K-010
SSPBTN220	R0.1×1.5	0.15	50	B-024
MRBTNH230	R0.1×1.5	0.15	50	F-062
MRB230	R0.1×1.5	0.15	50	G-106
MRBTN230	R0.1×1.5	0.2	50	G-124
MRBH230	R0.1×1.75	0.15	45	F-048
MRB230	R0.1×1.75	0.15	45	G-106
MRB230	R0.1×2	0.15	45	G-106
MRBH230	R0.1×2	0.15	45	F-048
DRB230	R0.1×2	0.15	45	K-010
SSPBTN220	R0.1×2	0.15	50	B-024
MRBTNH230	R0.1×2	0.15	50	F-062
MRB230	R0.1×2	0.15	50	G-106
MRBTN230	R0.1×2	0.2	50	G-124
RSB230	R0.1×2	0.6	50	L-022
MRBH230	R0.1×2.5	0.15	45	F-048
MRB230	R0.1×2.5	0.15	45	G-106
MRBTN230L	R0.1×2.5	0.2	50	G-134
MRBH230	R0.1×3	0.15	45	F-048
MRB230	R0.1×3	0.15	45	G-106
MRBTNH230	R0.1×3	0.15	50	F-062
MRBTN230L	R0.1×3	0.2	50	G-134
MRBTNH230	R0.1×5	0.15	50	F-062
R0.15				
MSBSH330-5X	R0.15	0.18	50	E-010
MSBH230	R0.15	0.3	50	F-030
MSB230G2	R0.15	0.3	50	G-068
MSB230	R0.15	0.3	50	G-062
MSB230S	R0.15	0.3	50	G-070
MSBL230	R0.15	0.75	70	G-078
RSB230	R0.15	0.9	50	L-022
RSB230	R0.15	1.5	50	L-022
SSPB220	R0.15×0.3	0.23	50	B-016
SSB200	R0.15×0.3	0.23	50	B-018
MRBSH230SF	R0.15×0.5	0.2	35	E-012
MRB230SF	R0.15×0.5	0.2	35	G-118
MRBSH330	R0.15×0.5	0.2	45	E-016
MRBH230	R0.15×0.5	0.2	45	F-048
MRB230	R0.15×0.5	0.2	45	G-106
DRB230	R0.15×0.5	0.2	45	K-010
SSB200	R0.15×0.5	0.23	50	B-018

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
SSPB220	R0.15×0.5	0.23	50	B-016
MRBSH230SF	R0.15×0.6	0.2	35	E-012
MRB230SF	R0.15×0.6	0.2	35	G-118
MRBSH330	R0.15×0.6	0.2	45	E-016
MRBH230	R0.15×0.6	0.2	45	F-048
MRB230	R0.15×0.6	0.2	45	G-106
MRBSH230SF	R0.15×0.75	0.2	35	E-012
MRB230SF	R0.15×0.75	0.2	35	G-118
MRBSH330	R0.15×0.75	0.2	45	E-016
MRBH230	R0.15×0.75	0.2	45	F-048
MRB230	R0.15×0.75	0.2	45	G-106
SSPB220	R0.15×0.75	0.23	50	B-016
SSB200	R0.15×0.75	0.23	50	B-018
SSPBL220	R0.15×0.9	0.23	50	B-020
SSBL200	R0.15×0.9	0.23	50	B-022
MRBSH230SF	R0.15×1	0.2	35	E-012
MRB230SF	R0.15×1	0.2	35	G-118
MRBSH330	R0.15×1	0.2	45	E-016
MRBH230	R0.15×1	0.2	45	F-048
MRB230	R0.15×1	0.2	45	G-106
DRB230	R0.15×1	0.2	45	K-010
MRB230	R0.15×1	0.2	50	G-106
MRB230SF	R0.15×1.25	0.2	35	G-118
MRBH230	R0.15×1.25	0.2	45	F-048
MRB230	R0.15×1.25	0.2	45	G-106
MRBSH230SF	R0.15×1.5	0.2	35	E-012
MRB230SF	R0.15×1.5	0.2	35	G-118
MRBH230	R0.15×1.5	0.2	45	F-048
MRB230	R0.15×1.5	0.2	45	G-106
DRB230	R0.15×1.5	0.2	45	K-010
MRBH230	R0.15×1.5	0.2	50	F-048
MRB230	R0.15×1.5	0.2	50	G-106
SSPBL220	R0.15×1.5	0.23	50	B-020
SSBL200	R0.15×1.5	0.23	50	B-022
MRB230SF	R0.15×1.75	0.2	35	G-118
MRBH230	R0.15×1.75	0.2	45	F-048
MRB230	R0.15×1.75	0.2	45	G-106
MRBH230	R0.15×2	0.2	45	F-048
DRB230	R0.15×2	0.2	45	K-010
MRB230	R0.15×2	0.2	45	G-106
MRBTNH230	R0.15×2	0.2	50	F-062
MRB230	R0.15×2	0.2	50	G-106
SSPBTN220	R0.15×2	0.23	50	B-024
MRBTN230	R0.15×2	0.3	50	G-124
MRBH230	R0.15×2.25	0.2	45	F-048
MRB230	R0.15×2.25	0.2	45	G-106
MRBH230	R0.15×2.5	0.2	45	F-048
MRB230	R0.15×2.5	0.2	45	G-106
MRB230	R0.15×2.75	0.2	45	G-106
MRBH230	R0.15×3	0.2	45	F-048
MRB230	R0.15×3	0.2	45	G-107

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBTNH230	R0.15×3	0.2	50	F-062
SSPBTN220	R0.15×3	0.23	52	B-024
MRBTN230	R0.15×3	0.3	50	G-124
MRBLN230-6	R0.15×3	0.3	60	G-122
RSB230	R0.15×3	0.9	50	L-022
MRBH230	R0.15×3.5	0.2	45	F-048
MRB230	R0.15×3.5	0.2	45	G-107
MRBH230	R0.15×4	0.2	45	F-048
MRB230	R0.15×4	0.2	45	G-107
MRBTN230L	R0.15×4	0.3	50	G-134
MRB230	R0.15×4.5	0.2	45	G-107
MRB230	R0.15×5	0.2	45	G-107
MRBTNH230	R0.15×5	0.2	50	F-062
MRBTNH230	R0.15×7	0.2	50	F-062
R0.2				
MSBSH330-5X	R0.2	0.24	50	E-010
DCMB	R0.2	0.3	45	N-008
MSB230SF	R0.2	0.4	35	G-074
MSB230S	R0.2	0.4	50	G-070
MSBH230	R0.2	0.6	50	F-030
MSB230G2	R0.2	0.6	50	G-068
MSB230	R0.2	0.6	50	G-062
MSBL230	R0.2	1	70	G-078
RSB230	R0.2	1.2	50	L-022
RSB230	R0.2	2	50	L-022
MRBSH230SF	R0.2×0.5	0.3	35	E-012
MRBSH330	R0.2×0.5	0.3	45	E-016
MRBH230	R0.2×0.5	0.3	45	F-049
MRB230	R0.2×0.5	0.3	45	G-107
DRB230	R0.2×0.5	0.3	45	K-010
SSPB220	R0.2×0.5	0.3	50	B-016
SSB200	R0.2×0.5	0.3	50	B-018
MRB230SF	R0.2×0.75	0.3	35	G-118
MRB230	R0.2×0.75	0.3	45	G-107
SSPB220	R0.2×0.75	0.3	50	B-016
SSB200	R0.2×0.75	0.3	50	B-018
MRBSH230SF	R0.2×0.8	0.3	35	E-012
MRBSH330	R0.2×0.8	0.3	45	E-016
MRBH230	R0.2×0.8	0.3	45	F-049
PCDRB	R0.2×1	0.2	48	C-008
DCMB	R0.2×1	0.25	45	N-008
MRBSH230SF	R0.2×1	0.3	35	E-012
MRB230SF	R0.2×1	0.3	35	G-118
MRBSH330	R0.2×1	0.3	45	E-016
MRBH230	R0.2×1	0.3	45	F-049
MRB230	R0.2×1	0.3	45	G-107
DRB230	R0.2×1	0.3	45	K-010
DCRB230	R0.2×1	0.3	45	M-010
SFB200	R0.2×1	0.3	50	B-014
SSPB220	R0.2×1	0.3	50	B-016
SSB200	R0.2×1	0.3	50	B-018

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBH230	R0.2×1	0.3	50	F-049
MRB230	R0.2×1	0.3	50	G-107
MACH225SF	R0.2×1	0.4	35	F-058
MACH225	R0.2×1	0.4	50	F-060
SSPB220	R0.2×1.2	0.3	50	B-016
SSBL200	R0.2×1.2	0.3	50	B-022
MRBSH230SF	R0.2×1.5	0.3	35	E-012
MRB230SF	R0.2×1.5	0.3	35	G-118
MRBH230	R0.2×1.5	0.3	45	F-049
MRB230	R0.2×1.5	0.3	45	G-107
DRB230	R0.2×1.5	0.3	45	K-010
MRB230	R0.2×1.5	0.3	50	G-107
MRBSH230SF	R0.2×2	0.3	35	E-012
MRB230SF	R0.2×2	0.3	35	G-118
MRBH230	R0.2×2	0.3	45	F-049
MRB230	R0.2×2	0.3	45	G-107
DRB230	R0.2×2	0.3	45	K-010
DCRB230	R0.2×2	0.3	45	M-010
SSPBL220	R0.2×2	0.3	50	B-020
SSBL200	R0.2×2	0.3	50	B-022
MRBH230	R0.2×2	0.3	50	F-049
MRB230	R0.2×2	0.3	50	G-107
MRBTN230	R0.2×2	0.4	50	G-124,G-125
MRBSH230SF	R0.2×2.5	0.3	35	E-012
MRB230SF	R0.2×2.5	0.3	35	G-118
MRBH230	R0.2×2.5	0.3	45	F-049
MRB230	R0.2×2.5	0.3	45	G-107
MRB230	R0.2×2.5	0.3	50	G-107
MRBH230	R0.2×3	0.3	45	F-049
MRB230	R0.2×3	0.3	45	G-107
DRB230	R0.2×3	0.3	45	K-010
SSPBTN220	R0.2×3	0.3	50	B-024
MRBTNH230	R0.2×3	0.3	50	F-062
MRB230	R0.2×3	0.3	50	G-107
SSPBL220	R0.2×3	0.3	52	B-020
MRBTN230	R0.2×3	0.4	50	G-124,G-125
MRBH230	R0.2×3.5	0.3	45	F-049
MRB230	R0.2×3.5	0.3	45	G-107
MRBH230	R0.2×4	0.3	45	F-049
MRB230	R0.2×4	0.3	45	G-107
DRB230	R0.2×4	0.3	45	K-010
DCRB230	R0.2×4	0.3	45	M-010
MRBTNH230	R0.2×4	0.3	50	F-062
SSPBTN220	R0.2×4	0.3	52	B-024
MRBTN230	R0.2×4	0.4	50	G-124,G-125
MRBLN230-6	R0.2×4	0.4	60	G-122
RSB230	R0.2×4	1.2	50	L-022
MRBH230	R0.2×4.5	0.3	45	F-049
MRB230	R0.2×4.5	0.3	45	G-107
MRBH230	R0.2×5	0.3	45	F-049
MRB230	R0.2×5	0.3	45	G-107

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
DRB230	R0.2×5	0.3	45	K-010
MRBTNH230	R0.2×5	0.3	50	F-063
MRBTN230L	R0.2×5	0.4	50	G-134
RSB230	R0.2×5	1.2	50	L-022
MRB230	R0.2×5.5	0.3	45	G-107
MRBH230	R0.2×6	0.3	45	F-049
MRB230	R0.2×6	0.3	45	G-107
DRB230	R0.2×6	0.3	45	K-010
DCRB230	R0.2×6	0.3	45	M-010
MRBTNH230	R0.2×6	0.3	50	F-062
MRBTN230L	R0.2×6	0.4	50	G-134
MRBTNH230	R0.2×7	0.3	50	F-063
R0.25				
MSBSH330-5X	R0.25	0.3	50	E-010
MSB230S	R0.25	0.5	50	G-070
MSBH230	R0.25	0.8	50	F-030
MSB230	R0.25	0.8	50	G-062
MSB230G2	R0.25	0.8	50	G-068
MSBL230	R0.25	1.25	70	G-078
RSB230	R0.25	1.5	50	L-022
RSB230	R0.25	2.5	50	L-022
RSB230	R0.25	5	50	L-022
MRBSH230SF	R0.25×1	0.35	35	E-012
MRB230SF	R0.25×1	0.35	35	G-118
MRBSH330	R0.25×1	0.35	45	E-016
MRBH230	R0.25×1	0.35	45	F-049
MRB230	R0.25×1	0.35	45	G-107
DRB230	R0.25×1	0.35	45	K-011
SSPB220	R0.25×1	0.38	50	B-016
SSB200	R0.25×1	0.38	50	B-018
SFB200	R0.25×1.25	0.38	50	B-014
MACH225	R0.25×1.25	0.5	50	F-060
MRBSH230SF	R0.25×1.5	0.35	35	E-012
MRB230SF	R0.25×1.5	0.35	35	G-118
MRBSH330	R0.25×1.5	0.35	45	E-016
MRBH230	R0.25×1.5	0.35	45	F-049
MRB230	R0.25×1.5	0.35	45	G-107
DRB230	R0.25×1.5	0.35	45	K-011
MRB230	R0.25×1.5	0.35	50	G-107
SSPBL220	R0.25×1.5	0.38	50	B-020
SSBL200	R0.25×1.5	0.38	50	B-022
MRBSH230SF	R0.25×2	0.35	35	E-012
MRB230SF	R0.25×2	0.35	35	G-118
MRBH230	R0.25×2	0.35	45	F-049
MRB230	R0.25×2	0.35	45	G-107
DRB230	R0.25×2	0.35	45	K-011
MRB230	R0.25×2	0.35	50	G-107
MRBSH230SF	R0.25×2.5	0.35	35	E-012
MRB230SF	R0.25×2.5	0.35	35	G-118
MRBH230	R0.25×2.5	0.35	45	F-049
MRB230	R0.25×2.5	0.35	45	G-107

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
SSPBL220	R0.25×2.5	0.38	50	B-020
SSBL200	R0.25×2.5	0.38	50	B-022
MRBSH230SF	R0.25×3	0.35	35	E-012
MRB230SF	R0.25×3	0.35	35	G-118
MRBH230	R0.25×3	0.35	45	F-049
MRB230	R0.25×3	0.35	45	G-107
DRB230	R0.25×3	0.35	45	K-011
MRBTN230	R0.25×3	0.5	50	G-125
MRBH230	R0.25×3.5	0.35	45	F-049
MRB230	R0.25×3.5	0.35	45	G-107
SSPBL220	R0.25×3.5	0.38	52	B-020
MRBH230	R0.25×4	0.35	45	F-049
MRB230	R0.25×4	0.35	45	G-107
DRB230	R0.25×4	0.35	45	K-011
MRBTNH230	R0.25×4	0.35	50	F-063
MRB230	R0.25×4	0.35	50	G-107
SSPBTN220	R0.25×4	0.38	52	B-025
MRBH230	R0.25×4.5	0.35	45	F-049
MRB230	R0.25×4.5	0.35	45	G-107
MRBH230	R0.25×5	0.35	45	F-049
MRB230	R0.25×5	0.35	45	G-107
DRB230	R0.25×5	0.35	45	K-011
MRBTNH230	R0.25×5	0.35	50	F-063
MRB230	R0.25×5	0.35	50	G-107
SSPBTN220	R0.25×5	0.38	52	B-025
MRBTN230	R0.25×5	0.5	50	G-125
MRBLN230-6	R0.25×5	0.8	60	G-122
MRBH230	R0.25×5.5	0.35	45	F-049
MRB230	R0.25×5.5	0.35	45	G-107
MRBH230	R0.25×6	0.35	45	F-049
MRB230	R0.25×6	0.35	45	G-107
DRB230	R0.25×6	0.35	45	K-011
MRB230	R0.25×6	0.35	50	G-107
MRBTN230L	R0.25×6	0.5	50	G-134,G-135
MRB230	R0.25×7	0.35	45	G-107
MRBTN230L	R0.25×7	0.5	50	G-134,G-135
MRBH230	R0.25×8	0.35	45	F-049
MRB230	R0.25×8	0.35	45	G-107
MRB230	R0.25×8	0.35	50	G-107
MRB230	R0.25×9	0.35	55	G-107
MRBH230	R0.25×10	0.35	45	F-049
MRB230	R0.25×10	0.35	55	G-107
RSB230	R0.25×10	1.5	50	L-022
RSB230	R0.25×15	1.5	50	L-022
RSB230	R0.25×20	1.5	60	L-022
R0.3				
MSBSH330-5X	R0.3	0.36	50	E-010
DCMB	R0.3	0.45	45	N-008
MSB230SF	R0.3	0.6	35	G-074
MSB230S	R0.3	0.6	50	G-070
MSBH230	R0.3	0.9	50	F-030

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MSB230G2	R0.3	0.9	50	G-068
MSB230	R0.3	0.9	50	G-062
MSBL230	R0.3	1.5	70	G-078
RSB230	R0.3	1.8	50	L-022
RSB230	R0.3	3	50	L-022
MRBSH230SF	R0.3×1	0.45	35	E-013
MRBSH330	R0.3×1	0.45	45	E-016
MRBH230	R0.3×1	0.45	45	F-049
MRB230	R0.3×1	0.45	45	G-108
DRB230	R0.3×1	0.45	45	K-011
SSPB220	R0.3×1.2	0.5	50	B-016
PCDRB	R0.3×1.5	0.3	48	C-008
DCMB	R0.3×1.5	0.35	45	N-008
MRBSH230SF	R0.3×1.5	0.45	35	E-013
MRB230SF	R0.3×1.5	0.45	35	G-118
MRBSH330	R0.3×1.5	0.45	45	E-016
MRBH230	R0.3×1.5	0.45	45	F-049
MRB230	R0.3×1.5	0.45	45	G-108
DRB230	R0.3×1.5	0.45	45	K-011
SFB200	R0.3×1.5	0.5	50	B-014
SSPB220	R0.3×1.5	0.5	50	B-016
SSB200	R0.3×1.5	0.5	50	B-018
MACH225SF	R0.3×1.5	0.6	35	F-058
MACH225	R0.3×1.5	0.6	50	F-060
MRBSH230SF	R0.3×2	0.45	35	E-013
MRB230SF	R0.3×2	0.45	35	G-118
MRBSH330	R0.3×2	0.45	45	E-016
MRBH230	R0.3×2	0.45	45	F-049
MRB230	R0.3×2	0.45	45	G-108
DRB230	R0.3×2	0.45	45	K-011
MRBH230	R0.3×2	0.45	50	F-049
MRB230	R0.3×2	0.45	50	G-108
MRBSH230SF	R0.3×2.5	0.45	35	E-013
MRB230SF	R0.3×2.5	0.45	35	G-118
MRBH230	R0.3×2.5	0.45	45	F-049
MRB230	R0.3×2.5	0.45	45	G-108
MRBSH230SF	R0.3×3	0.45	35	E-013
MRB230SF	R0.3×3	0.45	35	G-118
MRBH230	R0.3×3	0.45	45	F-049
MRB230	R0.3×3	0.45	45	G-108
DRB230	R0.3×3	0.45	45	K-011
DCRB230	R0.3×3	0.45	45	M-010
MRBH230	R0.3×3	0.45	50	F-049
MRB230	R0.3×3	0.45	50	G-108
ALB225	R0.3×3	0.45	60	J-032
ALB225-DLC	R0.3×3	0.45	60	J-034
SSPBL220	R0.3×3	0.5	50	B-020
SSBL200	R0.3×3	0.5	50	B-022
MRBLN230-6	R0.3×3	1	60	G-122
MRBSH230SF	R0.3×3.5	0.45	35	E-013
MRB230SF	R0.3×3.5	0.45	35	G-118

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRBH230	R0.3×3.5	0.45	45	F-049
MRB230	R0.3×3.5	0.45	45	G-108
MRBSH230SF	R0.3×4	0.45	40	E-013
MRB230SF	R0.3×4	0.45	40	G-118
MRBH230	R0.3×4	0.45	45	F-049
MRB230	R0.3×4	0.45	45	G-108
DRB230	R0.3×4	0.45	45	K-011
MRBTNH230	R0.3×4	0.45	50	F-063
MRBH230	R0.3×4	0.45	50	F-049
MRB230	R0.3×4	0.45	50	G-108
SSBL200	R0.3×4	0.5	52	B-022
SSPBL220	R0.3×4	0.5	53	B-020
MRBTN230	R0.3×4	0.6	50	G-125
MRB230SF	R0.3×4.5	0.45	40	G-118
MRBH230	R0.3×4.5	0.45	45	F-049
MRB230	R0.3×4.5	0.45	45	G-108
MRB230SF	R0.3×5	0.45	40	G-118
MRBH230	R0.3×5	0.45	45	F-049
MRB230	R0.3×5	0.45	45	G-108
DRB230	R0.3×5	0.45	45	K-011
MRBTNH230	R0.3×5	0.45	50	F-063
SSBL200	R0.3×5	0.5	52	B-022
SSPBL220	R0.3×5	0.5	53	B-020
SSPBTN220	R0.3×5	0.5	53	B-025
MRBTN230	R0.3×5	0.6	50	G-125
MRBLN230-6	R0.3×5	1	60	G-122
MRB230SF	R0.3×5.5	0.45	40	G-118
MRBH230	R0.3×5.5	0.45	45	F-049
MRB230	R0.3×5.5	0.45	45	G-108
MRB230SF	R0.3×6	0.45	40	G-118
MRBH230	R0.3×6	0.45	45	F-049
MRB230	R0.3×6	0.45	45	G-108
DRB230	R0.3×6	0.45	45	K-011
DCRB230	R0.3×6	0.45	45	M-010
MRBTNH230	R0.3×6	0.45	50	F-063
MRB230	R0.3×6	0.45	50	G-108
SSPBL220	R0.3×6	0.5	53	B-020
SSPBTN220	R0.3×6	0.5	53	B-025
MRBTN230	R0.3×6	0.6	50	G-125
MRBLN230-6	R0.3×6	1	60	G-122
RSB230	R0.3×6	1.8	50	L-022
MRB230	R0.3×6.5	0.45	45	G-108
MRBH230	R0.3×7	0.45	45	F-050
MRB230	R0.3×7	0.45	45	G-108
MRBTNH230	R0.3×7	0.45	50	F-063
MRB230	R0.3×7.5	0.45	45	G-108
MRBH230	R0.3×8	0.45	45	F-050
MRB230	R0.3×8	0.45	45	G-108
DRB230	R0.3×8	0.45	45	K-011
MRBTNH230	R0.3×8	0.45	50	F-063
MRB230	R0.3×8	0.45	50	G-108

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRBTN230	R0.3×8	0.6	50	G-125
MRB230	R0.3×8.5	0.45	45	G-108
MRBH230	R0.3×9	0.45	45	F-050
MRB230	R0.3×9	0.45	45	G-108
DCRB230	R0.3×9	0.45	45	M-010
MRB230	R0.3×9.5	0.45	45	G-108
MRBH230	R0.3×10	0.45	45	F-050
MRB230	R0.3×10	0.45	45	G-108
DRB230	R0.3×10	0.45	50	K-011
MRB230	R0.3×10	0.45	50	G-108
MRBTN230L	R0.3×10	0.6	60	G-135
RSB230	R0.3×10	1.8	50	L-022
MRB230	R0.3×11	0.45	45	G-108
MRBH230	R0.3×12	0.45	45	F-050
MRB230	R0.3×12	0.45	45	G-108
DCRB230	R0.3×12	0.45	45	M-010
MRBTN230L	R0.3×12	0.6	60	G-135
MRBTN230L	R0.3×20	0.6	60	G-135
R0.35				
MSB230S	R0.35	0.7	50	G-070
MSB230	R0.35	1.1	50	G-062
MSBL230	R0.35	1.75	70	G-078
MRBH230	R0.35×2	0.5	45	F-050
MRB230	R0.35×2	0.5	45	G-108
MRBH230	R0.35×4	0.5	45	F-050
MRB230	R0.35×4	0.5	45	G-108
MRBH230	R0.35×6	0.5	45	F-050
MRB230	R0.35×6	0.5	45	G-108
MRBH230	R0.35×8	0.5	45	F-050
MRB230	R0.35×8	0.5	45	G-108
R0.4				
MSB230SF	R0.4	0.8	35	G-074
MSB230S	R0.4	0.8	50	G-070
MSBH230	R0.4	1.2	50	F-030
MSB230	R0.4	1.2	50	G-062
MSB230G2	R0.4	1.2	50	G-068
MSBL230	R0.4	2	70	G-078
RSB230	R0.4	2.4	50	L-022
RSB230	R0.4	4	50	L-022
DRB230	R0.4×1.5	0.6	45	K-011
SSPB220	R0.4×1.6	0.6	50	B-016
MRBSH230SF	R0.4×2	0.6	35	E-013
MRB230SF	R0.4×2	0.6	35	G-119
MRBH230	R0.4×2	0.6	45	F-050
MRB230	R0.4×2	0.6	45	G-108
DRB230	R0.4×2	0.6	45	K-011
SFB200	R0.4×2	0.6	50	B-014
SSPB220	R0.4×2	0.6	50	B-016
SSB200	R0.4×2	0.6	50	B-018
MRBH230	R0.4×2	0.6	50	F-050
MRB230	R0.4×2	0.6	50	G-108

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MACH225SF	R0.4×2	0.8	35	F-058
MACH225	R0.4×2	0.8	50	F-060
MRBSH230SF	R0.4×3	0.6	35	E-013
MRB230SF	R0.4×3	0.6	35	G-119
MRBH230	R0.4×3	0.6	45	F-050
MRB230	R0.4×3	0.6	45	G-108
DRB230	R0.4×3	0.6	45	K-011
MRB230	R0.4×3	0.6	50	G-108
MRBSH230SF	R0.4×4	0.6	35	E-013
MRB230SF	R0.4×4	0.6	40	G-119
MRBH230	R0.4×4	0.6	45	F-050
MRB230	R0.4×4	0.6	45	G-108
DRB230	R0.4×4	0.6	45	K-011
MRB230	R0.4×4	0.6	50	G-108
SSPBL220	R0.4×4	0.6	53	B-020
SSBL200	R0.4×4	0.6	53	B-022
ALB225	R0.4×4	0.6	60	J-032
ALB225-DLC	R0.4×4	0.6	60	J-034
MRBSH230SF	R0.4×5	0.6	40	E-013
MRB230SF	R0.4×5	0.6	40	G-119
MRBH230	R0.4×5	0.6	45	F-050
MRB230	R0.4×5	0.6	45	G-108
DRB230	R0.4×5	0.6	45	K-011
MRBH230	R0.4×6	0.6	45	F-050
MRB230	R0.4×6	0.6	45	G-108
DRB230	R0.4×6	0.6	45	K-011
MRB230	R0.4×6	0.6	50	G-108
SSPBL220	R0.4×6	0.6	53	B-020
MRBH230	R0.4×7	0.6	45	F-050
MRB230	R0.4×7	0.6	45	G-108
MRBH230	R0.4×8	0.6	45	F-050
MRB230	R0.4×8	0.6	45	G-108
DRB230	R0.4×8	0.6	45	K-011
MRB230	R0.4×8	0.6	50	G-108
MRBTNH230	R0.4×8	0.6	60	F-063
MRBTN230	R0.4×8	0.8	50	G-125,G-126
MRBLN230-6	R0.4×8	1.4	60	G-122
RSB230	R0.4×8	2.4	50	L-022
MRB230	R0.4×9	0.6	45	G-108
MRBH230	R0.4×10	0.6	45	F-050
MRB230	R0.4×10	0.6	45	G-109
MRB230	R0.4×10	0.6	50	G-109
DRB230	R0.4×10	0.6	50	K-011
MRBH230	R0.4×12	0.6	45	F-050
MRB230	R0.4×12	0.6	45	G-109
MRBTNH230	R0.4×12	0.6	60	F-063
MRBTN230	R0.4×12	0.8	60	G-125,G-126
RSB230	R0.4×12	2.4	50	L-022
MRBTN230L	R0.4×16	0.8	60	G-135
MRBTN230L	R0.4×19.8	0.8	60	G-135
MRBTN230L	R0.4×20	0.8	60	G-135

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
R0.45				
MSB230S	R0.45	0.9	50	G-070
MSB230	R0.45	1.4	50	G-062
MSBL230	R0.45	2.25	70	G-078
MRBH230	R0.45×2	0.65	45	F-050
MRB230	R0.45×2	0.65	45	G-109
MRBH230	R0.45×4	0.65	45	F-050
MRB230	R0.45×4	0.65	45	G-109
MRBH230	R0.45×6	0.65	45	F-050
MRB230	R0.45×6	0.65	45	G-109
MRBH230	R0.45×8	0.65	45	F-050
MRB230	R0.45×8	0.65	45	G-109
MRBTNH230	R0.45×8	0.65	60	F-063
MRBTNH230	R0.45×12	0.65	60	F-063
MRBTNH230	R0.45×16	0.65	60	F-063
R0.5				
MSBSH330-5X	R0.5	0.6	50	E-010
DCMB	R0.5	0.75	45	N-008
MSB230SF	R0.5	1	40	G-074
MSB230S	R0.5	1	50	G-070
MSBH230	R0.5	1.5	50	F-030
MSB230	R0.5	1.5	50	G-062
MSB230G2	R0.5	1.5	50	G-068
MSB345	R0.5	1.5	60	G-066
MSBH345	R0.5	1.5	60	F-032
ALB225	R0.5	2	60	J-032
ALB225-DLC	R0.5	2	60	J-034
MSBL230	R0.5	2.5	70	G-078
MSBXL230	R0.5	2.5	100	G-079
RSB230	R0.5	3	50	L-022
RSB230	R0.5	5	50	L-022
RSB230	R0.5	10	50	L-022
SSPB220	R0.5×2	0.7	50	B-016
MRBSH230SF	R0.5×2	0.75	35	E-013
MRBSH330	R0.5×2	0.75	45	E-016
MRBH230	R0.5×2	0.75	45	F-050
MRB230	R0.5×2	0.75	45	G-109
DRB230	R0.5×2	0.75	45	K-011
PCDRB	R0.5×2.5	0.5	50	C-008
DCMB	R0.5×2.5	0.6	45	N-008
SFB200	R0.5×2.5	0.7	50	B-014
SSPB220	R0.5×2.5	0.7	50	B-016
SSB200	R0.5×2.5	0.7	50	B-018
MRBSH230SF	R0.5×2.5	0.75	35	E-013
MRBSH330	R0.5×2.5	0.75	45	E-016
MRBH230	R0.5×2.5	0.75	45	F-050
MRB230	R0.5×2.5	0.75	45	G-109
MACH225SF	R0.5×2.5	1	40	F-058
MACH225	R0.5×2.5	1	50	F-060
MRBSH230SF	R0.5×3	0.75	35	E-013
MRB230SF	R0.5×3	0.75	35	G-119

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBSH330	R0.5×3	0.75	45	E-016
MRBH230	R0.5×3	0.75	45	F-050
MRB230	R0.5×3	0.75	45	G-109
DRB230	R0.5×3	0.75	45	K-011
MRBH230	R0.5×3	0.75	50	F-050
MRB230	R0.5×3	0.75	50	G-109
SSPBL220	R0.5×4	0.7	51	B-020
SSBL200	R0.5×4	0.7	53	B-022
MRBSH230SF	R0.5×4	0.75	35	E-013
MRB230SF	R0.5×4	0.75	35	G-119
MRBH230	R0.5×4	0.75	45	F-050
MRB230	R0.5×4	0.75	45	G-109
DRB230	R0.5×4	0.75	45	K-011
DCRB230	R0.5×4	0.75	45	M-010
MRBH230	R0.5×4	0.75	50	F-050
MRB230	R0.5×4	0.75	50	G-109
MACH225	R0.5×4	1	50	F-060
SSBL200	R0.5×5	0.7	53	B-022
MRBSH230SF	R0.5×5	0.75	40	E-013
MRB230SF	R0.5×5	0.75	40	G-119
MRBH230	R0.5×5	0.75	45	F-050
MRB230	R0.5×5	0.75	45	G-109
DRB230	R0.5×5	0.75	45	K-011
MRBH230	R0.5×5	0.75	50	F-050
MRB230	R0.5×5	0.75	50	G-109
ALB225	R0.5×5	0.75	60	J-032
ALB225-DLC	R0.5×5	0.75	60	J-034
SSPBL220	R0.5×6	0.7	53	B-020
SSBL200	R0.5×6	0.7	53	B-022
MRBSH230SF	R0.5×6	0.75	40	E-013
MRB230SF	R0.5×6	0.75	40	G-119
MRBH230	R0.5×6	0.75	45	F-050
MRB230	R0.5×6	0.75	45	G-109
DRB230	R0.5×6	0.75	45	K-011
DCRB230	R0.5×6	0.75	45	M-010
MRBH230	R0.5×6	0.75	50	F-050
MRB230	R0.5×6	0.75	50	G-109
MRBTNH230	R0.5×6	0.75	60	F-063,F-064
MACH225	R0.5×6	1	50	F-060
MRBTN230	R0.5×6	1	60	G-126
MRBH230	R0.5×7	0.75	45	F-050
MRB230	R0.5×7	0.75	45	G-109
MRBH230	R0.5×7	0.75	50	F-050
SSPBL220	R0.5×8	0.7	53	B-020
SSBL200	R0.5×8	0.7	53	B-022
SSPBTN220	R0.5×8	0.7	53	B-025
MRB230SF	R0.5×8	0.75	40	G-119
MRBH230	R0.5×8	0.75	45	F-050
MRB230	R0.5×8	0.75	45	G-109
DRB230	R0.5×8	0.75	45	K-011
MRBH230	R0.5×8	0.75	50	F-050

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRB230	R0.5×8	0.75	50	G-109
MRBTNH230	R0.5×8	0.75	60	F-063,F-064
MRBTN230	R0.5×8	1	60	G-126
MRBH230	R0.5×9	0.75	45	F-050
MRB230	R0.5×9	0.75	45	G-109
SSPBL220	R0.5×10	0.7	53	B-020
SSBL200	R0.5×10	0.7	53	B-022
SSPBTN220	R0.5×10	0.7	53	B-025
MRB230SF	R0.5×10	0.75	40	G-119
MRBH230	R0.5×10	0.75	45	F-051
MRB230	R0.5×10	0.75	45	G-109
DRB230	R0.5×10	0.75	45	K-011
DCRB230	R0.5×10	0.75	50	M-010
MRBH230	R0.5×10	0.75	50	F-051
MRB230	R0.5×10	0.75	50	G-109
ALB225	R0.5×10	0.75	60	J-032
ALB225-DLC	R0.5×10	0.75	60	J-034
MRBTNH230	R0.5×10	0.75	60	F-063,F-064
MRBTN230	R0.5×10	1	60	G-126
MRBLN230-6	R0.5×10	1.5	60	G-122
RSB230	R0.5×10	3	50	L-022
MRBH230	R0.5×12	0.75	45	F-051
MRB230	R0.5×12	0.75	45	G-109
DRB230	R0.5×12	0.75	45	K-011
MRB230	R0.5×12	0.75	50	G-109
MRBTNH230	R0.5×12	0.75	60	F-063,F-064
MRBTNH345	R0.5×12	0.75	60	F-070
MRBTN230	R0.5×12	1	60	G-126
MRBH230	R0.5×13	0.75	45	F-051
MRB230	R0.5×13	0.75	45	G-109
MRBH230	R0.5×14	0.75	50	F-051
MRB230	R0.5×14	0.75	50	G-109
DRB230	R0.5×14	0.75	50	K-011
MRBTN230	R0.5×15	1	60	G-126
RSB230	R0.5×15	3	60	L-023
MRBH230	R0.5×16	0.75	50	F-051
MRB230	R0.5×16	0.75	50	G-109
DRB230	R0.5×16	0.75	50	K-011
DCRB230	R0.5×16	0.75	50	M-010
MRBTNH230	R0.5×16	0.75	60	F-063,F-064
MRBTNH345	R0.5×16	0.75	60	F-070
MRB230	R0.5×16	0.75	60	G-109
MRBTN230	R0.5×16	1	60	G-126
MRBH230	R0.5×18	0.75	55	F-051
MRB230	R0.5×18	0.75	55	G-109
MRBH230	R0.5×20	0.75	55	F-051
MRB230	R0.5×20	0.75	55	G-109
DCRB230	R0.5×20	0.75	55	M-010
MRB230	R0.5×20	0.75	60	G-109
MRBTNH230	R0.5×20	0.75	70	F-063,F-064
MRBTNH345	R0.5×20	0.75	70	F-070

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBTN230	R0.5×20	1	70	G-126
RSB230	R0.5×20	3	60	L-023
MRBH230	R0.5×22	0.75	60	F-051
MRB230	R0.5×22	0.75	60	G-109
MRBTN230	R0.5×22	1	70	G-126
MRBTNH230	R0.5×25	0.75	70	F-064
MRBTNH345	R0.5×25	0.75	70	F-070
MRBTN230	R0.5×25	1	70	G-126
MRBTNH230	R0.5×30	0.75	70	F-064
MRBTNH345	R0.5×30	0.75	70	F-070
MRBTN230L	R0.5×30	1	70	G-135,G-136
RSB230	R0.5×30	3	70	L-023
MRBTN230L	R0.5×30.5	1	70	G-136
MRBTN230L	R0.5×30.6	1	70	G-136
MRBTN230	R0.5×36	1	70	G-126
MRBTN230L	R0.5×49.7	1	90	G-136
MRBTN230L	R0.5×50	1	90	G-135,G-136
MRBTN230L	R0.5×53.4	1	90	G-136
MRBTN230L	R0.5×73.5	1	130	G-136
MRBTN230L	R0.5×80	1	130	G-135,G-136
R0.55				
MSB230	R0.55	1.7	50	G-062
MSBL230	R0.55	2.75	70	G-078
R0.6				
MSB230SF	R0.6	1.2	40	G-074
MSB230S	R0.6	1.2	50	G-070
MSB230	R0.6	1.8	50	G-062
MSBH345	R0.6	2	60	F-032
MSB345	R0.6	2	60	G-066
MSBL230	R0.6	3	70	G-078
SSPB220	R0.6×2.4	0.8	50	B-016
MRBSH230SF	R0.6×2.4	0.9	35	E-013
MRBH230	R0.6×2.4	0.9	45	F-051
MRB230	R0.6×2.4	0.9	45	G-109
SFB200	R0.6×3	0.8	50	B-014
SSPB220	R0.6×3	0.8	50	B-016
SSB200	R0.6×3	0.8	50	B-018
MACH225SF	R0.6×3	1.2	40	F-058
MRBSH230SF	R0.6×4	0.9	35	E-013
MRBH230	R0.6×4	0.9	45	F-051
MRB230	R0.6×4	0.9	45	G-109
SSPBL220	R0.6×6	0.8	53	B-020
MRBSH230SF	R0.6×6	0.9	40	E-013
MRBH230	R0.6×6	0.9	45	F-051
MRB230	R0.6×6	0.9	45	G-109
MRB230	R0.6×6	0.9	50	G-109
MRBTNH230	R0.6×6	0.9	60	F-064
MRBSH230SF	R0.6×8	0.9	40	E-013
MRBH230	R0.6×8	0.9	45	F-051
MRB230	R0.6×8	0.9	45	G-109
MRB230	R0.6×8	0.9	50	G-109

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBTNH230	R0.6×8	0.9	60	F-064
MRBH230	R0.6×10	0.9	45	F-051
MRB230	R0.6×10	0.9	45	G-109
MRB230	R0.6×10	0.9	50	G-109
MRBTNH230	R0.6×10	0.9	60	F-064
MRBH230	R0.6×12	0.9	45	F-051
MRB230	R0.6×12	0.9	45	G-109
MRB230	R0.6×12	0.9	50	G-109
MRBTN230	R0.6×12	1.2	60	G-126,G-127
MRBH230	R0.6×14	0.9	50	F-051
MRB230	R0.6×14	0.9	50	G-109
MRBH230	R0.6×16	0.9	50	F-051
MRB230	R0.6×16	0.9	50	G-110
MRB230	R0.6×16	0.9	60	G-110
MRB230	R0.6×18	0.9	55	G-110
MRB230	R0.6×20	0.9	55	G-110
MRBTNH230	R0.6×20	0.9	70	F-064
MRB230	R0.6×24	0.9	60	G-110
MRBTN230	R0.6×24	1.2	70	G-126,G-127
MRBTNH230	R0.6×30	0.9	70	F-064
MRBTNH230	R0.6×35	0.9	80	F-064
MRBTN230L	R0.6×36	1.2	80	G-136
MRBTN230L	R0.6×41.2	1.2	90	G-136
MRBTN230L	R0.6×48	1.2	90	G-136
R0.65				
MSB230	R0.65	2	50	G-062
MSBL230	R0.65	3.25	70	G-078
R0.7				
MSB230S	R0.7	1.4	50	G-070
MSB230	R0.7	2.1	50	G-062
MSBH345	R0.7	3	60	F-032
MSB345	R0.7	3	60	G-066
MSBL230	R0.7	3.5	70	G-078
SFB200	R0.7×3.5	1	52	B-014
MRBH230	R0.7×8	1	45	F-051
MRB230	R0.7×8	1	45	G-110
MRBH230	R0.7×12	1	50	F-051
MRB230	R0.7×12	1	50	G-110
MRBH230	R0.7×16	1	50	F-051
MRB230	R0.7×16	1	50	G-110
R0.75				
MSBSH330-5X	R0.75	0.9	50	E-010
DCMB	R0.75	1.1	45	N-008
MSB230SF	R0.75	1.5	40	G-074
MSB230S	R0.75	1.5	50	G-070
MSBH230	R0.75	2.3	50	F-030
MSB230	R0.75	2.3	50	G-062
MSB230G2	R0.75	2.3	50	G-068
ALB225	R0.75	3	60	J-032
ALB225-DLC	R0.75	3	60	J-034
MSBL230	R0.75	3.75	70	G-078

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
RSB230	R0.75	4.5	50	L-023
RSB230	R0.75	7.5	50	L-023
RSB230	R0.75	15	60	L-023
SSPB220	R0.75×3	1	52	B-016
MRBSH230SF	R0.75×3	1.1	35	E-013
MRB230SF	R0.75×3	1.1	35	G-119
MRBSH330	R0.75×3	1.1	45	E-016
MRBH230	R0.75×3	1.1	45	F-051
MRB230	R0.75×3	1.1	45	G-110
PCDRB	R0.75×3.8	0.75	48	C-008
DCMB	R0.75×3.8	0.9	45	N-008
SFB200	R0.75×3.8	1	52	B-014
SSPB220	R0.75×3.8	1	52	B-016
SSB200	R0.75×3.8	1	52	B-018
MACH225SF	R0.75×3.8	1.5	40	F-058
MACH225	R0.75×3.8	1.5	50	F-060
MRBSH230SF	R0.75×4	1.1	35	E-013
MRB230SF	R0.75×4	1.1	35	G-119
MRBSH330	R0.75×4	1.1	45	E-016
MRBH230	R0.75×4	1.1	45	F-051
MRB230	R0.75×4	1.1	45	G-110
DRB230	R0.75×4	1.1	50	K-011
MRBSH230SF	R0.75×6	1.1	40	E-013
MRB230SF	R0.75×6	1.1	40	G-119
MRBH230	R0.75×6	1.1	45	F-051
MRB230	R0.75×6	1.1	45	G-110
MRBH230	R0.75×6	1.1	50	F-051
DRB230	R0.75×6	1.1	50	K-011
SSPBL220	R0.75×7.5	1	52	B-020
SSBL200	R0.75×7.5	1	52	B-022
ALB225	R0.75×7.5	1.1	60	J-032
ALB225-DLC	R0.75×7.5	1.1	60	J-034
MRBSH230SF	R0.75×8	1.1	40	E-013
MRB230SF	R0.75×8	1.1	40	G-119
MRBH230	R0.75×8	1.1	45	F-051
MRB230	R0.75×8	1.1	45	G-110
MRBH230	R0.75×8	1.1	50	F-051
MRB230	R0.75×8	1.1	50	G-110
DRB230	R0.75×8	1.1	50	K-011
SSPBL220	R0.75×10	1	52	B-020
SSPBTN220	R0.75×10	1	52	B-025
MRBSH230SF	R0.75×10	1.1	40	E-013
MRB230SF	R0.75×10	1.1	40	G-119
MRBH230	R0.75×10	1.1	45	F-051
MRB230	R0.75×10	1.1	45	G-110
DRB230	R0.75×10	1.1	50	K-011
MRBTNH230	R0.75×10	1.1	60	F-064
MRBTN230	R0.75×10	1.5	60	G-127
MRBH230	R0.75×12	1.1	45	F-051
MRB230	R0.75×12	1.1	45	G-110
DRB230	R0.75×12	1.1	50	K-011

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRB230	R0.75×12	1.1	50	G-110
MRBTNH345	R0.75×12	1.1	60	F-070
MRBH230	R0.75×14	1.1	50	F-051
MRB230	R0.75×14	1.1	50	G-110
DRB230	R0.75×14	1.1	50	K-011
SSPBL220	R0.75×15	1	52	B-020
SSPBTN220	R0.75×15	1	52	B-025
ALB225	R0.75×15	1.1	60	J-032
ALB225-DLC	R0.75×15	1.1	60	J-034
MRBTNH230	R0.75×15	1.1	60	F-064
MRBTN230	R0.75×15	1.5	60	G-127
MRBLN230-6	R0.75×15	1.75	60	G-122
RSB230	R0.75×15	4.5	60	L-023
MRBH230	R0.75×16	1.1	50	F-051
MRB230	R0.75×16	1.1	50	G-110
DRB230	R0.75×16	1.1	50	K-011
MRBTNH345	R0.75×16	1.1	60	F-070
MRB230	R0.75×16	1.1	60	G-110
DRB230	R0.75×18	1.1	50	K-011
MRBH230	R0.75×18	1.1	55	F-051
MRB230	R0.75×18	1.1	55	G-110
MRBH230	R0.75×20	1.1	55	F-051
MRB230	R0.75×20	1.1	55	G-110
MRB230	R0.75×20	1.1	60	G-110
MRBTNH230	R0.75×20	1.1	70	F-064
MRBTNH345	R0.75×20	1.1	70	F-070
MRBTN230	R0.75×20	1.5	70	G-127
MRB230	R0.75×22	1.1	55	G-110
MRBH230	R0.75×22	1.1	60	F-051
MRBTNH230	R0.75×25	1.1	70	F-064
MRBTNH345	R0.75×25	1.1	70	F-070
MRBTN230	R0.75×28.7	1.5	70	G-127
MRBH230	R0.75×30	1.1	70	F-051
MRBTNH230	R0.75×30	1.1	70	F-064
MRBTNH345	R0.75×30	1.1	70	F-070
MRB230	R0.75×30	1.1	70	G-110
MRBTN230	R0.75×30	1.5	70	G-127
RSB230	R0.75×30	4.5	70	L-023
MRBTN230L	R0.75×45	1.5	90	G-136
RSB230	R0.75×45	4.5	90	L-023
MRBTN230L	R0.75×45.9	1.5	90	G-136
MRBTN230L	R0.75×60	1.5	110	G-136
R0.8				
MSB230S	R0.8	1.6	50	G-070
MSB230	R0.8	2.4	50	G-062
MSBH345	R0.8	3	60	F-032
MSB345	R0.8	3	60	G-066
MSBL230	R0.8	4	70	G-078
SFB200	R0.8×4	1	52	B-014
MRB230	R0.8×4	1.2	45	G-110
MRBSH230SF	R0.8×8	1.2	40	E-013

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBH230	R0.8×8	1.2	45	F-051
MRB230	R0.8×8	1.2	45	G-110
MRBH230	R0.8×12	1.2	45	F-051
MRB230	R0.8×12	1.2	45	G-110
MRBH230	R0.8×16	1.2	50	F-051
MRB230	R0.8×16	1.2	50	G-110
MRBH230	R0.8×20	1.2	55	F-051
MRB230	R0.8×20	1.2	55	G-110
R0.85				
MSB230	R0.85	2.6	50	G-062
MSBL230	R0.85	4.25	70	G-078
R0.9				
MSB230S	R0.9	1.8	50	G-070
MSB230	R0.9	2.7	50	G-062
MSBH345	R0.9	3	60	F-032
MSB345	R0.9	3	60	G-066
MSBL230	R0.9	4.5	70	G-078
SFB200	R0.9×4.5	1.2	52	B-014
MRB230	R0.9×8	1.3	45	G-110
MRB230	R0.9×12	1.3	45	G-110
MRB230	R0.9×16	1.3	50	G-110
MRB230	R0.9×20	1.3	55	G-110
R0.95				
MSB230	R0.95	2.9	50	G-062
MSBL230	R0.95	4.75	70	G-078
R1				
MSBSH330-5X	R1	1.2	50	E-010
DCMB	R1	1.5	45	N-008
MSB230SF	R1	2	40	G-074
MSB230S	R1	2	60	G-070
MSBH230	R1	3	60	F-030
MSBH345	R1	3	60	F-032
MSB230	R1	3	60	G-062
MSB345	R1	3	60	G-066
MSB230G2	R1	3	60	G-068
ALB225	R1	4	60	J-032
ALB225-DLC	R1	4	60	J-034
MSBL230	R1	5	70	G-078
MSBXL230	R1	5	100	G-079
RSB230	R1	6	50	L-023
RSB230	R1	10	50	L-023
RSB230	R1	20	60	L-023
MRBSH230SF	R1×3	1.5	35	E-013
MRB230SF	R1×3	1.5	35	G-119
MRBSH330	R1×3	1.5	45	E-016
MRBH230	R1×3	1.5	45	F-052
MRB230	R1×3	1.5	45	G-110
DRB230	R1×3	1.5	50	K-012
SSPB220	R1×4	1.2	52	B-016
SSB200	R1×4	1.2	52	B-018
MRBSH230SF	R1×4	1.5	35	E-013

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRB230SF	R1×4	1.5	35	G-119
MRBSH330	R1×4	1.5	45	E-016
MRBH230	R1×4	1.5	45	F-052
MRB230	R1×4	1.5	45	G-110
MRBH230	R1×4	1.5	50	F-052
MRB230	R1×4	1.5	50	G-110
DRB230	R1×4	1.5	50	K-012
PCDRB	R1×5	1	48	C-008
DCMB	R1×5	1.2	45	N-008
SFB200	R1×5	1.2	52	B-014
SSPB220	R1×5	1.2	52	B-016
SSB200	R1×5	1.2	52	B-018
MACH225SF	R1×5	2	40	F-058
MACH225	R1×5	2	50	F-060
SSBL200	R1×6	1.2	52	B-022
SSPBL220	R1×6	1.2	53	B-020
MRBSH230SF	R1×6	1.5	35	E-013
MRB230SF	R1×6	1.5	35	G-119
MRBSH330	R1×6	1.5	45	E-016
MRBH230	R1×6	1.5	45	F-052
MRB230	R1×6	1.5	45	G-110
DCRB230	R1×6	1.5	45	M-010
MRBH230	R1×6	1.5	50	F-052
MRB230	R1×6	1.5	50	G-110
DRB230	R1×6	1.5	50	K-012
MACH225	R1×6	2	50	F-060
SSBL200	R1×8	1.2	52	B-022
SSPBL220	R1×8	1.2	53	B-020
MRBSH230SF	R1×8	1.5	40	E-013
MRB230SF	R1×8	1.5	40	G-119
MRBH230	R1×8	1.5	45	F-052
MRB230	R1×8	1.5	45	G-110
MRBH230	R1×8	1.5	50	F-052
MRB230	R1×8	1.5	50	G-110
DRB230	R1×8	1.5	50	K-012
MACH225	R1×8	2	50	F-060
SSBL200	R1×10	1.2	52	B-022
SSPBL220	R1×10	1.2	53	B-020
MRBSH230SF	R1×10	1.5	40	E-013
MRB230SF	R1×10	1.5	40	G-119
MRBH230	R1×10	1.5	45	F-052
MRB230	R1×10	1.5	45	G-110
DCRB230	R1×10	1.5	45	M-010
MRBH230	R1×10	1.5	50	F-052
MRB230	R1×10	1.5	50	G-110
DRB230	R1×10	1.5	50	K-012
ALB225	R1×10	1.5	60	J-032
ALB225-DLC	R1×10	1.5	60	J-034
MRBSH230SF	R1×12	1.5	45	E-013
MRBH230	R1×12	1.5	45	F-052
MRB230	R1×12	1.5	45	G-110

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRB230SF	R1×12	1.5	45	G-119
MRB230	R1×12	1.5	50	G-110
DRB230	R1×12	1.5	50	K-012
MRBTNH230	R1×12	1.5	60	F-064,F-065
MRBTNH345	R1×12	1.5	60	F-071
MRBTN230	R1×12	2	60	G-127,G-128
MRBH230	R1×13	1.5	45	F-052
MRB230	R1×13	1.5	45	G-111
SSPBL220	R1×14	1.2	53	B-020
MRB230SF	R1×14	1.5	45	G-119
MRBH230	R1×14	1.5	50	F-052
MRB230	R1×14	1.5	50	G-111
DRB230	R1×14	1.5	50	K-012
SSPBTN220	R1×16	1.2	53	B-025
MRB230SF	R1×16	1.5	45	G-119
MRBH230	R1×16	1.5	50	F-052
MRB230	R1×16	1.5	50	G-111
DRB230	R1×16	1.5	50	K-012
DCRB230	R1×16	1.5	50	M-010
MRBTNH230	R1×16	1.5	60	F-064,F-065
MRBTNH345	R1×16	1.5	60	F-071
MRBH230	R1×16	1.5	60	F-052
MRB230	R1×16	1.5	60	G-111
MRBTN230	R1×16	2	60	G-127,G-128
MRB230SF	R1×18	1.5	50	G-119
MRBH230	R1×18	1.5	55	F-052
MRB230	R1×18	1.5	55	G-111
SSPBL220	R1×20	1.2	53	B-020
SSPBTN220	R1×20	1.2	53	B-025
MRB230SF	R1×20	1.5	50	G-119
MRBH230	R1×20	1.5	55	F-052
MRB230	R1×20	1.5	55	G-111
MRB230	R1×20	1.5	60	G-111
ALB225	R1×20	1.5	60	J-032
ALB225-DLC	R1×20	1.5	60	J-034
DRB230	R1×20	1.5	60	K-012
MRBTNH230	R1×20	1.5	70	F-065
MRBTNH345	R1×20	1.5	70	F-071
DCRB230	R1×20	1.5	70	M-010
MRBTN230	R1×20	2	60	G-127,G-128
MRBLN230-6	R1×20	2	60	G-122
MRBTN230	R1×20	2	70	G-128
RSB230	R1×20	6	60	L-023
MRBH230	R1×22	1.5	60	F-052
MRB230	R1×22	1.5	60	G-111
DRB230	R1×25	1.5	60	K-012
MRBH230	R1×25	1.5	65	F-052
MRBH230	R1×25	1.5	65	F-052
MRB230	R1×25	1.5	65	G-111
MRBTNH230	R1×25	1.5	70	F-065
MRBTNH345	R1×25	1.5	70	F-071

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRB230	R1×25	1.5	80	G-111
MRBTN230	R1×25	2	60	G-127
MRBTN230	R1×26.8	2	70	G-128
MRBTNH230	R1×30	1.5	70	F-065
MRBTNH345	R1×30	1.5	70	F-071
MRBH230	R1×30	1.5	70	F-052
MRB230	R1×30	1.5	70	G-111
DCRB230	R1×30	1.5	70	M-010
MRB230	R1×30	1.5	80	G-111
MRBTN230	R1×30	2	70	G-127,G-128
RSB230	R1×30	6	80	L-023
MRBH230	R1×35	1.5	70	F-052
MRB230	R1×35	1.5	70	G-111
MRBTNH230	R1×35	1.5	80	F-065
MRB230	R1×35	1.5	80	G-111
MRBTN230	R1×35	2	80	G-127
MRBTN230	R1×38.2	2	80	G-128
MRBTNH230	R1×40	1.5	80	F-065
MRBTNH345	R1×40	1.5	80	F-071
MRBH230	R1×40	1.5	90	F-052
MRB230	R1×40	1.5	90	G-111
MRBTN230	R1×40	2	80	G-127,G-128
MRBTN230L	R1×49.7	2	100	G-137
MRBTNH230	R1×50	1.5	90	F-065
MRBTN230L	R1×50	2	100	G-136,G-137
RSB230	R1×50	6	110	L-023
RSB230	R1×70	6	110	L-023
MRBTN230L	R1×80	2	130	G-136,G-137
MRBTN230L	R1×80.3	2	130	G-136,G-137
R1.05				
MSB230	R1.05	3.2	60	G-062
R1.1				
MSB230	R1.1	3.3	60	G-062
MSBH345	R1.1	3.5	60	F-032
MSB345	R1.1	3.5	60	G-066
MSBL230	R1.1	5.5	80	G-078
R1.15				
MSB230	R1.15	3.5	60	G-062
R1.2				
MSB230	R1.2	3.6	60	G-062
MSBH345	R1.2	4	60	F-032
MSB345	R1.2	4	60	G-066
MSBL230	R1.2	6	80	G-078
R1.25				
MSB230S	R1.25	2.5	60	G-070
MSBH230	R1.25	3.8	60	F-030
MSB230	R1.25	3.8	60	G-062
MSBL230	R1.25	6.25	80	G-078
MRBSH230SF	R1.25×6	2.3	35	E-013
MRBH230	R1.25×6	2.3	45	F-052
MRB230	R1.25×6	2.3	45	G-111

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRBSH230SF	R1.25×8	2.3	40	E-013
MRBH230	R1.25×8	2.3	45	F-052
MRBSH230SF	R1.25×10	2.3	40	E-013
MRBH230	R1.25×10	2.3	45	F-052
MRB230	R1.25×10	2.3	45	G-111
MRBSH230SF	R1.25×15	2.3	45	E-013
MRBH230	R1.25×15	2.3	50	F-052
MRB230	R1.25×15	2.3	50	G-111
MRBH230	R1.25×20	2.3	55	F-052
MRB230	R1.25×20	2.3	55	G-111
MRBH230	R1.25×25	2.3	65	F-052
MRB230	R1.25×25	2.3	65	G-111
MRBH230	R1.25×30	2.3	70	F-052
MRB230	R1.25×30	2.3	70	G-111
MRBH230	R1.25×35	2.3	70	F-052
MRB230	R1.25×35	2.3	70	G-111
R1.3				
MSB230	R1.3	3.9	60	G-062
MSBH345	R1.3	4	60	F-032
MSB345	R1.3	4	60	G-066
MSBL230	R1.3	6.5	80	G-078
R1.35				
MSB230	R1.35	4.1	60	G-062
R1.4				
MSB230	R1.4	4.2	60	G-062
MSBH345	R1.4	5	60	F-032
MSB345	R1.4	5	60	G-066
MSBL230	R1.4	7	80	G-078
R1.45				
MSB230	R1.45	4.4	60	G-062
R1.5				
MSB230SF	R1.5	3	40	G-074
MSB230S	R1.5	3	60	G-070
MSBH230	R1.5	5	60	F-030
MSBH345	R1.5	5	60	F-032
MSB230	R1.5	5	60	G-062
MSB345	R1.5	5	60	G-066
MSB230G2	R1.5	5	60	G-068
ALB225	R1.5	6	60	J-032
ALB225-DLC	R1.5	6	60	J-034
MSBL230	R1.5	7.5	80	G-078
MSBXL230	R1.5	7.5	120	G-079
RSB230	R1.5	9	50	L-023
RSB230	R1.5	9	100	L-023
RSB230	R1.5	15	60	L-023
SSPB220	R1.5×6	1.8	50	B-016
MRB230SF	R1.5×6	2.5	40	G-119
MRBSH230SF	R1.5×6	2.5	45	E-013
MRBSH330	R1.5×6	2.5	60	E-016
MRBH230	R1.5×6	2.5	60	F-052
MRB230	R1.5×6	2.5	60	G-111

Search from Ball R

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
DRB230	R1.5×6	2.5	60	K-012
PCDRB	R1.5×7.5	1.5	59	C-008
MRB230SF	R1.5×8	2.5	40	G-119
MRBSH230SF	R1.5×8	2.5	45	E-013
MRBSH330	R1.5×8	2.5	60	E-016
MRBH230	R1.5×8	2.5	60	F-052
MRB230	R1.5×8	2.5	60	G-111
DRB230	R1.5×8	2.5	60	K-012
MACH225SF	R1.5×8	3	40	F-058
MACH225	R1.5×8	3	60	F-060
SSPB220	R1.5×9	1.8	70	B-016
MRB230SF	R1.5×10	2.5	40	G-119
MRBSH230SF	R1.5×10	2.5	45	E-013
MRBSH330	R1.5×10	2.5	60	E-016
MRBH230	R1.5×10	2.5	60	F-052
MRB230	R1.5×10	2.5	60	G-111
DRB230	R1.5×10	2.5	60	K-012
MACH225	R1.5×10	3	60	F-060
MRB230SF	R1.5×12	2.5	40	G-119
MRBSH230SF	R1.5×12	2.5	45	E-013
MRBH230	R1.5×12	2.5	60	F-052
MRB230	R1.5×12	2.5	60	G-111
DRB230	R1.5×12	2.5	60	K-012
MRBH230	R1.5×14	2.5	60	F-052
MRBSH230SF	R1.5×14	2.5	50	E-013
MRB230	R1.5×14	2.5	60	G-111
MRB230	R1.5×15	2.5	60	G-111
ALB225	R1.5×15	2.5	60	J-032
ALB225-DLC	R1.5×15	2.5	60	J-034
MRBTNH230	R1.5×15	2.5	70	F-065
DRB230	R1.5×15	2.5	70	K-012
MACH225	R1.5×15	3	60	F-060
MRBTN230	R1.5×15	3	70	G-128
MRBTNH345	R1.5×15	4.5	70	F-071
MRBSH230SF	R1.5×16	2.5	50	E-013
MRBH230	R1.5×16	2.5	60	F-052
MRB230	R1.5×16	2.5	60	G-111
MRBSH230SF	R1.5×20	2.5	55	E-013
MRBH230	R1.5×20	2.5	65	F-052
MRB230	R1.5×20	2.5	65	G-111
DCRB230	R1.5×20	2.5	65	M-010
MRBTNH230	R1.5×20	2.5	70	F-065
DRB230	R1.5×20	2.5	70	K-012
MRBTN230	R1.5×20	3	70	G-128
MRBTNH345	R1.5×20	4.5	70	F-071
MRBTN230	R1.5×23.1	3	70	G-128
MRBH230	R1.5×25	2.5	65	F-052
MRB230	R1.5×25	2.5	65	G-111
MRBTNH230	R1.5×25	2.5	70	F-065
DRB230	R1.5×25	2.5	70	K-012
MRBTNH345	R1.5×25	4.5	70	F-071

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRBH230	R1.5×30	2.5	70	F-052
MRBTNH230	R1.5×30	2.5	70	F-065
MRB230	R1.5×30	2.5	70	G-111
ALB225	R1.5×30	2.5	70	J-032
ALB225-DLC	R1.5×30	2.5	70	J-034
DRB230	R1.5×30	2.5	70	K-012
MRBTN230	R1.5×30	3	70	G-128
MRBTNH345	R1.5×30	4.5	70	F-071
RSB230	R1.5×30	9	70	L-023
MRBH230	R1.5×35	2.5	80	F-052
MRB230	R1.5×35	2.5	80	G-111
MRBTNH230	R1.5×40	2.5	80	F-065
MRBH230	R1.5×40	2.5	90	F-052
DCRB230	R1.5×40	2.5	90	M-010
MRB230	R1.5×40	2.5	90	G-111
MRBTN230	R1.5×40	3	80	G-128
MRBTNH345	R1.5×40	4.5	80	F-071
RSB230	R1.5×45	9	90	L-023
MRBTN230	R1.5×48.9	3	90	G-128
MRBTNH230	R1.5×50	2.5	90	F-065
MRBTN230	R1.5×50	3	90	G-128
MRBTNH345	R1.5×50	4.5	100	F-071
RSB230	R1.5×60	9	110	L-023
MRBTN230L	R1.5×72.7	3	130	G-137
MRBTN230L	R1.5×77.5	3	130	G-137
MRBTN230L	R1.5×80	3	130	G-137
R1.55				
MSB230	R1.55	5	60	G-062
R1.6				
MSBH345	R1.6	5	60	F-032
MSB345	R1.6	5	60	G-066
MSB230	R1.6	5	60	G-062
MSBL230	R1.6	8	120	G-078
R1.65				
MSB230	R1.65	5	60	G-062
R1.7				
MSB230	R1.7	5.1	60	G-062
MSBH345	R1.7	6	60	F-032
MSB345	R1.7	6	60	G-066
MSBL230	R1.7	8.5	120	G-078
R1.75				
MSB230S	R1.75	3.5	60	G-070
MSB230	R1.75	5.3	60	G-062
MRB230	R1.75×10	2.8	60	G-111
MRBH230	R1.75×15	2.8	60	F-053
MRB230	R1.75×15	2.8	60	G-111
MRBH230	R1.75×20	2.8	65	F-053
MRB230	R1.75×20	2.8	65	G-111
MRBH230	R1.75×25	2.8	65	F-053
MRB230	R1.75×25	2.8	65	G-111
MRBH230	R1.75×30	2.8	70	F-053

Search from Ball R

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRB230	R1.75×30	2.8	70	G-111
MRBH230	R1.75×35	2.8	80	F-053
MRB230	R1.75×35	2.8	80	G-111
MRBH230	R1.75×40	2.8	90	F-053
MRB230	R1.75×40	2.8	90	G-111
MRBH230	R1.75×45	2.8	90	F-053
MRB230	R1.75×45	2.8	90	G-111
R1.8				
MSB230	R1.8	5.4	60	G-063
MSBH345	R1.8	6	60	F-032
MSB345	R1.8	6	60	G-066
MSBL230	R1.8	9	120	G-078
R1.85				
MSB230	R1.85	5.6	60	G-063
R1.9				
MSB230	R1.9	5.7	60	G-063
MSBH345	R1.9	6	60	F-032
MSB345	R1.9	6	60	G-066
MSBL230	R1.9	9.5	120	G-078
R1.95				
MSB230	R1.95	5.9	60	G-063
R2				
MSB230SF	R2	4	40	G-074
MSB230S	R2	4	60	G-070
MSBH230	R2	6	70	F-030
MSBH345	R2	6	70	F-032
MSB230	R2	6	70	G-063
MSB345	R2	6	70	G-066
MSB230G2	R2	6	70	G-068
ALB225	R2	8	70	J-032
ALB225-DLC	R2	8	70	J-034
MSBL230	R2	10	120	G-078
MSBXL230	R2	10	150	G-079
RSB230	R2	12	50	L-023
RSB230	R2	12	120	L-023
RSB230	R2	20	60	L-023
SSPB220	R2×8	2.4	50	B-016
MRBSH230SF	R2×8	3	45	E-013
MRBSH330	R2×8	3	65	E-016
MRBH230	R2×8	3	65	F-053
PCDRB	R2×10	2	60	C-008
MRBSH230SF	R2×10	3	45	E-013
DRB230	R2×10	3	60	K-012
MRBSH330	R2×10	3	65	E-016
MRBH230	R2×10	3	65	F-053
MRB230	R2×10	3	65	G-112
MACH225SF	R2×10	4	40	F-058
MACH225	R2×10	4	60	F-060
SSPB220	R2×12	2.4	70	B-016
MRBSH230SF	R2×12	3	45	E-013
DRB230	R2×12	3	60	K-012

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MRBSH330	R2×12	3	65	E-016
MRBH230	R2×12	3	65	F-053
MRB230	R2×12	3	65	G-112
MRBH230	R2×14	3	65	F-053
MRB230	R2×14	3	65	G-112
MRBSH230SF	R2×15	3	50	E-013
DRB230	R2×15	3	60	K-012
DCRB230	R2×15	3	65	M-010
MRBH230	R2×15	3	65	F-053
MRB230	R2×15	3	65	G-112
MRB230	R2×16	3	65	G-112
MRBSH230SF	R2×20	3	55	E-013
DRB230	R2×20	3	60	K-012
MRBH230	R2×20	3	65	F-053
MRB230	R2×20	3	65	G-112
ALB225	R2×20	3	80	J-032
ALB225-DLC	R2×20	3	80	J-034
MRBTNH230	R2×20	3	80	F-065
MRBTN230	R2×20	4	70	G-128
MRBSH230SF	R2×25	3	60	E-013
MRBH230	R2×25	3	70	F-053
MRB230	R2×25	3	70	G-112
DRB230	R2×25	3	70	K-012
DCRB230	R2×30	3	70	M-010
DRB230	R2×30	3	70	K-012
MRBH230	R2×30	3	70	F-053
MRB230	R2×30	3	70	G-112
MRBTNH230	R2×30	3	80	F-065
MRBTNH345	R2×30	6	80	F-071
RSB230	R2×30	12	70	L-023
MRBH230	R2×35	3	80	F-053
MRB230	R2×35	3	80	G-112
MRBTNH230	R2×40	3	80	F-065
DRB230	R2×40	3	80	K-012
MRBH230	R2×40	3	85	F-053
MRB230	R2×40	3	85	G-112
ALB225	R2×40	3	90	J-032
ALB225-DLC	R2×40	3	90	J-034
DCRB230	R2×40	3	90	M-010
MRBTN230	R2×40	4	90	G-128
MRBTNH345	R2×40	6	80	F-071
RSB230	R2×40	12	90	L-023
MRBH230	R2×45	3	90	F-053
MRB230	R2×45	3	90	G-112
MRBH230	R2×50	3	100	F-053
MRB230	R2×50	3	100	G-112
MRBTNH230	R2×50	3	90	F-065
MRBTNH345	R2×50	6	100	F-071
MRBTN230	R2×60	4	110	G-128
MRBTN230L	R2×60	4	110	G-137
MRBTNH230	R2×61.1	3	110	F-065

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBTNH345	R2×65.2	6	110	F-071
RSB230	R2×70	12	120	L-023
MRBTN230L	R2×80	4	130	G-137
MRBTN230L	R2×84.3	4	130	G-137
R2.05				
MSB230	R2.05	6.2	70	G-063
R2.1				
MSB230	R2.1	6.3	70	G-063
MSBH345	R2.1	7	70	F-032
MSB345	R2.1	7	70	G-066
MSBL230	R2.1	10.5	150	G-078
R2.15				
MSB230	R2.15	6.5	70	G-063
R2.2				
MSB230	R2.2	6.6	70	G-063
MSBH345	R2.2	7	70	F-032
MSB345	R2.2	7	70	G-066
MSBL230	R2.2	11	150	G-078
R2.25				
MSB230	R2.25	6.8	70	G-063
R2.3				
MSB230	R2.3	6.9	70	G-063
MSBH345	R2.3	7	70	F-032
MSB345	R2.3	7	70	G-066
MSBL230	R2.3	11.5	150	G-078
R2.35				
MSB230	R2.35	7.1	70	G-063
R2.4				
MSB230	R2.4	7.2	70	G-063
MSBH345	R2.4	8	70	F-032
MSB345	R2.4	8	70	G-066
MSBL230	R2.4	12	150	G-078
R2.45				
MSB230	R2.45	7.4	70	G-063
R2.5				
MSB230SF	R2.5	5	50	G-074
MSB230S	R2.5	5	70	G-070
MSBH230	R2.5	8	70	F-030
MSBH345	R2.5	8	70	F-032
MSB230	R2.5	8	70	G-063
MSB345	R2.5	8	70	G-066
MSB230G2	R2.5	8	70	G-068
ALB225	R2.5	10	80	J-032
ALB225-DLC	R2.5	10	80	J-034
MSBL230	R2.5	12.5	150	G-078
MSBXL230	R2.5	12.5	180	G-079
RSB230	R2.5	15	70	L-023
RSB230	R2.5	25	80	L-023
SSPB220	R2.5×10	3	60	B-016
MRBSH230SF	R2.5×10	3.5	45	E-013
MRBH230	R2.5×10	3.5	70	F-053

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRB230	R2.5×10	3.5	70	G-112
MACH225SF	R2.5×12	5	45	F-058
MACH225	R2.5×12	5	60	F-060
SSPB220	R2.5×15	3	80	B-016
MRBSH230SF	R2.5×15	3.5	45	E-013
MRBH230	R2.5×15	3.5	70	F-053
MRB230	R2.5×15	3.5	70	G-112
MRBSH230SF	R2.5×20	3.5	50	E-013
MRBH230	R2.5×20	3.5	70	F-053
MRB230	R2.5×20	3.5	70	G-112
MRBH230	R2.5×25	3.5	70	F-053
MRB230	R2.5×25	3.5	70	G-112
ALB225	R2.5×25	3.5	80	J-032
ALB225-DLC	R2.5×25	3.5	80	J-034
MRBH230	R2.5×30	3.5	80	F-053
MRB230	R2.5×30	3.5	80	G-112
MRB230	R2.5×35	3.5	80	G-112
MRBH230	R2.5×40	3.5	90	F-053
MRB230	R2.5×40	3.5	90	G-112
MRB230	R2.5×45	3.5	100	G-112
MRB230	R2.5×50	3.5	100	G-112
ALB225	R2.5×50	3.5	100	J-032
ALB225-DLC	R2.5×50	3.5	100	J-034
MRBTN230L	R2.5×50	5	100	G-137
MRBTN230L	R2.5×52.9	5	100	G-137
MRBTN230L	R2.5×57.7	5	110	G-137
MRBTN230L	R2.5×80	5	130	G-137
MRBTN230L	R2.5×81.5	5	130	G-137
R2.55				
MSB230	R2.55	8	70	G-063
R2.6				
MSBH345	R2.6	8	70	F-032
MSB230	R2.6	8	70	G-063
MSB345	R2.6	8	70	G-066
MSBL230	R2.6	13	150	G-078
R2.65				
MSB230	R2.65	8	70	G-063
R2.7				
MSB230	R2.7	8.1	70	G-063
MSBH345	R2.7	9	70	F-032
MSB345	R2.7	9	70	G-066
MSBL230	R2.7	13.5	150	G-078
R2.75				
MSB230	R2.75	8.3	70	G-063
R2.8				
MSB230	R2.8	8.4	70	G-063
MSBH345	R2.8	9	70	F-032
MSB345	R2.8	9	70	G-066
MSBL230	R2.8	14	150	G-078
R2.85				
MSB230	R2.85	8.6	70	G-063

Unit [Size : mm]

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
R2.9				
MSB230	R2.9	8.7	70	G-063
MSBH345	R2.9	9	70	F-032
MSB345	R2.9	9	70	G-066
MSBL230	R2.9	14.5	150	G-078
R2.95				
MSB230	R2.95	8.9	70	G-063
R3				
MSB230SF	R3	6	50	G-074
MSB230S	R3	6	80	G-070
MSBH230	R3	10	80	F-030
MSBH345	R3	10	80	F-032
MSB230	R3	10	80	G-063
MSB345	R3	10	80	G-066
MSB230G2	R3	10	80	G-068
ALB225	R3	12	90	J-032
ALB225-DLC	R3	12	90	J-034
MSBL230	R3	15	150	G-078
MSBXL230	R3	15	180	G-079
RSB230	R3	18	80	L-023
RSB230	R3	30	90	L-023
MRBSH230SF	R3×10	6	45	E-013
MRBSH330	R3×10	6	65	E-016
MRBH230	R3×10	6	70	F-053
MRB230	R3×10	6	70	G-112
SSPB220	R3×12	3.6	60	B-016
PCDRB	R3×15	3	62	C-008
MRBSH230SF	R3×15	6	45	E-013
MACH225SF	R3×15	6	45	F-058
MRBSH330	R3×15	6	65	E-016
MACH225	R3×15	6	60	F-060
MRBH230	R3×15	6	70	F-053
MRB230	R3×15	6	70	G-112
SSPB220	R3×18	3.6	80	B-016
MRBSH230SF	R3×20	6	50	E-013
MRBSH330	R3×20	6	65	E-016
MRBH230	R3×20	6	70	F-053
MRB230	R3×20	6	70	G-112
DRB230	R3×20	6	70	K-012
MRBSH230SF	R3×25	6	55	E-013
MRBH230	R3×25	6	70	F-053
MRB230	R3×25	6	70	G-112
DRB230	R3×25	6	70	K-012
MRBSH230SF	R3×30	6	60	E-013
MRBH230	R3×30	6	80	F-053
MRB230	R3×30	6	80	G-112
DRB230	R3×30	6	80	K-012
DCRB230	R3×30	6	80	M-010
ALB225	R3×30	6	90	J-032
ALB225-DLC	R3×30	6	90	J-034
MRB230	R3×35	6	80	G-112

Model	Radius (×Under neck Length)	Length of Cut	Overall Length	Page
MRBH230	R3×35	6	85	F-053
DRB230	R3×40	6	80	K-012
MRBH230	R3×40	6	90	F-053
MRB230	R3×40	6	90	G-112
RSB230	R3×40	18	100	L-023
MRB230	R3×45	6	100	G-112
DRB230	R3×50	6	100	K-012
MRBH230	R3×50	6	120	F-053
MRB230	R3×50	6	120	G-112
MRBH230	R3×60	6	120	F-053
ALB225	R3×60	6	120	J-032
ALB225-DLC	R3×60	6	120	J-034
DCRB230	R3×60	6	120	M-010
RSB230	R3×60	18	120	L-023
MRBTN230L	R3×69.2	6	130	G-137
MRBTN230L	R3×69.3	6	130	G-137
RSB230	R3×80	18	130	L-023
MRBTN230L	R3×88.3	6	140	G-137
R3.1				
MSB345	R3.1	10	90	G-066
R3.2				
MSB345	R3.2	10	90	G-066
R3.3				
MSB345	R3.3	10	90	G-066
R3.4				
MSB345	R3.4	11	90	G-066
R3.5				
MSB230	R3.5	10.5	80	G-063
MSB345	R3.5	11	90	G-066
R3.6				
MSB345	R3.6	11	90	G-066
R3.7				
MSB345	R3.7	12	90	G-066
R3.8				
MSB345	R3.8	12	90	G-066
R3.9				
MSB345	R3.9	12	90	G-066
R4				
MSB230SF	R4	8	60	G-074
MSB230S	R4	8	90	G-070
MSBH230	R4	12	90	F-030
MSB230	R4	12	90	G-063
MSB345	R4	12	90	G-066
ALB225	R4	16	90	J-032
ALB225-DLC	R4	16	90	J-034
MSBL230	R4	20	160	G-078
MSBXL230	R4	20	200	G-079
MRBTN230L	R4×73.2	8	130	G-137
MRBTN230L	R4×80	8	130	G-137
R4.1				
MSB345	R4.1	13	100	G-066

Search from Ball R

Unit [Size : mm]

Model	Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
R4.2				
MSB345	R4.2	13	100	G-066
R4.3				
MSB345	R4.3	13	100	G-066
R4.4				
MSB345	R4.4	14	100	G-066
R4.5				
MSB230	R4.5	13.5	90	G-063
MSB345	R4.5	14	100	G-066
R4.6				
MSB345	R4.6	14	100	G-066
R4.7				
MSB345	R4.7	15	100	G-066
R4.8				
MSB345	R4.8	15	100	G-066
R4.9				
MSB345	R4.9	15	100	G-066
R5				
MSB230SF	R5	10	60	G-074
MSB230S	R5	10	100	G-070
MSBH230	R5	15	100	F-030
MSB230	R5	15	100	G-063
MSB345	R5	15	100	G-066
ALB225	R5	20	100	J-032
ALB225-DLC	R5	20	100	J-034
MSBL230	R5	25	200	G-078
MSBXL230	R5	25	250	G-079
MRBTN230L	R5×58.2	10	110	G-137
MRBTN230L	R5×77.2	10	130	G-137
R5.1				
MSB345	R5.1	16	110	G-066
R5.2				
MSB345	R5.2	16	110	G-066
R5.3				
MSB345	R5.3	16	110	G-066
R5.4				
MSB345	R5.4	17	110	G-066
R5.5				
MSB230	R5.5	16.5	100	G-063
MSB345	R5.5	17	110	G-066
R5.6				
MSB345	R5.6	17	110	G-066
R5.7				
MSB345	R5.7	18	110	G-066
R5.8				
MSB345	R5.8	18	110	G-066
R5.9				
MSB345	R5.9	18	110	G-066
R6				
MSB230SF	R6	12	60	G-074
MSB230S	R6	12	110	G-070
MSBH230	R6	20	100	F-030
MSB230	R6	20	110	G-063
MSB345	R6	20	110	G-066
ALB225	R6	24	110	J-032
ALB225-DLC	R6	24	110	J-034
R7				
MSB230	R7	21	160	G-063
R8				
MSB230	R8	25	160	G-063
R9				
MSB230	R9	27	170	G-063
R10				
MSB230	R10	30	170	G-063

Search from Radius Dia. &Corner R

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
φ0.1				
SHPR400	φ0.1×R0.01×0.2	0.04	50	B-036
MHRSH430RSF	φ0.1×R0.01×0.2	0.08	35	E-018
SHPR400	φ0.1×R0.01×0.3	0.04	50	B-036
MHRSH430RSF	φ0.1×R0.01×0.3	0.08	35	E-018
MHRH430R	φ0.1×R0.01×0.3	0.08	45	F-078
SHPR400	φ0.1×R0.01×0.5	0.04	50	B-036
MHRH430R	φ0.1×R0.01×0.5	0.08	45	F-078
SSR200	φ0.1×R0.02×0.2	0.04	50	B-028
SHPR400	φ0.1×R0.02×0.2	0.04	50	B-036
SSR200	φ0.1×R0.02×0.3	0.04	50	B-028
SHPR400	φ0.1×R0.02×0.3	0.04	50	B-036
SSR200	φ0.1×R0.02×0.5	0.04	50	B-028
SHPR400	φ0.1×R0.02×0.5	0.04	50	B-036
SSR200	φ0.1×R0.03×0.2	0.04	50	B-028
SSR200	φ0.1×R0.03×0.3	0.04	50	B-028
SSR200	φ0.1×R0.03×0.5	0.04	50	B-028
φ0.15				
MHRSH430RSF	φ0.15×R0.01×0.3	0.12	35	E-018
MHRH430R	φ0.15×R0.01×0.3	0.12	45	F-078
MHRSH430RSF	φ0.15×R0.01×0.5	0.12	35	E-018
MHRH430R	φ0.15×R0.01×0.5	0.12	45	F-078
MHRH430R	φ0.15×R0.01×0.75	0.12	45	F-078
MHRH430R	φ0.15×R0.01×1	0.12	45	F-078
SSR200	φ0.15×R0.02×0.2	0.06	50	B-028
SHPR400	φ0.15×R0.02×0.2	0.06	50	B-036
SSR200	φ0.15×R0.02×0.3	0.06	50	B-028
SHPR400	φ0.15×R0.02×0.3	0.06	50	B-036
MHRSH430RSF	φ0.15×R0.02×0.3	0.12	35	E-018
MHRH430R	φ0.15×R0.02×0.3	0.12	45	F-078
SSR200	φ0.15×R0.02×0.5	0.06	50	B-028
SHPR400	φ0.15×R0.02×0.5	0.06	50	B-036
MHRSH430RSF	φ0.15×R0.02×0.5	0.12	35	E-018
MHRH430R	φ0.15×R0.02×0.5	0.12	45	F-078
MHRH430R	φ0.15×R0.02×0.75	0.12	45	F-078
MHRH430R	φ0.15×R0.02×1	0.12	45	F-078
SSR200	φ0.15×R0.03×0.2	0.06	50	B-028
SHPR400	φ0.15×R0.03×0.2	0.06	50	B-036
SSR200	φ0.15×R0.03×0.3	0.06	50	B-028
SHPR400	φ0.15×R0.03×0.3	0.06	50	B-036
SSR200	φ0.15×R0.03×0.5	0.06	50	B-028
SHPR400	φ0.15×R0.03×0.5	0.06	50	B-036
φ0.2				
SSR200	φ0.2×R0.02×0.3	0.08	50	B-028
SHPR400	φ0.2×R0.02×0.3	0.08	50	B-036
MHRSH430RSF	φ0.2×R0.02×0.3	0.15	35	E-018
SSR200	φ0.2×R0.02×0.5	0.08	50	B-028
SHPR400	φ0.2×R0.02×0.5	0.08	50	B-036
MHRSH430RSF	φ0.2×R0.02×0.5	0.15	35	E-018
MHRH230R	φ0.2×R0.02×0.5	0.15	45	F-074
MHRH430R	φ0.2×R0.02×0.5	0.15	45	F-078
DHR237R	φ0.2×R0.02×0.5	0.4	45	K-016
MHRSH430RSF	φ0.2×R0.02×0.75	0.15	35	E-018
SSR200	φ0.2×R0.02×1	0.08	50	B-028
SHPR400	φ0.2×R0.02×1	0.08	50	B-036
MHRSH430RSF	φ0.2×R0.02×1	0.15	35	E-018
MHRH230R	φ0.2×R0.02×1	0.15	45	F-074
MHRH430R	φ0.2×R0.02×1	0.15	45	F-078
DHR237R	φ0.2×R0.02×1	0.4	45	K-016
MHRH230R	φ0.2×R0.02×1.5	0.15	45	F-074
MHRH430R	φ0.2×R0.02×1.5	0.15	45	F-078
DHR237R	φ0.2×R0.02×1.5	0.4	45	K-016
MHRH230R	φ0.2×R0.02×2	0.15	45	F-074
MHRH430R	φ0.2×R0.02×2	0.15	45	F-078
SSR200	φ0.2×R0.03×0.3	0.08	50	B-028
SHPR400	φ0.2×R0.03×0.3	0.08	50	B-036
SSR200	φ0.2×R0.03×0.5	0.08	50	B-028
SHPR400	φ0.2×R0.03×0.5	0.08	50	B-036
SSR200	φ0.2×R0.03×1	0.08	50	B-028
SHPR400	φ0.2×R0.03×1	0.08	50	B-036
SSR200	φ0.2×R0.05×0.3	0.08	50	B-028
MHRSH430RSF	φ0.2×R0.05×0.3	0.15	35	E-018
SSR200	φ0.2×R0.05×0.5	0.08	50	B-028
SSF120	φ0.2×R0.05×0.5	0.1	50	B-042
MHRSH430RSF	φ0.2×R0.05×0.5	0.15	35	E-018
MHRH230R	φ0.2×R0.05×0.5	0.15	45	F-074
MHRH430R	φ0.2×R0.05×0.5	0.15	45	F-078
MHR230R	φ0.2×R0.05×0.5	0.15	45	G-138
MHR230R	φ0.2×R0.05×0.5	0.15	50	G-138
DHR237R	φ0.2×R0.05×0.5	0.4	45	K-016
MHRSH430RSF	φ0.2×R0.05×0.75	0.15	35	E-018
SSR200	φ0.2×R0.05×1	0.08	50	B-028
MHRSH430RSF	φ0.2×R0.05×1	0.15	35	E-018
MHRH230R	φ0.2×R0.05×1	0.15	45	F-074
MHRH430R	φ0.2×R0.05×1	0.15	45	F-078
MHR230R	φ0.2×R0.05×1	0.15	45	G-138
MHR230R	φ0.2×R0.05×1	0.15	50	G-138
MSTNR230	φ0.2×R0.05×1	0.15	50	G-158
DHR237R	φ0.2×R0.05×1	0.4	45	K-016
MHRH230R	φ0.2×R0.05×1.5	0.15	45	F-074
MHRH430R	φ0.2×R0.05×1.5	0.15	45	F-078
MHR230R	φ0.2×R0.05×1.5	0.15	45	G-138
DHR237R	φ0.2×R0.05×1.5	0.4	45	K-016
MHRH230R	φ0.2×R0.05×2	0.15	45	F-074
MHRH430R	φ0.2×R0.05×2	0.15	45	F-078
MHR230R	φ0.2×R0.05×2	0.15	45	G-138
MSTNR230	φ0.2×R0.05×2	0.15	50	G-158
φ0.3				
SSR200	φ0.3×R0.02×0.5	0.13	50	B-028
SHPR400	φ0.3×R0.02×0.5	0.13	50	B-036
MHRSH430RSF	φ0.3×R0.02×0.5	0.25	35	E-018
SSR200	φ0.3×R0.02×0.75	0.13	50	B-028

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SHPR400	φ0.3×R0.02×0.75	0.13	50	B-036
MHRSH430RSF	φ0.3×R0.02×0.75	0.25	35	E-018
SSR200	φ0.3×R0.02×1	0.13	50	B-028
SHPR400	φ0.3×R0.02×1	0.13	50	B-036
MHRSH430RSF	φ0.3×R0.02×1	0.25	35	E-018
MHRH230R	φ0.3×R0.02×1	0.25	45	F-074
MHRH430R	φ0.3×R0.02×1	0.25	45	F-078
DHR237R	φ0.3×R0.02×1	0.6	45	K-016
SSR200	φ0.3×R0.02×1.5	0.13	50	B-028
SHPR400	φ0.3×R0.02×1.5	0.13	50	B-036
MHRSH430RSF	φ0.3×R0.02×1.5	0.25	35	E-018
MHRH230R	φ0.3×R0.02×1.5	0.25	45	F-074
MHRH430R	φ0.3×R0.02×1.5	0.25	45	F-078
DHR237R	φ0.3×R0.02×1.5	0.6	45	K-016
SSR200	φ0.3×R0.02×2	0.13	50	B-028
SHPR400	φ0.3×R0.02×2	0.13	50	B-036
MHRH230R	φ0.3×R0.02×2	0.25	45	F-074
MHRH430R	φ0.3×R0.02×2	0.25	45	F-078
DHR237R	φ0.3×R0.02×2	0.6	45	K-016
MHRH230R	φ0.3×R0.02×2.5	0.25	45	F-074
MHRH430R	φ0.3×R0.02×2.5	0.25	45	F-078
MHRH230R	φ0.3×R0.02×3	0.25	45	F-074
MHRH430R	φ0.3×R0.02×3	0.25	45	F-078
SSR200	φ0.3×R0.03×0.5	0.13	50	B-029
SSR200	φ0.3×R0.03×0.75	0.13	50	B-029
SSR200	φ0.3×R0.03×1	0.13	50	B-029
SSR200	φ0.3×R0.03×1.5	0.13	50	B-029
SSR200	φ0.3×R0.03×2	0.13	50	B-029
PCDRS	φ0.3×R0.05×0.3	0.09	48	C-010
SSR200	φ0.3×R0.05×0.5	0.13	50	B-029
SHPR400	φ0.3×R0.05×0.5	0.13	50	B-037
MHRSH430RSF	φ0.3×R0.05×0.5	0.25	35	E-018
SSR200	φ0.3×R0.05×0.75	0.13	50	B-029
SHPR400	φ0.3×R0.05×0.75	0.13	50	B-037
SSF120	φ0.3×R0.05×0.75	0.15	50	B-042
MHRSH430RSF	φ0.3×R0.05×0.75	0.25	35	E-018
SSR200	φ0.3×R0.05×1	0.13	50	B-029
SHPR400	φ0.3×R0.05×1	0.13	50	B-037
MHRSH430RSF	φ0.3×R0.05×1	0.25	35	E-018
MHRH230R	φ0.3×R0.05×1	0.25	45	F-074
MHRH430R	φ0.3×R0.05×1	0.25	45	F-078
MHR230R	φ0.3×R0.05×1	0.25	45	G-138
MHR230R	φ0.3×R0.05×1	0.25	50	G-138
DHR237R	φ0.3×R0.05×1	0.6	45	K-016
SSR200	φ0.3×R0.05×1.5	0.13	50	B-029
SHPR400	φ0.3×R0.05×1.5	0.13	50	B-037
MHRSH430RSF	φ0.3×R0.05×1.5	0.25	35	E-018
MHRH230R	φ0.3×R0.05×1.5	0.25	45	F-074
MHRH430R	φ0.3×R0.05×1.5	0.25	45	F-078
MHR230R	φ0.3×R0.05×1.5	0.25	45	G-138
DHR237R	φ0.3×R0.05×1.5	0.6	45	K-016

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SSR200	φ0.3×R0.05×2	0.13	50	B-029
SHPR400	φ0.3×R0.05×2	0.13	50	B-037
MHRH230R	φ0.3×R0.05×2	0.25	45	F-074
MHRH430R	φ0.3×R0.05×2	0.25	45	F-078
MHR230R	φ0.3×R0.05×2	0.25	45	G-138
MHR230R	φ0.3×R0.05×2	0.25	50	G-138
MSTNR230	φ0.3×R0.05×2	0.25	50	G-158
DHR237R	φ0.3×R0.05×2	0.6	45	K-016
MHRH230R	φ0.3×R0.05×2.5	0.25	45	F-074
MHRH430R	φ0.3×R0.05×2.5	0.25	45	F-078
MHR230R	φ0.3×R0.05×2.5	0.25	45	G-138
MHRH230R	φ0.3×R0.05×3	0.25	45	F-074
MHRH430R	φ0.3×R0.05×3	0.25	45	F-078
MHR230R	φ0.3×R0.05×3	0.25	45	G-138
MSTNR230	φ0.3×R0.05×3	0.25	50	G-158
φ0.4				
SSR200	φ0.4×R0.02×0.5	0.24	50	B-029
SHPR400	φ0.4×R0.02×0.5	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.02×0.5	0.3	35	E-019
SSR200	φ0.4×R0.02×1	0.24	50	B-029
SHPR400	φ0.4×R0.02×1	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.02×1	0.3	35	E-019
MHRH230R	φ0.4×R0.02×1	0.3	45	F-074
MHRH430R	φ0.4×R0.02×1	0.3	45	F-078
DHR237R	φ0.4×R0.02×1	0.8	45	K-016
SSR200	φ0.4×R0.02×1.5	0.24	50	B-029
SHPR400	φ0.4×R0.02×1.5	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.02×1.5	0.3	35	E-019
MHRH230R	φ0.4×R0.02×1.5	0.3	45	F-074
MHRH430R	φ0.4×R0.02×1.5	0.3	45	F-078
SSR200	φ0.4×R0.02×2	0.24	50	B-029
SHPR400	φ0.4×R0.02×2	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.02×2	0.3	35	E-019
MHRH230R	φ0.4×R0.02×2	0.3	45	F-074
MHRH430R	φ0.4×R0.02×2	0.3	45	F-078
DHR237R	φ0.4×R0.02×2	0.8	45	K-016
SHPR400	φ0.4×R0.02×2.5	0.24	50	B-037
MHRH230R	φ0.4×R0.02×2.5	0.3	45	F-074
MHRH430R	φ0.4×R0.02×2.5	0.3	45	F-078
MHRH230R	φ0.4×R0.02×3	0.3	45	F-074
MHRH430R	φ0.4×R0.02×3	0.3	45	F-078
DHR237R	φ0.4×R0.02×3	0.8	45	K-016
MHRH230R	φ0.4×R0.02×4	0.3	45	F-074
MHRH430R	φ0.4×R0.02×4	0.3	45	F-078
DHR237R	φ0.4×R0.02×4	0.8	45	K-016
SSR200	φ0.4×R0.03×0.5	0.24	50	B-029
SSR200	φ0.4×R0.03×1	0.24	50	B-029
SSR200	φ0.4×R0.03×1.5	0.24	50	B-029
SSR200	φ0.4×R0.03×2	0.24	50	B-029
PCDRS	φ0.4×R0.05×0.4	0.12	48	C-010
SSR200	φ0.4×R0.05×0.5	0.24	50	B-029

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SHPR400	φ0.4×R0.05×0.5	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.05×0.5	0.3	35	E-019
SSF120	φ0.4×R0.05×1	0.2	50	B-042
SSR200	φ0.4×R0.05×1	0.24	50	B-029
SHPR400	φ0.4×R0.05×1	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.05×1	0.3	35	E-019
MHRH230R	φ0.4×R0.05×1	0.3	45	F-074
MHRH430R	φ0.4×R0.05×1	0.3	45	F-079
MHR230R	φ0.4×R0.05×1	0.3	45	G-138
DHR237R	φ0.4×R0.05×1	0.8	45	K-016
SSR200	φ0.4×R0.05×1.5	0.24	50	B-029
SHPR400	φ0.4×R0.05×1.5	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.05×1.5	0.3	35	E-019
MHRH230R	φ0.4×R0.05×1.5	0.3	45	F-074
MHRH430R	φ0.4×R0.05×1.5	0.3	45	F-079
MHR230R	φ0.4×R0.05×1.5	0.3	45	G-138
SSR200	φ0.4×R0.05×2	0.24	50	B-029
SHPR400	φ0.4×R0.05×2	0.24	50	B-037
MHRSH430RSF	φ0.4×R0.05×2	0.3	35	E-019
MHRH230R	φ0.4×R0.05×2	0.3	45	F-074
MHRH430R	φ0.4×R0.05×2	0.3	45	F-079
MHR230R	φ0.4×R0.05×2	0.3	45	G-138
MHR230R	φ0.4×R0.05×2	0.3	50	G-138
DHR237R	φ0.4×R0.05×2	0.8	45	K-016
SHPR400	φ0.4×R0.05×2.5	0.24	50	B-037
MHRH230R	φ0.4×R0.05×2.5	0.3	45	F-074
MHRH430R	φ0.4×R0.05×2.5	0.3	45	F-079
MHRH230R	φ0.4×R0.05×3	0.3	45	F-074
MHRH430R	φ0.4×R0.05×3	0.3	45	F-079
MHR230R	φ0.4×R0.05×3	0.3	45	G-138
MSTNR230	φ0.4×R0.05×3	0.3	50	G-158
MHR230R	φ0.4×R0.05×3	0.3	50	G-138
DHR237R	φ0.4×R0.05×3	0.8	45	K-016
MHRH230R	φ0.4×R0.05×4	0.3	45	F-074
MHRH430R	φ0.4×R0.05×4	0.3	45	F-079
MHR230R	φ0.4×R0.05×4	0.3	45	G-138
MHR230R	φ0.4×R0.05×4	0.3	50	G-138
MSTNR230	φ0.4×R0.05×4	0.3	50	G-158
DHR237R	φ0.4×R0.05×4	0.8	45	K-016
SSR200	φ0.4×R0.1×0.5	0.24	50	B-029
SHPR400	φ0.4×R0.1×0.5	0.24	50	B-037
SSR200	φ0.4×R0.1×1	0.24	50	B-029
SHPR400	φ0.4×R0.1×1	0.24	50	B-037
MHRH230R	φ0.4×R0.1×1	0.3	45	F-074
MHRH430R	φ0.4×R0.1×1	0.3	45	F-079
MHR230R	φ0.4×R0.1×1	0.3	45	G-138
DHR237R	φ0.4×R0.1×1	0.8	45	K-016
SSR200	φ0.4×R0.1×1.5	0.24	50	B-029
SHPR400	φ0.4×R0.1×1.5	0.24	50	B-037
MHR230R	φ0.4×R0.1×1.5	0.3	45	G-138
SSR200	φ0.4×R0.1×2	0.24	50	B-029

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SHPR400	φ0.4×R0.1×2	0.24	50	B-037
MHRH230R	φ0.4×R0.1×2	0.3	45	F-074
MHRH430R	φ0.4×R0.1×2	0.3	45	F-079
MHR230R	φ0.4×R0.1×2	0.3	45	G-138
MHR230R	φ0.4×R0.1×2	0.3	50	G-138
DHR237R	φ0.4×R0.1×2	0.8	45	K-016
SHPR400	φ0.4×R0.1×2.5	0.24	50	B-037
MHRH230R	φ0.4×R0.1×3	0.3	45	F-074
MHRH430R	φ0.4×R0.1×3	0.3	45	F-079
MHR230R	φ0.4×R0.1×3	0.3	45	G-138
MSTNR230	φ0.4×R0.1×3	0.3	50	G-158
MHR230R	φ0.4×R0.1×3	0.3	50	G-138
DHR237R	φ0.4×R0.1×3	0.8	45	K-016
MHRH230R	φ0.4×R0.1×4	0.3	45	F-074
MHRH430R	φ0.4×R0.1×4	0.3	45	F-079
MHR230R	φ0.4×R0.1×4	0.3	45	G-138
MHR230R	φ0.4×R0.1×4	0.3	50	G-138
MSTNR230	φ0.4×R0.1×4	0.3	50	G-158
DHR237R	φ0.4×R0.1×4	0.8	45	K-016
φ0.5				
SSR200	φ0.5×R0.02×0.5	0.3	48	B-029
SHPR400	φ0.5×R0.02×0.5	0.3	48	B-037
SSR200	φ0.5×R0.02×1	0.3	50	B-029
SHPR400	φ0.5×R0.02×1	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.02×1	0.4	35	E-019
MHRH230R	φ0.5×R0.02×1	0.4	45	F-074
MHRH430R	φ0.5×R0.02×1	0.4	45	F-079
SSR200	φ0.5×R0.02×1.5	0.3	50	B-029
SHPR400	φ0.5×R0.02×1.5	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.02×1.5	0.4	35	E-019
SHPR400	φ0.5×R0.02×2	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.02×2	0.4	35	E-019
MHRH230R	φ0.5×R0.02×2	0.4	45	F-074
MHRH430R	φ0.5×R0.02×2	0.4	45	F-079
DHR237R	φ0.5×R0.02×2	1	45	K-017
SSR200	φ0.5×R0.02×2.5	0.3	50	B-029
SHPR400	φ0.5×R0.02×2.5	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.02×2.5	0.4	35	E-019
MHRH230R	φ0.5×R0.02×3	0.4	45	F-074
MHRH430R	φ0.5×R0.02×3	0.4	45	F-079
DHR237R	φ0.5×R0.02×3	1	45	K-017
MHRH230R	φ0.5×R0.02×4	0.4	45	F-074
MHRH430R	φ0.5×R0.02×4	0.4	45	F-079
DHR237R	φ0.5×R0.02×4	1	45	K-017
MHRH230R	φ0.5×R0.02×5	0.4	45	F-074
MHRH430R	φ0.5×R0.02×5	0.4	45	F-079
DHR237R	φ0.5×R0.02×5	1	45	K-017
MHRH230R	φ0.5×R0.02×6	0.4	45	F-074
MHRH430R	φ0.5×R0.02×6	0.4	45	F-079
SSR200	φ0.5×R0.03×0.5	0.3	48	B-029
SSR200	φ0.5×R0.03×1	0.3	50	B-029

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SSR200	φ0.5×R0.03×1.5	0.3	50	B-029
SSR200	φ0.5×R0.03×2.5	0.3	50	B-029
PCDRS	φ0.5×R0.05×0.5	0.15	48	C-010
SSR200	φ0.5×R0.05×0.5	0.3	48	B-029
SHPR400	φ0.5×R0.05×0.5	0.3	48	B-037
SSR200	φ0.5×R0.05×1	0.3	50	B-029
SHPR400	φ0.5×R0.05×1	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.05×1	0.4	35	E-019
MHRH230R	φ0.5×R0.05×1	0.4	45	F-074
MHRH430R	φ0.5×R0.05×1	0.4	45	F-079
MHR230R	φ0.5×R0.05×1	0.4	45	G-139
SSF120	φ0.5×R0.05×1.25	0.25	50	B-042
SSR200	φ0.5×R0.05×1.5	0.3	50	B-029
SHPR400	φ0.5×R0.05×1.5	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.05×1.5	0.4	35	E-019
SHPR400	φ0.5×R0.05×2	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.05×2	0.4	35	E-019
MHRH230R	φ0.5×R0.05×2	0.4	45	F-074
MHRH430R	φ0.5×R0.05×2	0.4	45	F-079
MHR230R	φ0.5×R0.05×2	0.4	45	G-139
MHR230R	φ0.5×R0.05×2	0.4	50	G-139
DHR237R	φ0.5×R0.05×2	1	45	K-017
SSR200	φ0.5×R0.05×2.5	0.3	50	B-029
SHPR400	φ0.5×R0.05×2.5	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.05×2.5	0.4	35	E-019
MHRH230R	φ0.5×R0.05×3	0.4	45	F-074
MHRH430R	φ0.5×R0.05×3	0.4	45	F-079
MHR230R	φ0.5×R0.05×3	0.4	45	G-139
MHR230R	φ0.5×R0.05×3	0.4	50	G-139
MSTNR230	φ0.5×R0.05×3	0.4	50	G-158,G-159
DHR237R	φ0.5×R0.05×3	1	45	K-017
MHRH230R	φ0.5×R0.05×4	0.4	45	F-074
MHRH430R	φ0.5×R0.05×4	0.4	45	F-079
MHR230R	φ0.5×R0.05×4	0.4	45	G-139
MHR230R	φ0.5×R0.05×4	0.4	50	G-139
DHR237R	φ0.5×R0.05×4	1	45	K-017
MHRH230R	φ0.5×R0.05×5	0.4	45	F-074
MHRH430R	φ0.5×R0.05×5	0.4	45	F-079
MHR230R	φ0.5×R0.05×5	0.4	45	G-139
MHR230R	φ0.5×R0.05×5	0.4	50	G-139
MSTNR230	φ0.5×R0.05×5	0.4	50	G-158,G-159
DHR237R	φ0.5×R0.05×5	1	45	K-017
MHRH230R	φ0.5×R0.05×6	0.4	45	F-074
MHRH430R	φ0.5×R0.05×6	0.4	45	F-079
MHR230R	φ0.5×R0.05×6	0.4	45	G-139
MSTNR230	φ0.5×R0.05×8	0.4	50	G-158,G-159
MSTNR230	φ0.5×R0.05×10	0.4	50	G-158,G-159
MSTNR230	φ0.5×R0.05×12	0.4	50	G-158,G-159
PCDRS	φ0.5×R0.1×0.5	0.15	48	C-010
SSR200	φ0.5×R0.1×0.5	0.3	48	B-029
SHPR400	φ0.5×R0.1×0.5	0.3	48	B-037

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SSR200	φ0.5×R0.1×1	0.3	50	B-029
SHPR400	φ0.5×R0.1×1	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.1×1	0.4	35	E-019
MHRH230R	φ0.5×R0.1×1	0.4	45	F-075
MHRH430R	φ0.5×R0.1×1	0.4	45	F-079
MHR230R	φ0.5×R0.1×1	0.4	45	G-139
SHR320	φ0.5×R0.1×1.5	0.25	50	B-034
SSR200	φ0.5×R0.1×1.5	0.3	50	B-029
SHPR400	φ0.5×R0.1×1.5	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.1×1.5	0.4	35	E-019
SHPR400	φ0.5×R0.1×2	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.1×2	0.4	35	E-019
MHRH230R	φ0.5×R0.1×2	0.4	45	F-075
MHRH430R	φ0.5×R0.1×2	0.4	45	F-079
MHR230R	φ0.5×R0.1×2	0.4	45	G-139
MHR230R	φ0.5×R0.1×2	0.4	50	G-139
DHR237R	φ0.5×R0.1×2	1	45	K-017
SHR320	φ0.5×R0.1×2.5	0.25	50	B-034
SSR200	φ0.5×R0.1×2.5	0.3	50	B-029
SHPR400	φ0.5×R0.1×2.5	0.3	50	B-037
MHRSH430RSF	φ0.5×R0.1×2.5	0.4	35	E-019
MHRH230R	φ0.5×R0.1×3	0.4	45	F-075
MHRH430R	φ0.5×R0.1×3	0.4	45	F-079
MHR230R	φ0.5×R0.1×3	0.4	45	G-139
MHR230R	φ0.5×R0.1×3	0.4	50	G-139
MSTNR230	φ0.5×R0.1×3	0.4	50	G-159
DHR237R	φ0.5×R0.1×3	1	45	K-017
MHRH230R	φ0.5×R0.1×4	0.4	45	F-075
MHRH430R	φ0.5×R0.1×4	0.4	45	F-079
MHR230R	φ0.5×R0.1×4	0.4	45	G-139
MHR230R	φ0.5×R0.1×4	0.4	50	G-139
DHR237R	φ0.5×R0.1×4	1	45	K-017
MHRH230R	φ0.5×R0.1×5	0.4	45	F-075
MHRH430R	φ0.5×R0.1×5	0.4	45	F-079
MHR230R	φ0.5×R0.1×5	0.4	45	G-139
MHR230R	φ0.5×R0.1×5	0.4	50	G-139
MSTNR230	φ0.5×R0.1×5	0.4	50	G-159
DHR237R	φ0.5×R0.1×5	1	45	K-017
MHRH230R	φ0.5×R0.1×6	0.4	45	F-075
MHRH430R	φ0.5×R0.1×6	0.4	45	F-079
MHR230R	φ0.5×R0.1×6	0.4	45	G-139
MSTNR230	φ0.5×R0.1×8	0.4	50	G-159
MSTNR230	φ0.5×R0.1×10	0.4	50	G-159
MSTNR230	φ0.5×R0.1×12	0.4	50	G-159
φ0.6				
SSR200	φ0.6×R0.02×0.5	0.3	48	B-029
SHPR400	φ0.6×R0.02×0.5	0.3	48	B-037
SSR200	φ0.6×R0.02×1	0.3	50	B-029
SHPR400	φ0.6×R0.02×1	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.02×1	0.5	35	E-019
SSR200	φ0.6×R0.02×1.5	0.3	50	B-029

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SHPR400	φ0.6×R0.02×1.5	0.3	50	B-037
SHPR400	φ0.6×R0.02×2	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.02×2	0.5	35	E-019
MHRH230R	φ0.6×R0.02×2	0.5	45	F-075
MHRH430R	φ0.6×R0.02×2	0.5	45	F-079
DHR237R	φ0.6×R0.02×2	1.2	45	K-017
SSR200	φ0.6×R0.02×2.5	0.3	50	B-029
SHPR400	φ0.6×R0.02×2.5	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.02×3	0.5	35	E-019
MHRH230R	φ0.6×R0.02×4	0.5	45	F-075
MHRH430R	φ0.6×R0.02×4	0.5	45	F-079
DHR237R	φ0.6×R0.02×4	1.2	45	K-017
MHRH230R	φ0.6×R0.02×6	0.5	45	F-075
MHRH430R	φ0.6×R0.02×6	0.5	45	F-079
DHR237R	φ0.6×R0.02×6	1.2	45	K-017
MHRH230R	φ0.6×R0.02×8	0.5	50	F-075
MHRH430R	φ0.6×R0.02×8	0.5	50	F-079
MHRH230R	φ0.6×R0.02×10	0.5	50	F-075
MHRH430R	φ0.6×R0.02×10	0.5	50	F-079
SSR200	φ0.6×R0.03×0.5	0.3	48	B-029
SSR200	φ0.6×R0.03×1	0.3	50	B-029
SSR200	φ0.6×R0.03×1.5	0.3	50	B-029
SSR200	φ0.6×R0.03×2.5	0.3	50	B-029
SSR200	φ0.6×R0.05×0.5	0.3	48	B-029
SHPR400	φ0.6×R0.05×0.5	0.3	48	B-037
PCDRS	φ0.6×R0.05×0.6	0.18	48	C-010
SSR200	φ0.6×R0.05×1	0.3	50	B-029
SHPR400	φ0.6×R0.05×1	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.05×1	0.5	35	E-019
SSR200	φ0.6×R0.05×1.5	0.3	50	B-029
SHPR400	φ0.6×R0.05×1.5	0.3	50	B-037
SSF120	φ0.6×R0.05×1.5	0.3	50	B-042
SHPR400	φ0.6×R0.05×2	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.05×2	0.5	35	E-019
MHRH230R	φ0.6×R0.05×2	0.5	45	F-075
MHRH430R	φ0.6×R0.05×2	0.5	45	F-079
MHR230R	φ0.6×R0.05×2	0.5	45	G-139
MHR230R	φ0.6×R0.05×2	0.5	50	G-139
DHR237R	φ0.6×R0.05×2	1.2	45	K-017
SSR200	φ0.6×R0.05×2.5	0.3	50	B-029
SHPR400	φ0.6×R0.05×2.5	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.05×3	0.5	35	E-019
MHR230R	φ0.6×R0.05×3	0.5	45	G-139
MHRH230R	φ0.6×R0.05×4	0.5	45	F-075
MHRH430R	φ0.6×R0.05×4	0.5	45	F-079
MHR230R	φ0.6×R0.05×4	0.5	45	G-139
MHR230R	φ0.6×R0.05×4	0.5	50	G-139
DHR237R	φ0.6×R0.05×4	1.2	45	K-017
MHRH230R	φ0.6×R0.05×6	0.5	45	F-075
MHRH430R	φ0.6×R0.05×6	0.5	45	F-079
MHR230R	φ0.6×R0.05×6	0.5	45	G-139

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230R	φ0.6×R0.05×6	0.5	50	G-139
DHR237R	φ0.6×R0.05×6	1.2	45	K-017
MHRH230R	φ0.6×R0.05×8	0.5	50	F-075
MHRH430R	φ0.6×R0.05×8	0.5	50	F-079
MHR230R	φ0.6×R0.05×8	0.5	50	G-139
MHRH230R	φ0.6×R0.05×10	0.5	50	F-075
MHRH430R	φ0.6×R0.05×10	0.5	50	F-079
SSR200	φ0.6×R0.1×0.5	0.3	48	B-029
SHPR400	φ0.6×R0.1×0.5	0.3	48	B-037
PCDRS	φ0.6×R0.1×0.6	0.18	48	C-010
SSR200	φ0.6×R0.1×1	0.3	50	B-029
SHPR400	φ0.6×R0.1×1	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.1×1	0.5	35	E-019
SSR200	φ0.6×R0.1×1.5	0.3	50	B-029
SHPR400	φ0.6×R0.1×1.5	0.3	50	B-037
SHPR400	φ0.6×R0.1×2	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.1×2	0.5	35	E-019
MHRH230R	φ0.6×R0.1×2	0.5	45	F-075
MHRH430R	φ0.6×R0.1×2	0.5	45	F-079
MHR230R	φ0.6×R0.1×2	0.5	45	G-139
DHR237R	φ0.6×R0.1×2	1.2	45	K-017
SSR200	φ0.6×R0.1×2.5	0.3	50	B-029
SHPR400	φ0.6×R0.1×2.5	0.3	50	B-037
MHRSH430RSF	φ0.6×R0.1×3	0.5	35	E-019
MHR230R	φ0.6×R0.1×3	0.5	45	G-139
MHRH230R	φ0.6×R0.1×4	0.5	45	F-075
MHRH430R	φ0.6×R0.1×4	0.5	45	F-079
MHR230R	φ0.6×R0.1×4	0.5	45	G-139
MHR230R	φ0.6×R0.1×4	0.5	50	G-139
DHR237R	φ0.6×R0.1×4	1.2	45	K-017
MHRH230R	φ0.6×R0.1×6	0.5	45	F-075
MHRH430R	φ0.6×R0.1×6	0.5	45	F-079
MHR230R	φ0.6×R0.1×6	0.5	45	G-139
MHR230R	φ0.6×R0.1×6	0.5	50	G-139
DHR237R	φ0.6×R0.1×6	1.2	45	K-017
MHRH230R	φ0.6×R0.1×8	0.5	50	F-075
MHRH430R	φ0.6×R0.1×8	0.5	50	F-079
MHR230R	φ0.6×R0.1×8	0.5	50	G-139
MHRH230R	φ0.6×R0.1×10	0.5	50	F-075
MHRH430R	φ0.6×R0.1×10	0.5	50	F-079
MHR230R	φ0.6×R0.2×2	0.5	45	G-139
MHR230R	φ0.6×R0.2×3	0.5	45	G-139
MHR230R	φ0.6×R0.2×4	0.5	45	G-140
MHR230R	φ0.6×R0.2×6	0.5	45	G-140
MHR230R	φ0.6×R0.2×8	0.5	50	G-140
φ0.7				
MHRH230R	φ0.7×R0.02×2	0.55	45	F-075
MHRH430R	φ0.7×R0.02×2	0.55	45	F-079
MHRH230R	φ0.7×R0.02×4	0.55	45	F-075
MHRH430R	φ0.7×R0.02×4	0.55	45	F-079
MHRH230R	φ0.7×R0.02×6	0.55	45	F-075

Search from Radius Dia. &Corner R

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH430R	ϕ0.7×R0.02×6	0.55	45	F-079
MHRH230R	ϕ0.7×R0.05×2	0.55	45	F-075
MHRH430R	ϕ0.7×R0.05×2	0.55	45	F-079
MHRH230R	ϕ0.7×R0.05×4	0.55	45	F-075
MHRH430R	ϕ0.7×R0.05×4	0.55	45	F-079
MHR230R	ϕ0.7×R0.05×4	0.55	45	G-140
MHR230R	ϕ0.7×R0.05×4	0.55	50	G-140
MHRH230R	ϕ0.7×R0.05×6	0.55	45	F-075
MHRH430R	ϕ0.7×R0.05×6	0.55	45	F-079
MHR230R	ϕ0.7×R0.05×6	0.55	45	G-140
MHR230R	ϕ0.7×R0.05×6	0.55	50	G-140
MHRH230R	ϕ0.7×R0.1×2	0.55	45	F-075
MHRH430R	ϕ0.7×R0.1×2	0.55	45	F-079
MHRH230R	ϕ0.7×R0.1×4	0.55	45	F-075
MHRH430R	ϕ0.7×R0.1×4	0.55	45	F-079
MHR230R	ϕ0.7×R0.1×4	0.55	45	G-140
MHR230R	ϕ0.7×R0.1×4	0.55	50	G-140
MHRH230R	ϕ0.7×R0.1×6	0.55	45	F-075
MHRH430R	ϕ0.7×R0.1×6	0.55	45	F-079
MHR230R	ϕ0.7×R0.1×6	0.55	45	G-140
MHR230R	ϕ0.7×R0.1×6	0.55	50	G-140
ϕ0.8				
SSR200	ϕ0.8×R0.02×1.5	0.56	50	B-029
SHPR400	ϕ0.8×R0.02×1.5	0.56	50	B-037
MHRSH430RSF	ϕ0.8×R0.02×2	0.65	35	E-019
MHRH230R	ϕ0.8×R0.02×2	0.65	45	F-075
MHRH430R	ϕ0.8×R0.02×2	0.65	45	F-079
SSR200	ϕ0.8×R0.02×2.5	0.56	50	B-029
SHPR400	ϕ0.8×R0.02×2.5	0.56	50	B-037
MHRSH430RSF	ϕ0.8×R0.02×3	0.65	35	E-019
MHRSH430RSF	ϕ0.8×R0.02×4	0.65	35	E-019
MHRH230R	ϕ0.8×R0.02×4	0.65	45	F-075
MHRH430R	ϕ0.8×R0.02×4	0.65	45	F-079
DHR237R	ϕ0.8×R0.02×4	1.6	45	K-017
SSR200	ϕ0.8×R0.02×5	0.56	53	B-029
SHPR400	ϕ0.8×R0.02×5	0.56	53	B-037
MHRH230R	ϕ0.8×R0.02×6	0.65	45	F-075
MHRH430R	ϕ0.8×R0.02×6	0.65	45	F-079
DHR237R	ϕ0.8×R0.02×6	1.6	45	K-017
MHRH230R	ϕ0.8×R0.02×8	0.65	50	F-075
MHRH430R	ϕ0.8×R0.02×8	0.65	50	F-079
DHR237R	ϕ0.8×R0.02×8	1.6	50	K-017
SSR200	ϕ0.8×R0.03×1.5	0.56	50	B-030
SSR200	ϕ0.8×R0.03×2.5	0.56	50	B-030
SSR200	ϕ0.8×R0.03×5	0.56	53	B-030
PCDRS	ϕ0.8×R0.05×0.8	0.24	48	C-010
SSR200	ϕ0.8×R0.05×1.5	0.56	50	B-030
SHPR400	ϕ0.8×R0.05×1.5	0.56	50	B-037
SSF120	ϕ0.8×R0.05×2	0.4	50	B-042
MHRSH430RSF	ϕ0.8×R0.05×2	0.65	35	E-019
MHRH230R	ϕ0.8×R0.05×2	0.65	45	F-075

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH430R	ϕ0.8×R0.05×2	0.65	45	F-080
SSR200	ϕ0.8×R0.05×2.5	0.56	50	B-030
SHPR400	ϕ0.8×R0.05×2.5	0.56	50	B-037
MHRSH430RSF	ϕ0.8×R0.05×3	0.65	35	E-019
MHRSH430RSF	ϕ0.8×R0.05×4	0.65	35	E-019
MHRH230R	ϕ0.8×R0.05×4	0.65	45	F-075
MHRH430R	ϕ0.8×R0.05×4	0.65	45	F-080
MHR230R	ϕ0.8×R0.05×4	0.65	45	G-140
MHR230R	ϕ0.8×R0.05×4	0.65	50	G-140
DHR237R	ϕ0.8×R0.05×4	1.6	45	K-017
SSR200	ϕ0.8×R0.05×5	0.56	53	B-030
SHPR400	ϕ0.8×R0.05×5	0.56	53	B-037
MSTNR230	ϕ0.8×R0.05×5	0.65	50	G-159
MHRH230R	ϕ0.8×R0.05×6	0.65	45	F-075
MHRH430R	ϕ0.8×R0.05×6	0.65	45	F-080
MHR230R	ϕ0.8×R0.05×6	0.65	45	G-140
MHR230R	ϕ0.8×R0.05×6	0.65	50	G-140
DHR237R	ϕ0.8×R0.05×6	1.6	45	K-017
MHRH230R	ϕ0.8×R0.05×8	0.65	50	F-075
MHRH430R	ϕ0.8×R0.05×8	0.65	50	F-080
MHR230R	ϕ0.8×R0.05×8	0.65	50	G-140
MSTNR230	ϕ0.8×R0.05×8	0.65	50	G-159
DHR237R	ϕ0.8×R0.05×8	1.6	50	K-017
MHRH230R	ϕ0.8×R0.05×12	0.65	50	F-075
MHRH430R	ϕ0.8×R0.05×12	0.65	50	F-080
PCDRS	ϕ0.8×R0.1×0.8	0.24	48	C-010
SSR200	ϕ0.8×R0.1×1.5	0.56	50	B-030
SHPR400	ϕ0.8×R0.1×1.5	0.56	50	B-037
MHRSH430RSF	ϕ0.8×R0.1×2	0.65	35	E-019
MHRH230R	ϕ0.8×R0.1×2	0.65	45	F-075
MHRH430R	ϕ0.8×R0.1×2	0.65	45	F-080
SSR200	ϕ0.8×R0.1×2.5	0.56	50	B-030
SHPR400	ϕ0.8×R0.1×2.5	0.56	50	B-037
MHRSH430RSF	ϕ0.8×R0.1×3	0.65	35	E-019
MHRSH430RSF	ϕ0.8×R0.1×4	0.65	35	E-019
MHRH230R	ϕ0.8×R0.1×4	0.65	45	F-075
MHRH430R	ϕ0.8×R0.1×4	0.65	45	F-080
MHR230R	ϕ0.8×R0.1×4	0.65	45	G-140
MHR230R	ϕ0.8×R0.1×4	0.65	50	G-140
DHR237R	ϕ0.8×R0.1×4	1.6	45	K-017
SSR200	ϕ0.8×R0.1×5	0.56	53	B-030
SHPR400	ϕ0.8×R0.1×5	0.56	53	B-037
MSTNR230	ϕ0.8×R0.1×5	0.65	50	G-159
MHRH230R	ϕ0.8×R0.1×6	0.65	45	F-075
MHRH430R	ϕ0.8×R0.1×6	0.65	45	F-080
MHR230R	ϕ0.8×R0.1×6	0.65	45	G-140
MHR230R	ϕ0.8×R0.1×6	0.65	50	G-140
DHR237R	ϕ0.8×R0.1×6	1.6	45	K-017
MHRH230R	ϕ0.8×R0.1×8	0.65	50	F-075
MHRH430R	ϕ0.8×R0.1×8	0.65	50	F-080
MHR230R	ϕ0.8×R0.1×8	0.65	50	G-140

Search from Radius Dia. &Corner R

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MSTNR230	ϕ0.8×R0.1×8	0.65	50	G-159
DHR237R	ϕ0.8×R0.1×8	1.6	50	K-017
MHRH230R	ϕ0.8×R0.1×12	0.65	50	F-075
MHRH430R	ϕ0.8×R0.1×12	0.65	50	F-080
MHRSH430RSF	ϕ0.8×R0.2×2	0.65	35	E-019
MHRH230R	ϕ0.8×R0.2×2	0.65	45	F-075
MHRH430R	ϕ0.8×R0.2×2	0.65	45	F-080
MHRSH430RSF	ϕ0.8×R0.2×3	0.65	35	E-019
MHRSH430RSF	ϕ0.8×R0.2×4	0.65	35	E-019
MHRH230R	ϕ0.8×R0.2×4	0.65	45	F-075
MHRH430R	ϕ0.8×R0.2×4	0.65	45	F-080
MHR230R	ϕ0.8×R0.2×4	0.65	45	G-140
MHR230R	ϕ0.8×R0.2×4	0.65	50	G-140
MSTNR230	ϕ0.8×R0.2×5	0.65	50	G-159
MHRH230R	ϕ0.8×R0.2×6	0.65	45	F-075
MHRH430R	ϕ0.8×R0.2×6	0.65	45	F-080
MHR230R	ϕ0.8×R0.2×6	0.65	45	G-140
MHR230R	ϕ0.8×R0.2×6	0.65	50	G-140
MSTNR230	ϕ0.8×R0.2×8	0.65	50	G-159
MHRH230R	ϕ0.8×R0.2×8	0.65	50	F-075
MHRH430R	ϕ0.8×R0.2×8	0.65	50	F-080
MHR230R	ϕ0.8×R0.2×8	0.65	50	G-140
MHRH230R	ϕ0.8×R0.2×12	0.65	50	F-075
MHRH430R	ϕ0.8×R0.2×12	0.65	50	F-080
ϕ0.9				
MHRH230R	ϕ0.9×R0.1×4	0.7	45	F-075
MHRH430R	ϕ0.9×R0.1×4	0.7	45	F-080
MHR230R	ϕ0.9×R0.1×4	0.7	45	G-140
MHR230R	ϕ0.9×R0.1×4	0.7	50	G-140
MHRH230R	ϕ0.9×R0.1×8	0.7	50	F-075
MHRH430R	ϕ0.9×R0.1×8	0.7	50	F-080
MHR230R	ϕ0.9×R0.1×8	0.7	50	G-140
ϕ1				
SSR200	ϕ1×R0.02×1	0.7	49	B-030
SHPR400	ϕ1×R0.02×1	0.7	49	B-037
SSR200	ϕ1×R0.02×2	0.7	50	B-030
SHPR400	ϕ1×R0.02×2	0.7	50	B-037
MHRSH430RSF	ϕ1×R0.02×2	0.8	35	E-019
MHRH430R	ϕ1×R0.02×2	0.8	50	F-080
SSR200	ϕ1×R0.02×3	0.7	50	B-030
SHPR400	ϕ1×R0.02×3	0.7	50	B-037
MHRSH430RSF	ϕ1×R0.02×3	0.8	35	E-019
MHRH430R	ϕ1×R0.02×3	0.8	50	F-080
MHRSH430RSF	ϕ1×R0.02×4	0.8	35	E-019
MHRH430R	ϕ1×R0.02×4	0.8	50	F-080
SSR200	ϕ1×R0.02×5	0.7	53	B-030
SHPR400	ϕ1×R0.02×5	0.7	53	B-037
MHRSH430RSF	ϕ1×R0.02×5	0.8	40	E-019
MHRH430R	ϕ1×R0.02×5	0.8	50	F-080
MHRH430R	ϕ1×R0.02×6	0.8	50	F-080
MHRH430R	ϕ1×R0.02×8	0.8	50	F-080

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH430R	ϕ1×R0.02×10	0.8	50	F-080
SSR200	ϕ1×R0.03×1	0.7	49	B-030
SSR200	ϕ1×R0.03×2	0.7	50	B-030
SSR200	ϕ1×R0.03×3	0.7	50	B-030
SSR200	ϕ1×R0.03×5	0.7	53	B-030
PCDRS	ϕ1×R0.05×1	0.3	48	C-010
SSR200	ϕ1×R0.05×1	0.7	49	B-030
SHPR400	ϕ1×R0.05×1	0.7	49	B-038
SSR200	ϕ1×R0.05×2	0.7	50	B-030
SHPR400	ϕ1×R0.05×2	0.7	50	B-038
MHRSH430RSF	ϕ1×R0.05×2	0.8	35	E-019
MHRH430R	ϕ1×R0.05×2	0.8	50	F-080
MHR230R	ϕ1×R0.05×2	0.8	50	G-140
SSR200	ϕ1×R0.05×3	0.7	50	B-030
SHPR400	ϕ1×R0.05×3	0.7	50	B-038
MHRSH430RSF	ϕ1×R0.05×3	0.8	35	E-019
MHRH430R	ϕ1×R0.05×3	0.8	50	F-080
MHR230R	ϕ1×R0.05×3	0.8	50	G-140
MHR430R	ϕ1×R0.05×3	0.8	50	G-152
DHR237R	ϕ1×R0.05×3	2	45	K-017
MHRSH430RSF	ϕ1×R0.05×4	0.8	35	E-019
MHRH430R	ϕ1×R0.05×4	0.8	50	F-080
MHR230R	ϕ1×R0.05×4	0.8	50	G-140,G-141
MHR430R	ϕ1×R0.05×4	0.8	50	G-152
DHR237R	ϕ1×R0.05×4	2	45	K-017
SSR200	ϕ1×R0.05×5	0.7	53	B-030
SHPR400	ϕ1×R0.05×5	0.7	53	B-038
MHRSH430RSF	ϕ1×R0.05×5	0.8	40	E-019
MHRH430R	ϕ1×R0.05×5	0.8	50	F-080
MHR230R	ϕ1×R0.05×5	0.8	50	G-141
MHR430R	ϕ1×R0.05×5	0.8	50	G-152
DHR237R	ϕ1×R0.05×5	2	45	K-017
MSTNR230	ϕ1×R0.05×6	0.8	50	G-159,G-160
MHRH430R	ϕ1×R0.05×6	0.8	50	F-080
MHR230R	ϕ1×R0.05×6	0.8	50	G-141
MHR430R	ϕ1×R0.05×6	0.8	50	G-152
DHR237R	ϕ1×R0.05×6	2	45	K-017
MHRH430R	ϕ1×R0.05×8	0.8	50	F-080
MHR230R	ϕ1×R0.05×8	0.8	50	G-141
MHR430R	ϕ1×R0.05×8	0.8	50	G-152
DHR237R	ϕ1×R0.05×8	2	50	K-017
MHRH430R	ϕ1×R0.05×10	0.8	50	F-080
MHR230R	ϕ1×R0.05×10	0.8	50	G-141
MHR430R	ϕ1×R0.05×10	0.8	50	G-152
MSTNR230	ϕ1×R0.05×10	0.8	60	G-159,G-160
DHR237R	ϕ1×R0.05×10	2	50	K-017
MHR230R	ϕ1×R0.05×12	0.8	50	G-141
MHR430R	ϕ1×R0.05×12	0.8	50	G-152
MSTNR230	ϕ1×R0.05×15	0.8	60	G-159
MHR230R	ϕ1×R0.05×16	0.8	60	G-141
MSTNR230	ϕ1×R0.05×20	0.8	60	G-159

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230R	φ1×R0.05×20	0.8	60	G-141
MSTNR230	φ1×R0.05×25	0.8	70	G-160
MSTNR230	φ1×R0.05×30	0.8	80	G-160
MSTNR230	φ1×R0.05×35	0.8	80	G-160
MSRS230	φ1×R0.1	2	60	G-080
MSRS430	φ1×R0.1	2	60	G-082
PCDRS	φ1×R0.1×1	0.3	48	C-010
SSR200	φ1×R0.1×1	0.7	49	B-030
SHPR400	φ1×R0.1×1	0.7	49	B-038
SSR200	φ1×R0.1×2	0.7	50	B-030
SHPR400	φ1×R0.1×2	0.7	50	B-038
MHRSH430RSF	φ1×R0.1×2	0.8	35	E-019
MHRH430R	φ1×R0.1×2	0.8	50	F-080
MHR230R	φ1×R0.1×2	0.8	50	G-141
SSF120	φ1×R0.1×2.5	0.5	50	B-042
SHR320	φ1×R0.1×3	0.5	50	B-034
SSR200	φ1×R0.1×3	0.7	50	B-030
SHPR400	φ1×R0.1×3	0.7	50	B-038
MHRSH430RSF	φ1×R0.1×3	0.8	35	E-019
MHRH430R	φ1×R0.1×3	0.8	50	F-080
MHR230R	φ1×R0.1×3	0.8	50	G-141
MHR430R	φ1×R0.1×3	0.8	50	G-152
DHR237R	φ1×R0.1×3	2	45	K-017
MHRSH430RSF	φ1×R0.1×4	0.8	35	E-019
MHRH430R	φ1×R0.1×4	0.8	50	F-080
MHR230R	φ1×R0.1×4	0.8	50	G-141
MHR430R	φ1×R0.1×4	0.8	50	G-152
DHR237R	φ1×R0.1×4	2	45	K-017
SHR320	φ1×R0.1×5	0.5	52	B-034
SSR200	φ1×R0.1×5	0.7	53	B-030
SHPR400	φ1×R0.1×5	0.7	53	B-038
MHRSH430RSF	φ1×R0.1×5	0.8	40	E-019
MHRH430R	φ1×R0.1×5	0.8	50	F-080
MHR230R	φ1×R0.1×5	0.8	50	G-141
MHR430R	φ1×R0.1×5	0.8	50	G-152
DHR237R	φ1×R0.1×5	2	45	K-017
MHRH430R	φ1×R0.1×6	0.8	50	F-080
MHR230R	φ1×R0.1×6	0.8	50	G-141
MHR430R	φ1×R0.1×6	0.8	50	G-152
MSTNR230	φ1×R0.1×6	0.8	50	G-160
DHR237R	φ1×R0.1×6	2	45	K-017
MHRH430R	φ1×R0.1×8	0.8	50	F-080
MHR230R	φ1×R0.1×8	0.8	50	G-141
MHR430R	φ1×R0.1×8	0.8	50	G-152
DHR237R	φ1×R0.1×8	2	50	K-017
MHRH430R	φ1×R0.1×10	0.8	50	F-080
MHR230R	φ1×R0.1×10	0.8	50	G-141
MHR430R	φ1×R0.1×10	0.8	50	G-152
MSTNR230	φ1×R0.1×10	0.8	60	G-160
DHR237R	φ1×R0.1×10	2	50	K-017
MHR230R	φ1×R0.1×12	0.8	50	G-141

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR430R	φ1×R0.1×12	0.8	50	G-152
MSTNR230	φ1×R0.1×15	0.8	60	G-160
MHR230R	φ1×R0.1×16	0.8	60	G-141
MHR230R	φ1×R0.1×20	0.8	60	G-141
MSTNR230	φ1×R0.1×20	0.8	60	G-160
MSTNR230	φ1×R0.1×25	0.8	70	G-160
MSTNR230	φ1×R0.1×30	0.8	80	G-160
MSTNR230	φ1×R0.1×35	0.8	80	G-160
MSRS230	φ1×R0.2	2	60	G-080
MSRS430	φ1×R0.2	2	60	G-082
SSR200	φ1×R0.2×1	0.7	49	B-030
SHPR400	φ1×R0.2×1	0.7	49	B-038
SSR200	φ1×R0.2×2	0.7	50	B-030
SHPR400	φ1×R0.2×2	0.7	50	B-038
MHRSH430RSF	φ1×R0.2×2	0.8	35	E-020
MHRH430R	φ1×R0.2×2	0.8	50	F-080
MHR230R	φ1×R0.2×2	0.8	50	G-141
SHR320	φ1×R0.2×3	0.5	50	B-034
SSR200	φ1×R0.2×3	0.7	50	B-030
SHPR400	φ1×R0.2×3	0.7	50	B-038
MHRSH430RSF	φ1×R0.2×3	0.8	35	E-020
MHRH430R	φ1×R0.2×3	0.8	50	F-080
MHR230R	φ1×R0.2×3	0.8	50	G-141
MHR430R	φ1×R0.2×3	0.8	50	G-152
DHR237R	φ1×R0.2×3	2	45	K-017
MHRSH430RSF	φ1×R0.2×4	0.8	35	E-020
MHRH430R	φ1×R0.2×4	0.8	50	F-080
MHR230R	φ1×R0.2×4	0.8	50	G-141
MHR430R	φ1×R0.2×4	0.8	50	G-152
DHR237R	φ1×R0.2×4	2	45	K-017
SHR320	φ1×R0.2×5	0.5	52	B-034
SSR200	φ1×R0.2×5	0.7	53	B-030
SHPR400	φ1×R0.2×5	0.7	53	B-038
MHRSH430RSF	φ1×R0.2×5	0.8	40	E-020
MHRH430R	φ1×R0.2×5	0.8	50	F-080
MHR230R	φ1×R0.2×5	0.8	50	G-141
MHR430R	φ1×R0.2×5	0.8	50	G-152
DHR237R	φ1×R0.2×5	2	45	K-017
MHRH430R	φ1×R0.2×6	0.8	50	F-080
MHR230R	φ1×R0.2×6	0.8	50	G-142
MHR430R	φ1×R0.2×6	0.8	50	G-152
MSTNR230	φ1×R0.2×6	0.8	50	G-160
DHR237R	φ1×R0.2×6	2	45	K-017
MHRH430R	φ1×R0.2×8	0.8	50	F-080
MHR230R	φ1×R0.2×8	0.8	50	G-142
MHR430R	φ1×R0.2×8	0.8	50	G-152
DHR237R	φ1×R0.2×8	2	50	K-017
MHRH430R	φ1×R0.2×10	0.8	50	F-080
MHR230R	φ1×R0.2×10	0.8	50	G-142
MHR430R	φ1×R0.2×10	0.8	50	G-152
MSTNR230	φ1×R0.2×10	0.8	60	G-160

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
DHR237R	φ1×R0.2×10	2	50	K-017
MHR230R	φ1×R0.2×12	0.8	50	G-142
MHR430R	φ1×R0.2×12	0.8	50	G-152
MSTNR230	φ1×R0.2×15	0.8	60	G-160
MHR230R	φ1×R0.2×16	0.8	60	G-142
MHR230R	φ1×R0.2×20	0.8	60	G-142
MSTNR230	φ1×R0.2×20	0.8	60	G-160
MSTNR230	φ1×R0.2×25	0.8	70	G-160
MSTNR230	φ1×R0.2×30	0.8	80	G-160
MSTNR230	φ1×R0.2×35	0.8	80	G-160
MSRS230	φ1×R0.3	2	60	G-080
MSRS430	φ1×R0.3	2	60	G-082
SSR200	φ1×R0.3×1	0.7	49	B-030
SSR200	φ1×R0.3×2	0.7	50	B-030
MHRSH430RSF	φ1×R0.3×2	0.8	35	E-020
MHRH430R	φ1×R0.3×2	0.8	50	F-080
MHR230R	φ1×R0.3×2	0.8	50	G-142
SSR200	φ1×R0.3×3	0.7	50	B-030
MHRSH430RSF	φ1×R0.3×3	0.8	35	E-020
MHRH430R	φ1×R0.3×3	0.8	50	F-080
MHR230R	φ1×R0.3×3	0.8	50	G-142
MHR430R	φ1×R0.3×3	0.8	50	G-152
MHRSH430RSF	φ1×R0.3×4	0.8	35	E-020
MHRH430R	φ1×R0.3×4	0.8	50	F-080
MHR230R	φ1×R0.3×4	0.8	50	G-142
MHR430R	φ1×R0.3×4	0.8	50	G-152
SSR200	φ1×R0.3×5	0.7	53	B-030
MHRSH430RSF	φ1×R0.3×5	0.8	40	E-020
MHRH430R	φ1×R0.3×5	0.8	50	F-080
MHR230R	φ1×R0.3×5	0.8	50	G-142
MHR430R	φ1×R0.3×5	0.8	50	G-152
MHRH430R	φ1×R0.3×6	0.8	50	F-080
MHR230R	φ1×R0.3×6	0.8	50	G-142
MHR430R	φ1×R0.3×6	0.8	50	G-152
MSTNR230	φ1×R0.3×6	0.8	50	G-160
MHRH430R	φ1×R0.3×8	0.8	50	F-080
MHR230R	φ1×R0.3×8	0.8	50	G-142
MHR430R	φ1×R0.3×8	0.8	50	G-152
MHRH430R	φ1×R0.3×10	0.8	50	F-080
MHR230R	φ1×R0.3×10	0.8	50	G-142
MHR430R	φ1×R0.3×10	0.8	50	G-152
MSTNR230	φ1×R0.3×10	0.8	60	G-160
MHR230R	φ1×R0.3×12	0.8	50	G-142
MHR430R	φ1×R0.3×12	0.8	50	G-152
MSTNR230	φ1×R0.3×15	0.8	60	G-160
MHR230R	φ1×R0.3×16	0.8	60	G-142
MHR230R	φ1×R0.3×20	0.8	60	G-142
MSTNR230	φ1×R0.3×20	0.8	60	G-160
MSTNR230	φ1×R0.3×25	0.8	70	G-160
MSTNR230	φ1×R0.3×30	0.8	80	G-160
MSTNR230	φ1×R0.3×35	0.8	80	G-160

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
φ1.2				
MHRH430R	φ1.2×R0.1×5	1	50	F-080
MHR430R	φ1.2×R0.1×5	1	50	G-152
MHR230R	φ1.2×R0.1×5	1	50	G-142
MHR230R	φ1.2×R0.1×6	1	50	G-142
MHR230R	φ1.2×R0.1×8	1	50	G-142
MHRH430R	φ1.2×R0.1×10	1	50	F-080
MHR230R	φ1.2×R0.1×10	1	50	G-142
MHR430R	φ1.2×R0.1×10	1	50	G-152
MHR230R	φ1.2×R0.1×12	1	50	G-142
MHR230R	φ1.2×R0.1×15	1	60	G-142
MHR430R	φ1.2×R0.1×15	1	60	G-152
MHR230R	φ1.2×R0.1×16	1	60	G-142
MHR230R	φ1.2×R0.1×20	1	60	G-142
MHRH430R	φ1.2×R0.2×5	1	50	F-080
MHR230R	φ1.2×R0.2×5	1	50	G-142
MHR430R	φ1.2×R0.2×5	1	50	G-153
MHR230R	φ1.2×R0.2×6	1	50	G-143
MHR230R	φ1.2×R0.2×8	1	50	G-143
MHRH430R	φ1.2×R0.2×10	1	50	F-080
MHR230R	φ1.2×R0.2×10	1	50	G-143
MHR430R	φ1.2×R0.2×10	1	50	G-153
MHR230R	φ1.2×R0.2×12	1	50	G-143
MHR430R	φ1.2×R0.2×15	1	60	G-153
MHR230R	φ1.2×R0.2×15	1	60	G-143
MHR230R	φ1.2×R0.2×16	1	60	G-143
MHR230R	φ1.2×R0.2×20	1	60	G-143
MHRH430R	φ1.2×R0.3×5	1	50	F-080
MHR430R	φ1.2×R0.3×5	1	50	G-153
MHR230R	φ1.2×R0.3×5	1	50	G-143
MHR230R	φ1.2×R0.3×6	1	50	G-143
MHR230R	φ1.2×R0.3×8	1	50	G-143
MHRH430R	φ1.2×R0.3×10	1	50	F-080
MHR230R	φ1.2×R0.3×10	1	50	G-143
MHR430R	φ1.2×R0.3×10	1	50	G-153
MHR230R	φ1.2×R0.3×12	1	50	G-143
MHR430R	φ1.2×R0.3×15	1	60	G-153
MHR230R	φ1.2×R0.3×15	1	60	G-143
MHR230R	φ1.2×R0.3×16	1	60	G-143
MHR230R	φ1.2×R0.3×20	1	60	G-143
φ1.5				
SSR200	φ1.5×R0.02×2	1	52	B-030
SHPR400	φ1.5×R0.02×2	1	52	B-038
SSR200	φ1.5×R0.02×3	1	52	B-030
SHPR400	φ1.5×R0.02×3	1	52	B-038
MHRSH430RSF	φ1.5×R0.02×3	1.2	35	E-020
MHRH430R	φ1.5×R0.02×3	1.2	50	F-081
MHRSH430RSF	φ1.5×R0.02×4	1.2	35	E-020
MHRH430R	φ1.5×R0.02×4	1.2	50	F-081
SSR200	φ1.5×R0.02×4.5	1	52	B-030
SHPR400	φ1.5×R0.02×4.5	1	52	B-038

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRSH430RSF	φ1.5×R0.02×6	1.2	40	E-020
MHRH430R	φ1.5×R0.02×6	1.2	50	F-081
SSR200	φ1.5×R0.02×7.5	1	52	B-030
SHPR400	φ1.5×R0.02×7.5	1	52	B-038
MHRSH430RSF	φ1.5×R0.02×8	1.2	40	E-020
MHRH430R	φ1.5×R0.02×8	1.2	50	F-081
MHRH430R	φ1.5×R0.02×12	1.2	50	F-081
MHRH430R	φ1.5×R0.02×15	1.2	50	F-081
SSR200	φ1.5×R0.03×2	1	52	B-030
SSR200	φ1.5×R0.03×3	1	52	B-030
SSR200	φ1.5×R0.03×4.5	1	52	B-030
SSR200	φ1.5×R0.03×7.5	1	52	B-030
SSR200	φ1.5×R0.05×2	1	52	B-030
SHPR400	φ1.5×R0.05×2	1	52	B-038
SSR200	φ1.5×R0.05×3	1	52	B-030
SHPR400	φ1.5×R0.05×3	1	52	B-038
MHRSH430RSF	φ1.5×R0.05×3	1.2	35	E-020
MHRH430R	φ1.5×R0.05×3	1.2	50	F-081
MHRSH430RSF	φ1.5×R0.05×4	1.2	35	E-020
MHRH430R	φ1.5×R0.05×4	1.2	50	F-081
SSR200	φ1.5×R0.05×4.5	1	52	B-030
SHPR400	φ1.5×R0.05×4.5	1	52	B-038
MHRSH430RSF	φ1.5×R0.05×6	1.2	40	E-020
MHRH430R	φ1.5×R0.05×6	1.2	50	F-081
SSR200	φ1.5×R0.05×7.5	1	52	B-030
SHPR400	φ1.5×R0.05×7.5	1	52	B-038
MHRSH430RSF	φ1.5×R0.05×8	1.2	40	E-020
MHRH430R	φ1.5×R0.05×8	1.2	50	F-081
MHRH430R	φ1.5×R0.05×12	1.2	50	F-081
MHRH430R	φ1.5×R0.05×15	1.2	50	F-081
MSRS230	φ1.5×R0.1	3	60	G-080
MSRS430	φ1.5×R0.1	3	60	G-082
SSR200	φ1.5×R0.1×2	1	52	B-030
SHPR400	φ1.5×R0.1×2	1	52	B-038
SSR200	φ1.5×R0.1×3	1	52	B-030
SHPR400	φ1.5×R0.1×3	1	52	B-038
MHRSH430RSF	φ1.5×R0.1×3	1.2	35	E-020
MHRH430R	φ1.5×R0.1×3	1.2	50	F-081
SSF120	φ1.5×R0.1×3.8	0.75	52	B-042
MHRSH430RSF	φ1.5×R0.1×4	1.2	35	E-020
MHRH430R	φ1.5×R0.1×4	1.2	50	F-081
MHR230R	φ1.5×R0.1×4	1.2	50	G-143
SHR320	φ1.5×R0.1×4.5	0.75	52	B-034
SSR200	φ1.5×R0.1×4.5	1	52	B-030
SHPR400	φ1.5×R0.1×4.5	1	52	B-038
DHR237R	φ1.5×R0.1×5	3	45	K-018
MHRSH430RSF	φ1.5×R0.1×6	1.2	40	E-020
MHRH430R	φ1.5×R0.1×6	1.2	50	F-081
MHR230R	φ1.5×R0.1×6	1.2	50	G-143
MHR430R	φ1.5×R0.1×6	1.2	50	G-153
SHR320	φ1.5×R0.1×7.5	0.75	52	B-034

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SSR200	φ1.5×R0.1×7.5	1	52	B-030
SHPR400	φ1.5×R0.1×7.5	1	52	B-038
MHRSH430RSF	φ1.5×R0.1×8	1.2	40	E-020
MHRH430R	φ1.5×R0.1×8	1.2	50	F-081
MHR230R	φ1.5×R0.1×8	1.2	50	G-143
MHR230R	φ1.5×R0.1×10	1.2	50	G-143
MSTNR230	φ1.5×R0.1×10	1.2	60	G-160
DHR237R	φ1.5×R0.1×10	3	50	K-018
MHRH430R	φ1.5×R0.1×12	1.2	50	F-081
MHR230R	φ1.5×R0.1×12	1.2	50	G-143
MHR430R	φ1.5×R0.1×12	1.2	50	G-153
MHRH430R	φ1.5×R0.1×15	1.2	60	F-081
MSTNR230	φ1.5×R0.1×15	1.2	60	G-160
DHR237R	φ1.5×R0.1×15	3	50	K-018
MHR230R	φ1.5×R0.1×16	1.2	60	G-143
MHR230R	φ1.5×R0.1×18	1.2	60	G-143
MHR430R	φ1.5×R0.1×18	1.2	60	G-153
MHR230R	φ1.5×R0.1×20	1.2	60	G-143
MSTNR230	φ1.5×R0.1×20	1.2	60	G-160
MSTNR230	φ1.5×R0.1×25	1.2	70	G-160
MSTNR230	φ1.5×R0.1×30	1.2	80	G-160
MSRS230	φ1.5×R0.2	3	60	G-080
MSRS430	φ1.5×R0.2	3	60	G-082
SSR200	φ1.5×R0.2×2	1	52	B-031
SHPR400	φ1.5×R0.2×2	1	52	B-038
SSR200	φ1.5×R0.2×3	1	52	B-031
SHPR400	φ1.5×R0.2×3	1	52	B-038
MHRSH430RSF	φ1.5×R0.2×3	1.2	35	E-020
MHRH430R	φ1.5×R0.2×3	1.2	50	F-081
MHRSH430RSF	φ1.5×R0.2×4	1.2	35	E-020
MHRH430R	φ1.5×R0.2×4	1.2	50	F-081
MHR230R	φ1.5×R0.2×4	1.2	50	G-143
SHR320	φ1.5×R0.2×4.5	0.75	52	B-034
SSR200	φ1.5×R0.2×4.5	1	52	B-031
SHPR400	φ1.5×R0.2×4.5	1	52	B-038
DHR237R	φ1.5×R0.2×5	3	45	K-018
MHRSH430RSF	φ1.5×R0.2×6	1.2	40	E-020
MHRH430R	φ1.5×R0.2×6	1.2	50	F-081
MHR230R	φ1.5×R0.2×6	1.2	50	G-143
MHR430R	φ1.5×R0.2×6	1.2	50	G-153
SHR320	φ1.5×R0.2×7.5	0.75	52	B-034
SSR200	φ1.5×R0.2×7.5	1	52	B-031
SHPR400	φ1.5×R0.2×7.5	1	52	B-038
MHRSH430RSF	φ1.5×R0.2×8	1.2	40	E-020
MHRH430R	φ1.5×R0.2×8	1.2	50	F-081
MHR230R	φ1.5×R0.2×8	1.2	50	G-143
MHR230R	φ1.5×R0.2×10	1.2	50	G-143
MSTNR230	φ1.5×R0.2×10	1.2	60	G-161
DHR237R	φ1.5×R0.2×10	3	50	K-018
MHRH430R	φ1.5×R0.2×12	1.2	50	F-081
MHR230R	φ1.5×R0.2×12	1.2	50	G-143

Search from Radius Dia. &Corner R

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR430R	φ1.5×R0.2×12	1.2	50	G-153
MSTNR230	φ1.5×R0.2×15	1.2	60	G-161
MHRH430R	φ1.5×R0.2×15	1.2	60	F-081
DHR237R	φ1.5×R0.2×15	3	50	K-018
MHR230R	φ1.5×R0.2×16	1.2	60	G-143
MHR230R	φ1.5×R0.2×18	1.2	60	G-143,G-144
MHR430R	φ1.5×R0.2×18	1.2	60	G-153
MSTNR230	φ1.5×R0.2×20	1.2	60	G-161
MHR230R	φ1.5×R0.2×20	1.2	60	G-144
MSTNR230	φ1.5×R0.2×25	1.2	70	G-161
MSTNR230	φ1.5×R0.2×30	1.2	80	G-161
MSRS230	φ1.5×R0.3	3	60	G-080
MSRS430	φ1.5×R0.3	3	60	G-082
SSR200	φ1.5×R0.3×2	1	52	B-031
SSR200	φ1.5×R0.3×3	1	52	B-031
MHRSH430RSF	φ1.5×R0.3×3	1.2	35	E-020
MHRH430R	φ1.5×R0.3×3	1.2	50	F-081
MHRSH430RSF	φ1.5×R0.3×4	1.2	35	E-020
MHRH430R	φ1.5×R0.3×4	1.2	50	F-081
MHR230R	φ1.5×R0.3×4	1.2	50	G-144
SSR200	φ1.5×R0.3×4.5	1	52	B-031
DHR237R	φ1.5×R0.3×5	3	45	K-018
MHRSH430RSF	φ1.5×R0.3×6	1.2	40	E-020
MHRH430R	φ1.5×R0.3×6	1.2	50	F-081
MHR230R	φ1.5×R0.3×6	1.2	50	G-144
MHR430R	φ1.5×R0.3×6	1.2	50	G-153
SSR200	φ1.5×R0.3×7.5	1	52	B-031
MHRSH430RSF	φ1.5×R0.3×8	1.2	40	E-020
MHRH430R	φ1.5×R0.3×8	1.2	50	F-081
MHR230R	φ1.5×R0.3×8	1.2	50	G-144
MHR230R	φ1.5×R0.3×10	1.2	50	G-144
MSTNR230	φ1.5×R0.3×10	1.2	60	G-161
DHR237R	φ1.5×R0.3×10	3	50	K-018
MHRH430R	φ1.5×R0.3×12	1.2	50	F-081
MHR230R	φ1.5×R0.3×12	1.2	50	G-144
MHR430R	φ1.5×R0.3×12	1.2	50	G-153
MSTNR230	φ1.5×R0.3×15	1.2	60	G-161
MHRH430R	φ1.5×R0.3×15	1.2	60	F-081
DHR237R	φ1.5×R0.3×15	3	50	K-018
MHR230R	φ1.5×R0.3×16	1.2	60	G-144
MHR230R	φ1.5×R0.3×18	1.2	60	G-144
MHR430R	φ1.5×R0.3×18	1.2	60	G-153
MHR230R	φ1.5×R0.3×20	1.2	60	G-144
MSTNR230	φ1.5×R0.3×20	1.2	60	G-161
MSTNR230	φ1.5×R0.3×25	1.2	70	G-161
MSTNR230	φ1.5×R0.3×30	1.2	80	G-161
MSRS230	φ1.5×R0.5	3	60	G-080
MSRS430	φ1.5×R0.5	3	60	G-082
MHRSH430RSF	φ1.5×R0.5×3	1.2	35	E-020
MHRH430R	φ1.5×R0.5×3	1.2	50	F-081
MHRSH430RSF	φ1.5×R0.5×4	1.2	35	E-020

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH430R	φ1.5×R0.5×4	1.2	50	F-081
MHR230R	φ1.5×R0.5×4	1.2	50	G-144
DHR237R	φ1.5×R0.5×5	3	45	K-018
MHRSH430RSF	φ1.5×R0.5×6	1.2	40	E-020
MHRH430R	φ1.5×R0.5×6	1.2	50	F-081
MHR230R	φ1.5×R0.5×6	1.2	50	G-144
MHR430R	φ1.5×R0.5×6	1.2	50	G-153
MHRSH430RSF	φ1.5×R0.5×8	1.2	40	E-020
MHRH430R	φ1.5×R0.5×8	1.2	50	F-081
MHR230R	φ1.5×R0.5×8	1.2	50	G-144
MHR230R	φ1.5×R0.5×10	1.2	50	G-144
DHR237R	φ1.5×R0.5×10	3	50	K-018
MHRH430R	φ1.5×R0.5×12	1.2	50	F-081
MHR230R	φ1.5×R0.5×12	1.2	50	G-144
MHR430R	φ1.5×R0.5×12	1.2	50	G-153
MHRH430R	φ1.5×R0.5×15	1.2	60	F-081
DHR237R	φ1.5×R0.5×15	3	50	K-018
MHR230R	φ1.5×R0.5×16	1.2	60	G-144
MHR230R	φ1.5×R0.5×18	1.2	60	G-144
MHR430R	φ1.5×R0.5×18	1.2	60	G-153
MHR230R	φ1.5×R0.5×20	1.2	60	G-144
DHR237R	φ1.5×R0.5×20	3	60	K-018
φ2				
SSR200	φ2×R0.02×3	1.2	53	B-031
SHPR400	φ2×R0.02×3	1.2	53	B-038
SSR200	φ2×R0.02×4	1.2	53	B-031
SHPR400	φ2×R0.02×4	1.2	53	B-038
MHRSH430RSF	φ2×R0.02×4	1.6	35	E-020
MHRH430R	φ2×R0.02×4	1.6	50	F-081
SSR200	φ2×R0.02×6	1.2	53	B-031
SHPR400	φ2×R0.02×6	1.2	53	B-038
MHRSH430RSF	φ2×R0.02×6	1.6	35	E-020
MHRH430R	φ2×R0.02×6	1.6	50	F-081
MHRSH430RSF	φ2×R0.02×8	1.6	40	E-020
MHRH430R	φ2×R0.02×8	1.6	50	F-081
SSR200	φ2×R0.02×10	1.2	53	B-031
SHPR400	φ2×R0.02×10	1.2	53	B-038
MHRSH430RSF	φ2×R0.02×10	1.6	40	E-020
MHRH430R	φ2×R0.02×12	1.6	50	F-081
MHRH430R	φ2×R0.02×16	1.6	60	F-081
MHRH430R	φ2×R0.02×20	1.6	60	F-081
SSR200	φ2×R0.03×3	1.2	53	B-031
SSR200	φ2×R0.03×4	1.2	53	B-031
SSR200	φ2×R0.03×6	1.2	53	B-031
SSR200	φ2×R0.03×10	1.2	53	B-031
SSR200	φ2×R0.05×3	1.2	53	B-031
SHPR400	φ2×R0.05×3	1.2	53	B-038
SSR200	φ2×R0.05×4	1.2	53	B-031
SHPR400	φ2×R0.05×4	1.2	53	B-038
MHRSH430RSF	φ2×R0.05×4	1.6	35	E-020
MHRH430R	φ2×R0.05×4	1.6	50	F-081

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SSR200	φ2×R0.05×6	1.2	53	B-031
SHPR400	φ2×R0.05×6	1.2	53	B-038
MHRSH430RSF	φ2×R0.05×6	1.6	35	E-020
MHRH430R	φ2×R0.05×6	1.6	50	F-081
MHRSH430RSF	φ2×R0.05×8	1.6	40	E-020
MHRH430R	φ2×R0.05×8	1.6	50	F-081
SSR200	φ2×R0.05×10	1.2	53	B-031
SHPR400	φ2×R0.05×10	1.2	53	B-038
MHRSH430RSF	φ2×R0.05×10	1.6	40	E-020
MHRH430R	φ2×R0.05×12	1.6	50	F-081
MHRH430R	φ2×R0.05×16	1.6	60	F-081
MHRH430R	φ2×R0.05×20	1.6	60	F-081
MSRS230	φ2×R0.1	4	60	G-080
MSRS430	φ2×R0.1	4	60	G-082
SSR200	φ2×R0.1×3	1.2	53	B-031
SHPR400	φ2×R0.1×3	1.2	53	B-038
SSR200	φ2×R0.1×4	1.2	53	B-031
SHPR400	φ2×R0.1×4	1.2	53	B-038
MHRSH430RSF	φ2×R0.1×4	1.6	35	E-020
MHRH430R	φ2×R0.1×4	1.6	50	F-081
MHR230R	φ2×R0.1×4	1.6	50	G-144
SSF120	φ2×R0.1×5	1	52	B-042
DHR237R	φ2×R0.1×5	4	45	K-018
SHR320	φ2×R0.1×6	1	52	B-034
SSR200	φ2×R0.1×6	1.2	52	B-031
SHPR400	φ2×R0.1×6	1.2	53	B-038
MHRSH430RSF	φ2×R0.1×6	1.6	35	E-020
MHRH430R	φ2×R0.1×6	1.6	50	F-081
MHR230R	φ2×R0.1×6	1.6	50	G-144
MHRSH430RSF	φ2×R0.1×8	1.6	40	E-020
MHRH430R	φ2×R0.1×8	1.6	50	F-081
MHR230R	φ2×R0.1×8	1.6	50	G-144
MHR430R	φ2×R0.1×8	1.6	50	G-153
DHR237R	φ2×R0.1×8	4	50	K-018
SHR320	φ2×R0.1×10	1	52	B-034
SSR200	φ2×R0.1×10	1.2	52	B-031
SHPR400	φ2×R0.1×10	1.2	53	B-038
MHRSH430RSF	φ2×R0.1×10	1.6	40	E-020
MHR230R	φ2×R0.1×10	1.6	50	G-144
DHR237R	φ2×R0.1×10	4	50	K-018
MHRH430R	φ2×R0.1×12	1.6	50	F-081
MHR230R	φ2×R0.1×12	1.6	50	G-144
MHR430R	φ2×R0.1×12	1.6	50	G-153
MSTNR230	φ2×R0.1×15	1.6	60	G-161
DHR237R	φ2×R0.1×15	4	50	K-018
MHRH430R	φ2×R0.1×16	1.6	60	F-081
MHR230R	φ2×R0.1×16	1.6	60	G-144
MHR430R	φ2×R0.1×16	1.6	60	G-153
MHRH430R	φ2×R0.1×20	1.6	60	F-081
MHR230R	φ2×R0.1×20	1.6	60	G-144
MHR430R	φ2×R0.1×20	1.6	60	G-153

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MSTNR230	φ2×R0.1×20	1.6	60	G-161
DHR237R	φ2×R0.1×20	4	60	K-018
MHR230R	φ2×R0.1×24	1.6	70	G-144
MHR430R	φ2×R0.1×24	1.6	70	G-153
MSTNR230	φ2×R0.1×25	1.6	70	G-161
MHR230R	φ2×R0.1×26	1.6	70	G-145
MHR230R	φ2×R0.1×30	1.6	70	G-145
MSTNR230	φ2×R0.1×30	1.6	80	G-161
MSTNR230	φ2×R0.1×40	1.6	80	G-161
MSTNR230	φ2×R0.1×50	1.6	100	G-161
MSRS230	φ2×R0.2	4	60	G-080
MSRS430	φ2×R0.2	4	60	G-082
SSR200	φ2×R0.2×3	1.2	53	B-031
SHPR400	φ2×R0.2×3	1.2	53	B-038
SSR200	φ2×R0.2×4	1.2	53	B-031
SHPR400	φ2×R0.2×4	1.2	53	B-038
MHRSH430RSF	φ2×R0.2×4	1.6	35	E-020
MHRH430R	φ2×R0.2×4	1.6	50	F-081
MHR230R	φ2×R0.2×4	1.6	50	G-145
DHR237R	φ2×R0.2×5	4	45	K-018
SSR200	φ2×R0.2×6	1.2	52	B-031
SHPR400	φ2×R0.2×6	1.2	53	B-038
MHRSH430RSF	φ2×R0.2×6	1.6	35	E-020
MHRH430R	φ2×R0.2×6	1.6	50	F-081
MHR230R	φ2×R0.2×6	1.6	50	G-145
MHRSH430RSF	φ2×R0.2×8	1.6	40	E-020
MHRH430R	φ2×R0.2×8	1.6	50	F-081
MHR230R	φ2×R0.2×8	1.6	50	G-145
MHR430R	φ2×R0.2×8	1.6	50	G-153
DHR237R	φ2×R0.2×8	4	50	K-018
SSR200	φ2×R0.2×10	1.2	52	B-031
SHPR400	φ2×R0.2×10	1.2	53	B-038
MHRSH430RSF	φ2×R0.2×10	1.6	40	E-020
MHR230R	φ2×R0.2×10	1.6	50	G-145
DHR237R	φ2×R0.2×10	4	50	K-018
MHRH430R	φ2×R0.2×12	1.6	50	F-081
MHR230R	φ2×R0.2×12	1.6	50	G-145
MHR430R	φ2×R0.2×12	1.6	50	G-153
MSTNR230	φ2×R0.2×15	1.6	60	G-161
DHR237R	φ2×R0.2×15	4	50	K-018
MHRH430R	φ2×R0.2×16	1.6	60	F-081
MHR230R	φ2×R0.2×16	1.6	60	G-145
MHR430R	φ2×R0.2×16	1.6	60	G-153
MHRH430R	φ2×R0.2×20	1.6	60	F-081
MHR230R	φ2×R0.2×20	1.6	60	G-145
MHR430R	φ2×R0.2×20	1.6	60	G-153
MSTNR230	φ2×R0.2×20	1.6	60	G-161
DHR237R	φ2×R0.2×20	4	60	K-018
MHR230R	φ2×R0.2×24	1.6	70	G-145
MHR430R	φ2×R0.2×24	1.6	70	G-153
MSTNR230	φ2×R0.2×25	1.6	70	G-161

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230R	φ2×R0.2×26	1.6	70	G-145
MHR230R	φ2×R0.2×30	1.6	70	G-145
MSTNR230	φ2×R0.2×30	1.6	80	G-161
MSTNR230	φ2×R0.2×40	1.6	80	G-161
MSTNR230	φ2×R0.2×50	1.6	100	G-161
MSRS230	φ2×R0.3	4	60	G-080
MSRS430	φ2×R0.3	4	60	G-082
SSR200	φ2×R0.3×3	1.2	53	B-031
SSR200	φ2×R0.3×4	1.2	53	B-031
MHRSH430RSF	φ2×R0.3×4	1.6	35	E-020
MHRH430R	φ2×R0.3×4	1.6	50	F-081
MHR230R	φ2×R0.3×4	1.6	50	G-145
DHR237R	φ2×R0.3×5	4	45	K-018
SHR320	φ2×R0.3×6	1	52	B-034
SSR200	φ2×R0.3×6	1.2	52	B-031
MHRSH430RSF	φ2×R0.3×6	1.6	35	E-020
MHRH430R	φ2×R0.3×6	1.6	50	F-081
MHR230R	φ2×R0.3×6	1.6	50	G-145
MHRSH430RSF	φ2×R0.3×8	1.6	40	E-020
MHRH430R	φ2×R0.3×8	1.6	50	F-081
MHR230R	φ2×R0.3×8	1.6	50	G-145
MHR430R	φ2×R0.3×8	1.6	50	G-153
DHR237R	φ2×R0.3×8	4	50	K-018
SHR320	φ2×R0.3×10	1	52	B-034
SSR200	φ2×R0.3×10	1.2	52	B-031
MHRSH430RSF	φ2×R0.3×10	1.6	40	E-020
MHR230R	φ2×R0.3×10	1.6	50	G-145
DHR237R	φ2×R0.3×10	4	50	K-018
MHRH430R	φ2×R0.3×12	1.6	50	F-081
MHR230R	φ2×R0.3×12	1.6	50	G-145
MHR430R	φ2×R0.3×12	1.6	50	G-153
MSTNR230	φ2×R0.3×15	1.6	60	G-161
DHR237R	φ2×R0.3×15	4	50	K-018
MHRH430R	φ2×R0.3×16	1.6	60	F-081
MHR230R	φ2×R0.3×16	1.6	60	G-145
MHR430R	φ2×R0.3×16	1.6	60	G-153
MHRH430R	φ2×R0.3×20	1.6	60	F-081
MHR230R	φ2×R0.3×20	1.6	60	G-145
MHR430R	φ2×R0.3×20	1.6	60	G-153
MSTNR230	φ2×R0.3×20	1.6	60	G-161
DHR237R	φ2×R0.3×20	4	60	K-018
MHR230R	φ2×R0.3×24	1.6	70	G-145
MHR430R	φ2×R0.3×24	1.6	70	G-153
MSTNR230	φ2×R0.3×25	1.6	70	G-161
MHR230R	φ2×R0.3×26	1.6	70	G-145
MHR230R	φ2×R0.3×30	1.6	70	G-145
MSTNR230	φ2×R0.3×30	1.6	80	G-161
MSTNR230	φ2×R0.3×40	1.6	80	G-161
MSTNR230	φ2×R0.3×50	1.6	100	G-161
MSRS230	φ2×R0.5	4	60	G-080
MSRS430	φ2×R0.5	4	60	G-082

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SSR200	φ2×R0.5×3	1.2	53	B-031
SSR200	φ2×R0.5×4	1.2	53	B-031
MHRSH430RSF	φ2×R0.5×4	1.6	35	E-020
MHRH430R	φ2×R0.5×4	1.6	50	F-081
MHR230R	φ2×R0.5×4	1.6	50	G-145
DHR237R	φ2×R0.5×5	4	45	K-018
SSR200	φ2×R0.5×6	1.2	52	B-031
MHRSH430RSF	φ2×R0.5×6	1.6	35	E-020
MHRH430R	φ2×R0.5×6	1.6	50	F-081
MHR230R	φ2×R0.5×6	1.6	50	G-145
MHRSH430RSF	φ2×R0.5×8	1.6	40	E-020
MHRH430R	φ2×R0.5×8	1.6	50	F-081
MHR230R	φ2×R0.5×8	1.6	50	G-145
MHR430R	φ2×R0.5×8	1.6	50	G-153
DHR237R	φ2×R0.5×8	4	50	K-018
SSR200	φ2×R0.5×10	1.2	52	B-031
MHRSH430RSF	φ2×R0.5×10	1.6	40	E-020
MHR230R	φ2×R0.5×10	1.6	50	G-145
DHR237R	φ2×R0.5×10	4	50	K-018
MHRH430R	φ2×R0.5×12	1.6	50	F-081
MHR230R	φ2×R0.5×12	1.6	50	G-146
MHR430R	φ2×R0.5×12	1.6	50	G-153
MSTNR230	φ2×R0.5×15	1.6	60	G-162
DHR237R	φ2×R0.5×15	4	50	K-018
MHRH430R	φ2×R0.5×16	1.6	60	F-081
MHR230R	φ2×R0.5×16	1.6	60	G-146
MHR430R	φ2×R0.5×16	1.6	60	G-153
MHRH430R	φ2×R0.5×20	1.6	60	F-081
MHR230R	φ2×R0.5×20	1.6	60	G-146
MHR430R	φ2×R0.5×20	1.6	60	G-153
MSTNR230	φ2×R0.5×20	1.6	60	G-162
DHR237R	φ2×R0.5×20	4	60	K-018
MHR230R	φ2×R0.5×24	1.6	70	G-146
MHR430R	φ2×R0.5×24	1.6	70	G-153
MSTNR230	φ2×R0.5×25	1.6	70	G-162
MHR230R	φ2×R0.5×26	1.6	70	G-146
MHR230R	φ2×R0.5×30	1.6	70	G-146
MSTNR230	φ2×R0.5×30	1.6	80	G-162
MSTNR230	φ2×R0.5×40	1.6	80	G-162
MSTNR230	φ2×R0.5×50	1.6	100	G-162
φ2.5				
MSRS230	φ2.5×R0.1	5	60	G-080
MSRS430	φ2.5×R0.1	5	60	G-082
MHRH430R	φ2.5×R0.1×10	2	50	F-082
MHR230R	φ2.5×R0.1×10	2	50	G-146
MHR430R	φ2.5×R0.1×10	2	50	G-154
MHRH430R	φ2.5×R0.1×20	2	60	F-082
MHR230R	φ2.5×R0.1×20	2	60	G-146
MHR430R	φ2.5×R0.1×20	2	60	G-154
MHRH430R	φ2.5×R0.1×30	2	70	F-082
MHR230R	φ2.5×R0.1×30	2	70	G-146

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR430R	φ2.5×R0.1×30	2	70	G-154
MSRS230	φ2.5×R0.2	5	60	G-080
MSRS430	φ2.5×R0.2	5	60	G-082
DHR237R	φ2.5×R0.2×8	5	50	K-018
MHRH430R	φ2.5×R0.2×10	2	50	F-082
MHR230R	φ2.5×R0.2×10	2	50	G-146
MHR430R	φ2.5×R0.2×10	2	50	G-154
DHR237R	φ2.5×R0.2×14	5	50	K-018
MHRH430R	φ2.5×R0.2×20	2	60	F-082
MHR230R	φ2.5×R0.2×20	2	60	G-146
MHR430R	φ2.5×R0.2×20	2	60	G-154
DHR237R	φ2.5×R0.2×20	5	60	K-018
MHRH430R	φ2.5×R0.2×30	2	70	F-082
MHR230R	φ2.5×R0.2×30	2	70	G-146
MHR430R	φ2.5×R0.2×30	2	70	G-154
MSRS230	φ2.5×R0.3	5	60	G-080
MSRS430	φ2.5×R0.3	5	60	G-082
MHRH430R	φ2.5×R0.3×10	2	50	F-082
MHR230R	φ2.5×R0.3×10	2	50	G-146
MHR430R	φ2.5×R0.3×10	2	50	G-154
MHRH430R	φ2.5×R0.3×20	2	60	F-082
MHR230R	φ2.5×R0.3×20	2	60	G-146
MHR430R	φ2.5×R0.3×20	2	60	G-154
MHRH430R	φ2.5×R0.3×30	2	70	F-082
MHR230R	φ2.5×R0.3×30	2	70	G-146
MHR430R	φ2.5×R0.3×30	2	70	G-154
MSRS230	φ2.5×R0.5	5	60	G-080
MSRS430	φ2.5×R0.5	5	60	G-082
DHR237R	φ2.5×R0.5×8	5	50	K-018
MHRH430R	φ2.5×R0.5×10	2	50	F-082
MHR230R	φ2.5×R0.5×10	2	50	G-146
MHR430R	φ2.5×R0.5×10	2	50	G-154
DHR237R	φ2.5×R0.5×14	5	50	K-018
MHRH430R	φ2.5×R0.5×20	2	60	F-082
MHR230R	φ2.5×R0.5×20	2	60	G-146
MHR430R	φ2.5×R0.5×20	2	60	G-154
DHR237R	φ2.5×R0.5×20	5	60	K-018
MHRH430R	φ2.5×R0.5×30	2	70	F-082
MHR230R	φ2.5×R0.5×30	2	70	G-146
MHR430R	φ2.5×R0.5×30	2	70	G-154
φ3				
MHRSH430RSF	φ3×R0.05×4	2.5	45	E-021
MHRH430R	φ3×R0.05×4	2.5	50	F-082
SHPR400	φ3×R0.05×6	1.8	53	B-038
MHRSH430RSF	φ3×R0.05×6	2.5	45	E-021
MHRH430R	φ3×R0.05×6	2.5	50	F-082
MHRSH430RSF	φ3×R0.05×8	2.5	45	E-021
MHRH430R	φ3×R0.05×8	2.5	50	F-082
SHPR400	φ3×R0.05×9	1.8	53	B-038
MHRSH430RSF	φ3×R0.05×10	2.5	50	E-021
SHPR400	φ3×R0.05×12	1.8	63	B-038

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRSH430RSF	φ3×R0.05×12	2.5	50	E-021
MHRH430R	φ3×R0.05×12	2.5	50	F-082
SHPR400	φ3×R0.05×15	1.8	63	B-038
MHRSH430RSF	φ3×R0.05×15	2.5	55	E-021
MHRH430R	φ3×R0.05×16	2.5	60	F-082
MHRH430R	φ3×R0.05×20	2.5	60	F-082
MSRS230	φ3×R0.1	6	60	G-080
MSRS430	φ3×R0.1	6	60	G-082
MHRSH430RSF	φ3×R0.1×4	2.5	45	E-021
MHRH430R	φ3×R0.1×4	2.5	50	F-082
SHPR400	φ3×R0.1×6	1.8	53	B-038
MHRSH430RSF	φ3×R0.1×6	2.5	45	E-021
MHRH430R	φ3×R0.1×6	2.5	50	F-082
MHRSH430RSF	φ3×R0.1×8	2.5	45	E-021
MHRH430R	φ3×R0.1×8	2.5	50	F-082
SHPR400	φ3×R0.1×9	1.8	53	B-038
MHRSH430RSF	φ3×R0.1×10	2.5	50	E-021
SHPR400	φ3×R0.1×12	1.8	63	B-038
MHRSH430RSF	φ3×R0.1×12	2.5	50	E-021
MHRH430R	φ3×R0.1×12	2.5	50	F-082
MHR430R	φ3×R0.1×12	2.5	50	G-154
MHR230R	φ3×R0.1×12	4.5	50	G-147
DHR237R	φ3×R0.1×12	6	50	K-019
SHPR400	φ3×R0.1×15	1.8	63	B-038
MHRSH430RSF	φ3×R0.1×15	2.5	55	E-021
MHRH430R	φ3×R0.1×16	2.5	60	F-082
MHR430R	φ3×R0.1×18	2.5	60	G-154
MHR230R	φ3×R0.1×18	4.5	60	G-147
DHR237R	φ3×R0.1×18	6	60	K-019
MHRH430R	φ3×R0.1×20	2.5	60	F-082
MHR430R	φ3×R0.1×24	2.5	70	G-154
MHR230R	φ3×R0.1×24	4.5	70	G-147
DHR237R	φ3×R0.1×24	6	70	K-019
MHRH430R	φ3×R0.1×25	2.5	70	F-082
MHRH430R	φ3×R0.1×30	2.5	70	F-082
MHR430R	φ3×R0.1×30	2.5	70	G-154
MHR230R	φ3×R0.1×30	4.5	70	G-147
MHR430R	φ3×R0.1×36	2.5	80	G-154
MHR230R	φ3×R0.1×36	4.5	80	G-147
MHDH445R	φ3×R0.2	6	60	F-034
MSRS230	φ3×R0.2	6	60	G-080
MSRS430	φ3×R0.2	6	60	G-082
MHRSH430RSF	φ3×R0.2×4	2.5	45	E-021
MHRH430R	φ3×R0.2×4	2.5	50	F-082
SHPR400	φ3×R0.2×6	1.8	53	B-038
MHRSH430RSF	φ3×R0.2×6	2.5	45	E-021
MHRH430R	φ3×R0.2×6	2.5	50	F-082
MHRSH430RSF	φ3×R0.2×8	2.5	45	E-021
MHRH430R	φ3×R0.2×8	2.5	50	F-082
SHPR400	φ3×R0.2×9	1.8	53	B-038
MHRSH430RSF	φ3×R0.2×10	2.5	50	E-021

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
SHPR400	φ3×R0.2×12	1.8	63	B-038
MHRSH430RSF	φ3×R0.2×12	2.5	50	E-021
MHRH430R	φ3×R0.2×12	2.5	50	F-082
MHR430R	φ3×R0.2×12	2.5	50	G-154
MHR230R	φ3×R0.2×12	4.5	50	G-147
DHR237R	φ3×R0.2×12	6	50	K-019
SHPR400	φ3×R0.2×15	1.8	63	B-038
MHRSH430RSF	φ3×R0.2×15	2.5	55	E-021
MSTNR230	φ3×R0.2×15	2.5	60	G-162
MHRH430R	φ3×R0.2×16	2.5	60	F-082
MHR430R	φ3×R0.2×18	2.5	60	G-154
MHR230R	φ3×R0.2×18	4.5	60	G-147
DHR237R	φ3×R0.2×18	6	60	K-019
MHRH430R	φ3×R0.2×20	2.5	60	F-082
MSTNR230	φ3×R0.2×20	2.5	60	G-162
MHR430R	φ3×R0.2×24	2.5	70	G-154
MHR230R	φ3×R0.2×24	4.5	70	G-147
DHR237R	φ3×R0.2×24	6	70	K-019
MHRH430R	φ3×R0.2×25	2.5	70	F-082
MHRH430R	φ3×R0.2×30	2.5	70	F-082
MHR430R	φ3×R0.2×30	2.5	70	G-154
MSTNR230	φ3×R0.2×30	2.5	80	G-162
MHR230R	φ3×R0.2×30	4.5	70	G-147
MHR430R	φ3×R0.2×36	2.5	80	G-154
MHR230R	φ3×R0.2×36	4.5	80	G-147
MSTNR230	φ3×R0.2×40	2.5	80	G-162
MSTNR230	φ3×R0.2×50	2.5	100	G-162
MSTNR230	φ3×R0.2×60	2.5	110	G-162
MHDH445R	φ3×R0.3	6	60	F-034
MSRS230	φ3×R0.3	6	60	G-080
MSRS430	φ3×R0.3	6	60	G-082
MSXH440R	φ3×R0.3	8	60	I-026
MHRSH430RSF	φ3×R0.3×4	2.5	45	E-021
MHRH430R	φ3×R0.3×4	2.5	50	F-082
MHRSH430RSF	φ3×R0.3×6	2.5	45	E-021
MHRH430R	φ3×R0.3×6	2.5	50	F-082
MHRSH430RSF	φ3×R0.3×8	2.5	45	E-021
MHRH430R	φ3×R0.3×8	2.5	50	F-082
MHRSH430RSF	φ3×R0.3×10	2.5	50	E-021
MHRSH430RSF	φ3×R0.3×12	2.5	50	E-021
MHRH430R	φ3×R0.3×12	2.5	50	F-082
MHR430R	φ3×R0.3×12	2.5	50	G-154
MHR230R	φ3×R0.3×12	4.5	50	G-147
DHR237R	φ3×R0.3×12	6	50	K-019
MHRSH430RSF	φ3×R0.3×15	2.5	55	E-021
MHRH430R	φ3×R0.3×16	2.5	60	F-082
MHR230R	φ3×R0.3×18	4.5	60	G-147
DHR237R	φ3×R0.3×18	6	60	K-019
MHRH430R	φ3×R0.3×20	2.5	60	F-082
MHR430R	φ3×R0.3×20	2.5	60	G-154
MHR430R	φ3×R0.3×24	2.5	70	G-154

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR230R	φ3×R0.3×24	4.5	70	G-147
DHR237R	φ3×R0.3×24	6	70	K-019
MHRH430R	φ3×R0.3×25	2.5	70	F-082
MHRH430R	φ3×R0.3×30	2.5	70	F-082
MHR430R	φ3×R0.3×30	2.5	70	G-154
MHR230R	φ3×R0.3×30	4.5	70	G-147
MHR430R	φ3×R0.3×36	2.5	80	G-154
MHR230R	φ3×R0.3×36	4.5	80	G-147
MHDH445R	φ3×R0.5	6	60	F-034
MSRS230	φ3×R0.5	6	60	G-080
MSRS430	φ3×R0.5	6	60	G-082
MSXH440R	φ3×R0.5	8	60	I-026
MHRSH430RSF	φ3×R0.5×4	2.5	45	E-021
MHRH430R	φ3×R0.5×4	2.5	50	F-082
MHRSH430RSF	φ3×R0.5×6	2.5	45	E-021
MHRH430R	φ3×R0.5×6	2.5	50	F-082
MHRSH430RSF	φ3×R0.5×8	2.5	45	E-021
MHRH430R	φ3×R0.5×8	2.5	50	F-082
MHRSH430RSF	φ3×R0.5×10	2.5	50	E-021
MHRSH430RSF	φ3×R0.5×12	2.5	50	E-021
MHRH430R	φ3×R0.5×12	2.5	50	F-082
MHR430R	φ3×R0.5×12	2.5	50	G-154
MHR230R	φ3×R0.5×12	4.5	50	G-147
DHR237R	φ3×R0.5×12	6	50	K-019
MHRSH430RSF	φ3×R0.5×15	2.5	55	E-021
MSTNR230	φ3×R0.5×15	2.5	60	G-162
DHR237R	φ3×R0.5×15	6	60	K-019
MHRH430R	φ3×R0.5×16	2.5	60	F-082
MHR230R	φ3×R0.5×18	4.5	60	G-147
DHR237R	φ3×R0.5×18	6	60	K-019
MHRH430R	φ3×R0.5×20	2.5	60	F-082
MHR430R	φ3×R0.5×20	2.5	60	G-154
MSTNR230	φ3×R0.5×20	2.5	60	G-162
MHR430R	φ3×R0.5×24	2.5	70	G-154
MHR230R	φ3×R0.5×24	4.5	70	G-147
DHR237R	φ3×R0.5×24	6	70	K-019
MHRH430R	φ3×R0.5×25	2.5	70	F-082
MHRH430R	φ3×R0.5×30	2.5	70	F-082
MHR430R	φ3×R0.5×30	2.5	70	G-154
MSTNR230	φ3×R0.5×30	2.5	80	G-162
MHR230R	φ3×R0.5×30	4.5	70	G-147
DHR237R	φ3×R0.5×30	6	70	K-019
MHR430R	φ3×R0.5×36	2.5	80	G-154
MHR230R	φ3×R0.5×36	4.5	80	G-147
MSTNR230	φ3×R0.5×40	2.5	80	G-162
MSTNR230	φ3×R0.5×50	2.5	100	G-162
MSTNR230	φ3×R0.5×60	2.5	110	G-162
MSRS230	φ3×R1	6	60	G-080
MSRS430	φ3×R1	6	60	G-082
MHRH430R	φ3×R1×8	2.5	50	F-082
MHRH430R	φ3×R1×12	2.5	50	F-082

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR430R	φ3×R1×12	2.5	50	G-154
MHR230R	φ3×R1×12	4.5	50	G-147
MHRH430R	φ3×R1×16	2.5	60	F-082
MHR230R	φ3×R1×18	4.5	60	G-147
MHRH430R	φ3×R1×20	2.5	60	F-082
MHR430R	φ3×R1×20	2.5	60	G-154
MHR430R	φ3×R1×24	2.5	70	G-154
MHR230R	φ3×R1×24	4.5	70	G-147
MHRH430R	φ3×R1×25	2.5	70	F-082
MHRH430R	φ3×R1×30	2.5	70	F-082
MHR430R	φ3×R1×30	2.5	70	G-154
MHR230R	φ3×R1×30	4.5	70	G-147
MHR430R	φ3×R1×36	2.5	80	G-154
MHR230R	φ3×R1×36	4.5	80	G-147
φ4				
MSRS230	φ4×R0.1	8	65	G-080
MSRS430	φ4×R0.1	8	65	G-082
MHRSH430RSF	φ4×R0.1×8	3.2	45	E-021
MHRH430R	φ4×R0.1×8	3.2	60	F-083
MHRSH430RSF	φ4×R0.1×12	3.2	50	E-021
MHRH430R	φ4×R0.1×12	3.2	60	F-083
MHRSH430RSF	φ4×R0.1×16	3.2	55	E-021
MHRH430R	φ4×R0.1×16	3.2	60	F-083
MHR430R	φ4×R0.1×16	3.2	60	G-155
MHR230R	φ4×R0.1×16	6	60	G-147
DHR237R	φ4×R0.1×16	8	60	K-019
MHRSH430RSF	φ4×R0.1×20	3.2	55	E-021
MHRH430R	φ4×R0.1×24	3.2	70	F-083
MHR430R	φ4×R0.1×24	3.2	70	G-155
MHR230R	φ4×R0.1×24	6	70	G-147
DHR237R	φ4×R0.1×24	8	60	K-019
MHRH430R	φ4×R0.1×32	3.2	70	F-083
MHR430R	φ4×R0.1×32	3.2	70	G-155
MHR230R	φ4×R0.1×32	6	70	G-147
DHR237R	φ4×R0.1×32	8	70	K-019
MHR430R	φ4×R0.1×48	3.2	100	G-155
MHR230R	φ4×R0.1×48	6	100	G-147
MHDH445R	φ4×R0.2	8	60	F-034
MSRS230	φ4×R0.2	8	65	G-080
MSRS430	φ4×R0.2	8	65	G-082
MHRSH430RSF	φ4×R0.2×8	3.2	45	E-021
MHRH430R	φ4×R0.2×8	3.2	60	F-083
MHRSH430RSF	φ4×R0.2×12	3.2	50	E-021
MHRH430R	φ4×R0.2×12	3.2	60	F-083
MHRSH430RSF	φ4×R0.2×16	3.2	55	E-021
MHRH430R	φ4×R0.2×16	3.2	60	F-083
MHR430R	φ4×R0.2×16	3.2	60	G-155
MHR230R	φ4×R0.2×16	6	60	G-147
DHR237R	φ4×R0.2×16	8	60	K-019
MHRSH430RSF	φ4×R0.2×20	3.2	55	E-021
MHRH430R	φ4×R0.2×24	3.2	70	F-083

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHR430R	φ4×R0.2×24	3.2	70	G-155
MHR230R	φ4×R0.2×24	6	70	G-147
DHR237R	φ4×R0.2×24	8	60	K-019
MHRH430R	φ4×R0.2×32	3.2	70	F-083
MHR430R	φ4×R0.2×32	3.2	70	G-155
MHR230R	φ4×R0.2×32	6	70	G-147
DHR237R	φ4×R0.2×32	8	70	K-019
MHR430R	φ4×R0.2×48	3.2	100	G-155
MHR230R	φ4×R0.2×48	6	100	G-147
MHDH445R	φ4×R0.3	8	60	F-034
MSRS230	φ4×R0.3	8	65	G-080
MSRS430	φ4×R0.3	8	65	G-082
MSXH440R	φ4×R0.3	11	60	I-026
MHRSH430RSF	φ4×R0.3×8	3.2	45	E-021
MHRH430R	φ4×R0.3×8	3.2	60	F-083
MHRSH430RSF	φ4×R0.3×12	3.2	50	E-021
MHRH430R	φ4×R0.3×12	3.2	60	F-083
MHRSH430RSF	φ4×R0.3×16	3.2	55	E-021
MHRH430R	φ4×R0.3×16	3.2	60	F-083
MHR430R	φ4×R0.3×16	3.2	60	G-155
MHR230R	φ4×R0.3×16	6	60	G-147
DHR237R	φ4×R0.3×16	8	60	K-019
MHRSH430RSF	φ4×R0.3×20	3.2	55	E-021
MHRH430R	φ4×R0.3×24	3.2	70	F-083
MHR430R	φ4×R0.3×24	3.2	70	G-155
MHR230R	φ4×R0.3×24	6	70	G-147
DHR237R	φ4×R0.3×24	8	60	K-019
MHRH430R	φ4×R0.3×32	3.2	70	F-083
MHR430R	φ4×R0.3×32	3.2	70	G-155
MHR230R	φ4×R0.3×32	6	70	G-147
DHR237R	φ4×R0.3×32	8	70	K-019
MHR430R	φ4×R0.3×48	3.2	100	G-155
MHR230R	φ4×R0.3×48	6	100	G-147
MHDH445R	φ4×R0.5	8	60	F-034
MSRS230	φ4×R0.5	8	65	G-080
MSRS430	φ4×R0.5	8	65	G-082
MSXH440R	φ4×R0.5	11	60	I-026
MHRSH430RSF	φ4×R0.5×8	3.2	45	E-021
MHRH430R	φ4×R0.5×8	3.2	60	F-083
MHRSH430RSF	φ4×R0.5×12	3.2	50	E-021
MHRH430R	φ4×R0.5×12	3.2	60	F-083
MHRSH430RSF	φ4×R0.5×16	3.2	55	E-021
MHRH430R	φ4×R0.5×16	3.2	60	F-083
MHR430R	φ4×R0.5×16	3.2	60	G-155
MHR230R	φ4×R0.5×16	6	60	G-148
DHR237R	φ4×R0.5×16	8	60	K-019
MHRSH430RSF	φ4×R0.5×20	3.2	55	E-021
MHRH430R	φ4×R0.5×24	3.2	70	F-083
MHR430R	φ4×R0.5×24	3.2	70	G-155
MHR230R	φ4×R0.5×24	6	70	G-148
DHR237R	φ4×R0.5×24	8	60	K-019

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRH430R	φ4×R0.5×32	3.2	70	F-083
MHR430R	φ4×R0.5×32	3.2	70	G-155
MHR230R	φ4×R0.5×32	6	70	G-148
DHR237R	φ4×R0.5×32	8	70	K-019
MHR430R	φ4×R0.5×48	3.2	100	G-155
MHR230R	φ4×R0.5×48	6	100	G-148
MSRS230	φ4×R1	8	65	G-080
MSRS430	φ4×R1	8	65	G-082
MSXH440R	φ4×R1	11	60	I-026
MHRH430R	φ4×R1×8	3.2	60	F-083
MHRH430R	φ4×R1×12	3.2	60	F-083
MHRH430R	φ4×R1×16	3.2	60	F-083
MHR430R	φ4×R1×16	3.2	60	G-155
MHR230R	φ4×R1×16	6	60	G-148
DHR237R	φ4×R1×16	8	60	K-019
MHRH430R	φ4×R1×24	3.2	70	F-083
MHR430R	φ4×R1×24	3.2	70	G-155
MHR230R	φ4×R1×24	6	70	G-148
DHR237R	φ4×R1×24	8	60	K-019
MHRH430R	φ4×R1×32	3.2	70	F-083
MHR430R	φ4×R1×32	3.2	70	G-155
MHR230R	φ4×R1×32	6	70	G-148
DHR237R	φ4×R1×32	8	70	K-019
MHR430R	φ4×R1×48	3.2	100	G-155
MHR230R	φ4×R1×48	6	100	G-148
φ5				
MSRS230	φ5×R0.1	10	70	G-080
MSRS430	φ5×R0.1	10	70	G-082
MHRSH430RSF	φ5×R0.1×15	4	50	E-021
MHRH430R	φ5×R0.1×15	4	70	F-083
MHRSH430RSF	φ5×R0.1×20	4	55	E-021
MHRH430R	φ5×R0.1×20	4	70	F-083
MHR430R	φ5×R0.1×20	4	70	G-155
MHR230R	φ5×R0.1×20	7.5	70	G-148
DHR237R	φ5×R0.1×20	10	60	K-019
MHRH430R	φ5×R0.1×40	4	90	F-083
MHR430R	φ5×R0.1×40	4	90	G-155
MHR230R	φ5×R0.1×40	7.5	90	G-148
DHR237R	φ5×R0.1×40	10	80	K-019
MHDH645R	φ5×R0.2	10	60	F-036
MSRS230	φ5×R0.2	10	70	G-080
MSRS430	φ5×R0.2	10	70	G-082
MHRSH430RSF	φ5×R0.2×15	4	50	E-021
MHRH430R	φ5×R0.2×15	4	70	F-083
MHRSH430RSF	φ5×R0.2×20	4	55	E-021
MHRH430R	φ5×R0.2×20	4	70	F-083
MHR430R	φ5×R0.2×20	4	70	G-155
MHR230R	φ5×R0.2×20	7.5	70	G-148
MHRH430R	φ5×R0.2×40	4	90	F-083
MHR430R	φ5×R0.2×40	4	90	G-155
MHR230R	φ5×R0.2×40	7.5	90	G-148

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHDH645R	φ5×R0.3	10	60	F-036
MSRS230	φ5×R0.3	10	70	G-080
MSRS430	φ5×R0.3	10	70	G-082
MSXH440R	φ5×R0.3	13	60	I-026
MHRSH430RSF	φ5×R0.3×15	4	50	E-021
MHRH430R	φ5×R0.3×15	4	70	F-083
MHRSH430RSF	φ5×R0.3×20	4	55	E-021
MHRH430R	φ5×R0.3×20	4	70	F-083
MHR430R	φ5×R0.3×20	4	70	G-155
MHR230R	φ5×R0.3×20	7.5	70	G-148
MHRH430R	φ5×R0.3×40	4	90	F-083
MHR430R	φ5×R0.3×40	4	90	G-155
MHR230R	φ5×R0.3×40	7.5	90	G-148
MHDH645R	φ5×R0.5	10	60	F-036
MSRS230	φ5×R0.5	10	70	G-080
MSRS430	φ5×R0.5	10	70	G-082
MSXH440R	φ5×R0.5	13	60	I-026
MHRSH430RSF	φ5×R0.5×15	4	50	E-021
MHRH430R	φ5×R0.5×15	4	70	F-083
MHRSH430RSF	φ5×R0.5×20	4	55	E-021
MHRH430R	φ5×R0.5×20	4	70	F-083
MHR430R	φ5×R0.5×20	4	70	G-155
MHR230R	φ5×R0.5×20	7.5	70	G-148
MHRH430R	φ5×R0.5×40	4	90	F-083
MHR430R	φ5×R0.5×40	4	90	G-155
MHR230R	φ5×R0.5×40	7.5	90	G-148
MHDH645R	φ5×R1	10	60	F-036
MSRS230	φ5×R1	10	70	G-080
MSRS430	φ5×R1	10	70	G-082
MSXH440R	φ5×R1	13	60	I-026
MHRH430R	φ5×R1×15	4	70	F-083
MHRH430R	φ5×R1×20	4	70	F-083
MHR430R	φ5×R1×20	4	70	G-155
MHR230R	φ5×R1×20	7.5	70	G-148
MHRH430R	φ5×R1×40	4	90	F-083
MHR430R	φ5×R1×40	4	90	G-155
MHR230R	φ5×R1×40	7.5	90	G-148
MSRS230	φ5×R1.5	10	70	G-080
MSRS430	φ5×R1.5	10	70	G-082
φ6				
MSRS230	φ6×R0.1	12	80	G-080
MSRS430	φ6×R0.1	12	80	G-082
MHRSH430RSF	φ6×R0.1×12	5	45	E-022
MHRH430R	φ6×R0.1×12	5	70	F-083
MHRSH430RSF	φ6×R0.1×18	5	50	E-022
MHRH430R	φ6×R0.1×18	5	90	F-083
MHRSH430RSF	φ6×R0.1×24	5	60	E-022
MHRH430R	φ6×R0.1×24	5	90	F-083
MHR430R	φ6×R0.1×24	5	90	G-155
MHR230R	φ6×R0.1×24	9	90	G-148
DHR237R	φ6×R0.1×24	12	60	K-019

Search from Radius Dia. &Corner R

Unit [Size : mm]

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MHRSH430RSF	ϕ6×R0.1×30	5	65	E-022
MHRH430R	ϕ6×R0.1×48	5	110	F-083
MHR430R	ϕ6×R0.1×48	5	110	G-155
MHR230R	ϕ6×R0.1×48	9	110	G-148
DHR237R	ϕ6×R0.1×48	12	90	K-019
MHDH645R	ϕ6×R0.2	12	60	F-036
MSRS230	ϕ6×R0.2	12	80	G-080
MSRS430	ϕ6×R0.2	12	80	G-082
MHRSH430RSF	ϕ6×R0.2×12	5	45	E-022
MHRH430R	ϕ6×R0.2×12	5	70	F-083
MHRSH430RSF	ϕ6×R0.2×18	5	50	E-022
MHRH430R	ϕ6×R0.2×18	5	90	F-083
MHRSH430RSF	ϕ6×R0.2×24	5	60	E-022
MHRH430R	ϕ6×R0.2×24	5	90	F-083
MHR430R	ϕ6×R0.2×24	5	90	G-155
MHR230R	ϕ6×R0.2×24	9	90	G-148
DHR237R	ϕ6×R0.2×24	12	60	K-019
MHRSH430RSF	ϕ6×R0.2×30	5	65	E-022
MHRH430R	ϕ6×R0.2×48	5	110	F-083
MHR430R	ϕ6×R0.2×48	5	110	G-155
MHR230R	ϕ6×R0.2×48	9	110	G-148
DHR237R	ϕ6×R0.2×48	12	90	K-019
MHDH645R	ϕ6×R0.3	12	60	F-036
MSRS230	ϕ6×R0.3	12	80	G-080
MSRS430	ϕ6×R0.3	12	80	G-082
MHRSH430RSF	ϕ6×R0.3×12	5	45	E-022
MHRH430R	ϕ6×R0.3×12	5	70	F-083
MHRSH430RSF	ϕ6×R0.3×18	5	50	E-022
MHRH430R	ϕ6×R0.3×18	5	90	F-083
MHRSH430RSF	ϕ6×R0.3×24	5	60	E-022
MHRH430R	ϕ6×R0.3×24	5	90	F-083
MHR430R	ϕ6×R0.3×24	5	90	G-155
MHR230R	ϕ6×R0.3×24	9	90	G-148
DHR237R	ϕ6×R0.3×24	12	60	K-019
MHRSH430RSF	ϕ6×R0.3×30	5	65	E-022
MHRH430R	ϕ6×R0.3×48	5	110	F-083
MHR430R	ϕ6×R0.3×48	5	110	G-155
MHR230R	ϕ6×R0.3×48	9	110	G-148
DHR237R	ϕ6×R0.3×48	12	90	K-019
MHDH645R	ϕ6×R0.5	12	60	F-036
MSRS230	ϕ6×R0.5	12	80	G-080
MSRS430	ϕ6×R0.5	12	80	G-082
MSXH440R	ϕ6×R0.5	13	60	I-026
MHRSH430RSF	ϕ6×R0.5×12	5	45	E-022
MHRH430R	ϕ6×R0.5×12	5	70	F-083
MHRSH430RSF	ϕ6×R0.5×18	5	50	E-022
MHRH430R	ϕ6×R0.5×18	5	90	F-083
MHRSH430RSF	ϕ6×R0.5×24	5	60	E-022
MHRH430R	ϕ6×R0.5×24	5	90	F-083
MHR430R	ϕ6×R0.5×24	5	90	G-155
MHR230R	ϕ6×R0.5×24	9	90	G-148

Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
DHR237R	ϕ6×R0.5×24	12	60	K-019
MHRSH430RSF	ϕ6×R0.5×30	5	65	E-022
DHR237R	ϕ6×R0.5×30	12	70	K-019
MHRH430R	ϕ6×R0.5×48	5	110	F-083
MHR430R	ϕ6×R0.5×48	5	110	G-155
MHR230R	ϕ6×R0.5×48	9	110	G-148
DHR237R	ϕ6×R0.5×48	12	90	K-019
MHDH645R	ϕ6×R1	12	60	F-036
MSRS230	ϕ6×R1	12	80	G-080
MSRS430	ϕ6×R1	12	80	G-082
MSXH440R	ϕ6×R1	13	60	I-026
MHRSH430RSF	ϕ6×R1×12	5	45	E-022
MHRH430R	ϕ6×R1×12	5	70	F-083
MHRSH430RSF	ϕ6×R1×18	5	50	E-022
MHRH430R	ϕ6×R1×18	5	90	F-083
MHRSH430RSF	ϕ6×R1×24	5	60	E-022
MHRH430R	ϕ6×R1×24	5	90	F-083
MHR430R	ϕ6×R1×24	5	90	G-155
MHR230R	ϕ6×R1×24	9	90	G-148
DHR237R	ϕ6×R1×24	12	60	K-019
MHRSH430RSF	ϕ6×R1×30	5	65	E-022
MHRH430R	ϕ6×R1×48	5	110	F-083
MHR430R	ϕ6×R1×48	5	110	G-155
MHR230R	ϕ6×R1×48	9	110	G-148
DHR237R	ϕ6×R1×48	12	90	K-019
MSRS230	ϕ6×R1.5	12	80	G-080
MSRS430	ϕ6×R1.5	12	80	G-082
MSRS230	ϕ6×R2	12	80	G-080
MSRS430	ϕ6×R2	12	80	G-082
ϕ8				
MSRS430	ϕ8×R0.1	16	90	G-082
MSRS430	ϕ8×R0.2	16	90	G-082
MHDH645R	ϕ8×R0.3	16	65	F-036
MHDH645R	ϕ8×R0.5	16	65	F-036
MSRS430	ϕ8×R0.5	16	90	G-082
MSXH440R	ϕ8×R0.5	19	65	I-026
MHDH645R	ϕ8×R1	16	65	F-036
MSRS430	ϕ8×R1	16	90	G-082
MSXH440R	ϕ8×R1	19	65	I-026
MHDH645R	ϕ8×R1.5	16	65	F-036
MSRS430	ϕ8×R1.5	16	90	G-082
MSRS430	ϕ8×R2	16	90	G-082
MSRS430	ϕ8×R2.5	16	90	G-082
MSRS430	ϕ8×R3	16	90	G-082
ϕ10				
MSRS430	ϕ10×R0.1	20	100	G-082
MSRS430	ϕ10×R0.2	20	100	G-082
MHDH645R	ϕ10×R0.3	20	75	F-036
MSRS430	ϕ10×R0.3	20	100	G-082
MHDH645R	ϕ10×R0.5	20	75	F-036
MSRS430	ϕ10×R0.5	20	100	G-082

Unit [Size : mm]

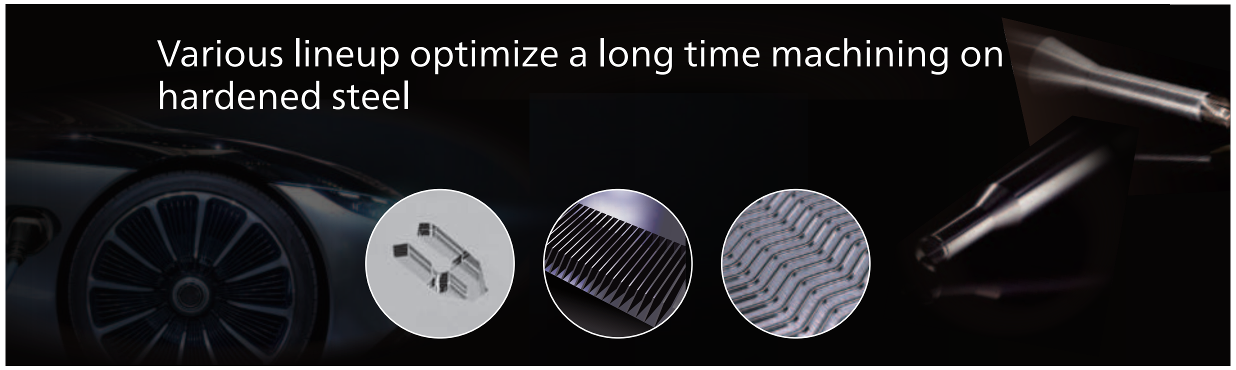
Model	Dia.xCorner Radius (xUnder neck Length)	Length of Cut	Overall Length	Page
MSXH440R	ϕ10×R0.5	22	75	I-026
MHDH645R	ϕ10×R1	20	75	F-036
MSRS430	ϕ10×R1	20	100	G-082
MSXH440R	ϕ10×R1	22	75	I-026
MHDH645R	ϕ10×R1.5	20	75	F-036
MSRS430	ϕ10×R1.5	20	100	G-082
MHDH645R	ϕ10×R2	20	75	F-036
MSRS430	ϕ10×R2	20	100	G-082
MSXH440R	ϕ10×R2	22	75	I-026
MSRS430	ϕ10×R2.5	20	100	G-082
MSRS430	ϕ10×R3	20	100	G-082
MSXH440R	ϕ10×R3	22	75	I-026
ϕ12				
MSRS430	ϕ12×R0.1	24	110	G-082
MSRS430	ϕ12×R0.2	24	110	G-082
MSRS430	ϕ12×R0.3	24	110	G-082
MHDH645R	ϕ12×R0.5	24	80	F-036
MSRS430	ϕ12×R0.5	24	110	G-082
MSXH440R	ϕ12×R0.5	26	80	I-026
MHDH645R	ϕ12×R1	24	80	F-036
MSRS430	ϕ12×R1	24	110	G-082
MSXH440R	ϕ12×R1	26	80	I-026
MHDH645R	ϕ12×R1.5	24	80	F-036
MSRS430	ϕ12×R1.5	24	110	G-082
MHDH645R	ϕ12×R2	24	80	F-036
MSRS430	ϕ12×R2	24	110	G-082
MSXH440R	ϕ12×R2	26	80	I-026
MSRS430	ϕ12×R2.5	24	110	G-082
MSRS430	ϕ12×R3	24	110	G-082

2

NS TOOL Main Series

Some semi-standard items are also listed in the standard catalog

CBN Core Line



Wide variation and size lineup

The cBN core line consists of 7 ball end mills, 4 corner radius end mills, and 3 square end mills, for a total of 541 sizes for finishing a variety of machining shapes.

		Type	Model	Maximum cutting depth (1D 2D 3D 4D 5D)	Size		Features
Square End Mill	For micro milling	SMEZ	SMEZ120	L/D=1	ϕ0.03 ～ ϕ0.1	Total 8 sizes	Ultrafine machining of ϕ0.1 or less
	For microscopic corners	SSE Type	SSE400	L/D=5	ϕ0.1	Total 2 sizes	Square end mill for microscopic corners
			SSE600	L/D=5	ϕ0.2 ～ ϕ1	Total 14 sizes	Square end mill for microscopic corners

		Type	Model	Maximum cutting depth (1D 2D 3D 4D ・・・10D)	Size		Features
Ball End Mill	For stable machining precision	SSB Type	SSB200	L/D=2.5	R0.1 ～ R1	Total 15 sizes	Realize stable milling
			SSBL200	L/D=10	R0.05 ～ R1	Total 25 sizes	Long neck with max. L/D=10
	For surface roughness	SSPB Type	SSPB220	L/D=3	R0.1 ～ R3	Total 30 sizes	Glossy finished surface
			SSPBL220	L/D=10	R0.1 ～ R1	Total 27 sizes	Long neck with max. L/D=10
			SSPBTN220	L/D=10	R0.1 × neck taper angle30' ～ R1 × neck taper angle2°	Total 64 sizes	Tapered neck with max. L/D=10
	For gradual shape	SFB	SFB200	L/D=2.5	R0.1 ～ R1	Total 12 sizes	Sharpened edge at R-center improves shearing ability
	For micro milling	SMB	SMB120	L/D=1	R0.01 ～ R0.05	Total 7 sizes	Ultrafine machining of R0.01 to R0.05

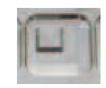
		Type	Model	Maximum cutting depth (2D 3D 4D 5D 6D)	Size		Features
Corner Radius End Mill	Multi purpose	SSR	SSR200	L/D=6	ϕ0.1 × R0.02 ～ ϕ2 × R0.5	Total 172 sizes	2-flute in total 172 sizes
	High efficiency	SHR	SHR320	L/D=5	ϕ0.5 × R0.1 ～ ϕ2 × R0.3	Total 14 sizes	3-flute in total 14 sizes
	High precision	SHPR	SHPR400	L/D=6	ϕ0.1 × R0.01 ～ ϕ3 × R0.2	Total 142 sizes	4-flute in total 142 sizes
	For flat surface	SSF	SSF120	L/D=2.5	ϕ0.2 × R0.05 ～ ϕ2 × R0.1	Total 9 sizes	1-flute for flat surface

Excellent surface roughness over long machining duration

CBN (Cubic Boron Nitride) sintered material is the hardest next to diamond, and is about three times harder than cemented carbide. It also has very high heat and wear resistance, making it an extremely effective material for long life and surface roughness in the finishing for hardened steel.

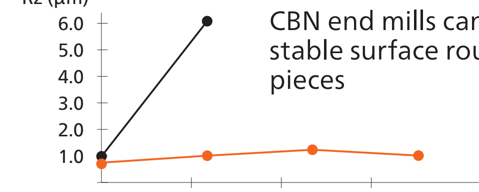
Comparison of surface roughness between CBN ball end mills and coated carbide ball end mills

Tool: Ball end mill R0.5
Work material: DC53 (60HRC)
Spindle speed n: 30,000 min^{-1}
Feed vf: 1,200 mm/min
Depth of cut: ap 0.01 x ae 0.02 mm



Machined size (1 pc/30 min) 14 × 14 mm

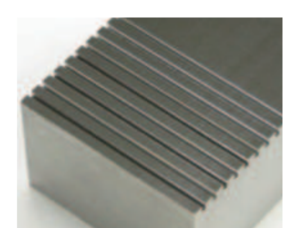
Surface roughness Rz [µm]	1 pc	10 pc	20 pc	30 pc
CBN end mill SFB200	0.9	1.0	1.2	1.0
	1 pc  30 pc			
Coated carbide end mill	1.0	6.2	―	―
	1 pc  10 pc			



CBN end mills can be continued to use with stable surface roughness after machining 30 pieces

Comparison of surface roughness between CBN end mills and coated carbide end mills

Tool: Corner radius end mill
ϕ0.5 × R0.05 × 1
Work material: ELMAX (58HRC)
Spindle speed n: 30,000 min^{-1}
Feed vf: 300 mm/min
Depth of cut: ap 0.005 mm
Coolant: Oil mist



Machined size
width 0.5 × length 20 × depth 1mm

	CBN end mill SSR200	Coated carbide end mill
After 1 grooving Cutting length approx. 4m		
After 3 grooving Cutting length approx. 12m		
After 6 grooving Cutting length approx. 24m		End of machining due to tool life

Even in grooving with high cutting load, CBN tools can be used for a long time

CBN Core Line

Various lineup optimize a long time machining on hardened steel

CBN Core Line

Model	Size	Maximum Cutting Depth	Length of Cut	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
CBN Micro Edge Square																								
SMEZ120	φ0.03 ~ φ0.1	1D	1D	1	-20°	-	Slot	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	8	B-006
CBN micro end mill with standardized of Dia.0.1mm or smaller ※ Listed at "Micro Edge" as well (Page D-006)																								
CBN Long Neck Square																								
SSE400	φ0.1	5D	0.4D	4	0°	-	Slot	Face	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	2	B-008
Best applicable for precise machining on minute corners of the narrow pitch connectors and etc																								
SSE600	φ0.2 ~ φ1	5D	0.4D	6	0°	-	Slot	Face	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	14	B-010
Best applicable for precise machining on minute corners of the narrow pitch connectors and etc																								
CBN Micro Edge Ball																								
SMB120	R0.01 ~ R0.05	1D	1D	1	-20°	-	-	-	3D	-	-	○	◎	◎	○	-	-	-	-	-	-	-	7	B-012
Realized micro milling by size line up R0.01 - R0.05 ※ Listed at "Micro Edge Series" as well (Page D-012)																								
CBN Long Neck Ball																								
SFB200	R0.1 ~ R1	2.5D	≒0.8D	2	0°	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	12	B-014
Realized nano level surface roughness even for milling with its R-center																								
SSPB220	R0.1 ~ R3	3D	≒0.8D	2	20°	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	30	B-016
Realized glossy finished surface																								
SSB200	R0.1 ~ R1	2.5D	≒0.8D	2	0°	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	15	B-018
Capable to machine with the same depth of cut as carbide tool finishing																								

Model	Size	Maximum Cutting Depth	Length of Cut	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
CBN Long Neck Ball																								
SSPBL220	R0.1 ~ R1	10D	≒0.8D	2	20°	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	27	B-020
Realized glossy finished surface by maximum L/D=10																								
SSBL200	R0.05 ~ R1	10D	≒0.8D	2	0°	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	25	B-022
Capable to machine at deep area finishing by maximum L/D=10																								
CBN Long Neck Tapered Ball																								
SSPBTN220	R0.1×neck taper angle30' ~ R1×neck taper angle2°	10D	≒0.8D	2	20°	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	64	B-024
Taper neck design for high rigidity. Suitable for deep and high accurate finishing																								
CBN Long Neck Corner Radius																								
SSR200	φ0.1× R0.02 ~ φ2× R0.5	6D	≒0.7D	2	0°	-	Slot	Face	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	172	B-028
Corner radius end mill with CBN material at the cutting edge. Total 172 sizes. Applicable for various machining profiles																								
SHR320	φ0.5× R0.1 ~ φ2× R0.3	5D	0.5D	3	20°	-	Slot	Face	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	14	B-034
3-flute CBN corner radius end mill. Realized high efficient and high accurate machining																								
SHPR400	φ0.1× R0.01 ~ φ3× R0.2	6D	≒0.7D	4	0°	-	Slot	Face	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	142	B-036
4-flute corner radius end mill from Dia.0.1mm. High precise type to pursue machining accuracy																								
SSF120	φ0.2× R0.05 ~ φ2× R0.1	2.5D	0.5D	1	-20°	-	-	Face	-	-	-	-	◎	◎	◎	-	-	-	-	-	-	-	9	B-042
Single flute end mill for hardened steels. Specialized for accurate finishing on flat surface																								

SMEZ120

Size ϕ 0.03～ϕ 0.1

CBN ≦70 HRC

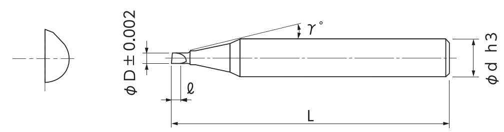
CBN "MICRO EDGE Z"

Total 8 sizes

CBN micro end mill with standardized of Dia.0.1mm or smaller

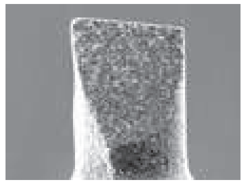
Slot

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H



※ Listed at "Micro Edge" as well (Page D-006)

- NS TOOL engineering technology and selected CBN material realize sharp edge.
- Tolerance of flute diameter is ±2μm.
- Tolerance of shank diameter is h3 (0〜-0.0025).



Cutting edge shape

Square

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00480-00030	0.03	0.03	15°	4	50
01-00480-00040	0.04	0.04	15°	4	50
01-00480-00050	0.05	0.05	15°	4	50
01-00480-00060	0.06	0.06	15°	4	50
01-00480-00070	0.07	0.07	15°	4	50
01-00480-00080	0.08	0.08	15°	4	50
01-00480-00090	0.09	0.09	15°	4	50
01-00480-00100	0.1	0.1	15°	4	50

How to Order When you order, indicate SMEZ120 (D). ※(γ) is reference value.

Work Material	Prehardened Steels･Hardened Steels NAK･STAVAX･SKD11･PD613 (〜62HRC)			
Dia.	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹
0.03	0.0005	0.003	10	60,000
0.04	0.001	0.003	20	60,000
0.05	0.001	0.005	30	60,000
0.06	0.002	0.005	40	60,000
0.07	0.002	0.01	50	60,000
0.08	0.003	0.015	65	60,000
0.09	0.003	0.02	80	60,000
0.1	0.003	0.025	100	60,000
Notes	※1 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 We recommend using oil mist coolant. ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.) ※5 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.			

P Prehardened Steel
H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel
H ~70 HRC Hardened Steel
Square

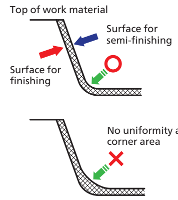
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSE400

Size ϕ 0.1

CBN ≤70 HRC

SSE400

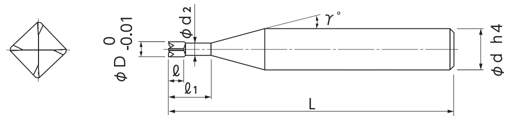
CBN Square End Mill

Total 2 sizes

4 0° ϕd h4 Slot Face

Best applicable for precise machining on minute corners of the narrow pitch connectors and etc

Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H



- Possible to machine the corner edge of hardened steels.
- Intensified wear resistance by NS TOOL original design of cutting edge.

Cutting edge shape

Long Neck Square

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00440-01002	0.1	0.2	0.04	0.075	15°	4	53
01-00440-01005		0.5	0.04	0.08	15°	4	53

How to Order When you order, indicate SSE400 (D)×(ℓ1). ※(γ) is reference value.

Recommended Milling Conditions

Work Material		Hardened Steels HPM-38•STAVAX•SKD61 (~55HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.1	0.2	0.001	0.002	250	40,000	0.001	0.002	200	40,000	0.001	0.002	150	40,000
	0.5	0.001	0.002	200	40,000	0.001	0.002	150	40,000	0.001	0.001	100	40,000

Notes

※1 Depth of Cut is the maximum effective value for the contour line tool path.
※2 ap: Axial Depth of Cut, ae: Radial Depth of Cut.
※3 Recommended oil mist coolant.
※4 Minimize a possible tool overhang length.
※5 Minimize chucking runout. (Recommend to measure actual runout of activated spindle speed.)
※6 For the reference value, when finishing process of bottom surface, reduce the feed approx. 50% of the recommended milling conditions and Depth of Cut (ap): 0.001mm for Dia. 0.1mm, (ae): Dia. x 0.05mm.

H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel
H ~70 HRC Hardened Steel

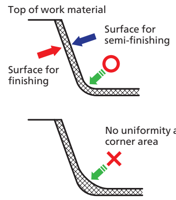
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



Long Neck Square

SSE600

Size ϕ 0.2 ～ ϕ 1

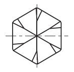
CBN ≦70 HRC

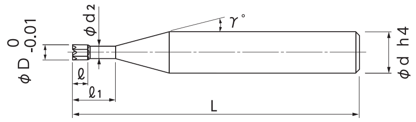
CBN Square End Mill

Total 14 sizes

Best applicable for precise machining on minute corners of the narrow pitch connectors and etc

6 | 0° | ϕd h4 | Slot | Face





- Possible to machine the corner edge of hardened steels.
- Intensified wear resistance by NS TOOL original design of cutting edge.

Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00450-02004	0.2	0.4	0.08	0.175	15°	4	53
01-00450-02010		1	0.08	0.175	15°	4	53
01-00450-03005	0.3	0.5	0.12	0.275	15°	4	49
01-00450-03015		1.5	0.12	0.275	15°	4	50
01-00450-04008	0.4	0.8	0.16	0.37	15°	4	49
01-00450-04020		2	0.16	0.37	15°	4	50
01-00450-05010	0.5	1	0.2	0.46	15°	4	49
01-00450-05025		2.5	0.2	0.46	15°	4	50
01-00450-06012	0.6	1.2	0.24	0.56	15°	4	49
01-00450-06030		3	0.24	0.56	15°	4	50
01-00450-08015	0.8	1.5	0.32	0.76	15°	4	49
01-00450-08040		4	0.32	0.76	15°	4	52
01-00450-10020	1	2	0.4	0.95	15°	4	49
01-00450-10050		5	0.4	0.95	15°	4	52

How to Order When you order, indicate SSE600 (D)×(ℓ1). ※(γ) is reference value.

Machining case S-002

Machining Case 1

Flow Channel Model

Work Size : 40×20mm Cutting depth : 0.5mm

- Work Material : HAP40 64HRC
- Coolant : Oil mist
- Total machining time : 7hr 30min

Process	Pre-roughing	Roughing (2 pcs)	Semi-finishing	Contour line finishing	Bottom finishing
Tool	MHRH430 ϕ2.5×8	MHRH430 ϕ1×4	SSR200 ϕ1×R0.02×1	SSE600 ϕ1×2	
Spindle speed [min⁻¹]	8,000	20,000	30,000		
Feed [mm/min]	1,000		600	300	90
Depth of cut ap×ae[mm]	0.03×0.75	0.02×0.3	0.005×0.01～0.05	0.005×0.005	0.001×0.5
Machining time	13min	1hr44min	1hr18min	4hr15min	

Recommended Milling Conditions

Work Material		Hardened Steels HPM-38・STAVAX・SKD61 (～55HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Steels SKH (～65HRC)			
Dia.	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.2	0.4	0.003	0.002	400	40,000	0.002	0.002	300	40,000	0.002	0.002	200	40,000
	1	0.003	0.002	300	40,000	0.002	0.002	200	40,000	0.002	0.002	100	40,000
0.3	0.5	0.005	0.003	600	40,000	0.004	0.003	400	40,000	0.003	0.003	400	40,000
	1.5	0.005	0.002	500	40,000	0.004	0.002	300	40,000	0.003	0.002	200	40,000
0.4	0.8	0.007	0.004	700	40,000	0.005	0.003	600	40,000	0.003	0.003	600	40,000
	2	0.007	0.003	600	40,000	0.005	0.002	400	40,000	0.003	0.002	400	40,000
0.5	1	0.01	0.005	800	40,000	0.007	0.003	700	40,000	0.005	0.003	600	40,000
	2.5	0.01	0.004	800	40,000	0.007	0.002	500	40,000	0.005	0.002	400	40,000
0.6	1.2	0.01	0.005	800	40,000	0.007	0.003	700	40,000	0.005	0.003	600	40,000
	3	0.01	0.004	800	40,000	0.007	0.002	500	40,000	0.005	0.002	400	40,000
0.8	1.5	0.01	0.005	800	40,000	0.007	0.004	800	40,000	0.005	0.004	700	40,000
	3.5	0.01	0.004	800	40,000	0.007	0.003	600	40,000	0.005	0.003	500	40,000
1	2	0.01	0.006	800	40,000	0.007	0.006	800	40,000	0.005	0.006	800	40,000
	5	0.01	0.005	800	40,000	0.007	0.005	600	40,000	0.005	0.005	600	40,000

Notes

※1 Depth of Cut is the maximum effective value for the contour line tool path.
※2 ap: Axial Depth of Cut, ae: Radial Depth of Cut.
※3 Recommended oil mist coolant.
※4 Minimize a possible tool overhang length.
※5 Minimize chucking runout. (Recommend to measure actual runout of activated spindle speed.)
※6 For the reference value, when finishing process of bottom surface, reduce the feed approx. 50% of the recommended milling conditions and Depth of Cut (ap): 0.002mm for Dia. 0.2mm and 0.3mm, for Dia. 0.4 to 1mm, up to 0.003mm, (ae): Dia. x 0.05mm.

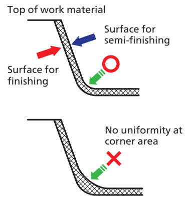
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SMB120

Size R0.01 ～ R0.05

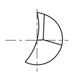
CBN ≦70 HRC

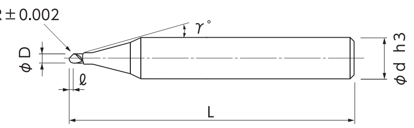
CBN Ball End Mill for precision machining "CBN Micro Ball"

Total 7 sizes

Realized micro milling by size line up R0.01 - R0.05

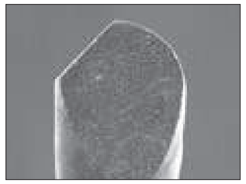
1 -20° R ±0.002 φd h3 3D





※ Listed at "Micro Edge" as well (Page D-012)

- The world's first CBN Micro Ball End Mill.
- CBN Micro Ball develops new machining capability in high-precision technology.
- Standarized sizes from R0.01.
- Long machining on pre-hardened to high-hardened steels.



Cutting edge shape

Unit : mm

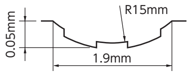
Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00460-00010	R0.01	0.02	0.02	15°	4	50
01-00460-00015	R0.015	0.03	0.03	15°	4	50
01-00460-00020	R0.02	0.04	0.04	15°	4	50
01-00460-00025	R0.025	0.05	0.05	15°	4	50
01-00460-00030	R0.03	0.06	0.06	15°	4	50
01-00460-00040	R0.04	0.08	0.08	15°	4	50
01-00460-00050	R0.05	0.1	0.1	15°	4	50

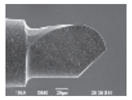
How to Order When you order, indicate SMB120 (R). ※(γ) is reference value.

Machining case S-003

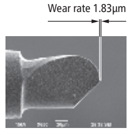
Machining Case 1

R0.05 NS Logo





Before machining



After machining

Work Material	STAVAX 52HRC	
Spindle speed	80,000min^{-1}	
Feed	Roughing：200mm/min	Finishing：50mm/min
Depth of cut ※	Roughing：2μm×5μm (ap×ae)	Finishing：2μm×2μm (ap×ae)
Machining time	1hr 50min	
Machining length	7.7m	
Coolant	Oil mist	

- Full process done by one tool.

※ap: Axial Depth of Cut, ae: Radial Depth of Cut.

SMB120

CBN
Core Line

Recommended Milling Conditions

Work Material	Prehardened Steels・Hardened Steels NAK・STAVAX・SKD11・PD613 (～62HRC)				
Radius	Depth of Cut		Feed	Approaching Feed	Spindle Speed
	ap mm	ae mm	mm/min	mm/min	min^{-1}
0.01	0.0005	0.001	5	3	80,000
0.02	0.001	0.001	30	5	80,000
0.03	0.001	0.002	70	10	80,000
0.04	0.002	0.003	100	30	80,000
0.05	0.002	0.005	200	30	80,000
Notes	※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 We recommend using oil mist coolant. ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.) ※5 Tool approaching angle must be 3 degrees or below. ※6 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.				

Prehardened Steel P
H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel
H ~70 HRC Hardened Steel

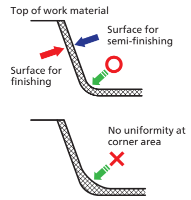
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

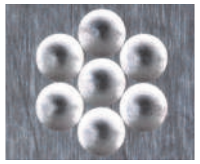
- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.

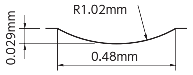


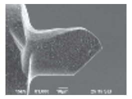
Ball

Machining Case 2

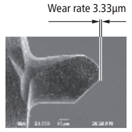
R0.03 Lens Array Model







Before machining



After machining

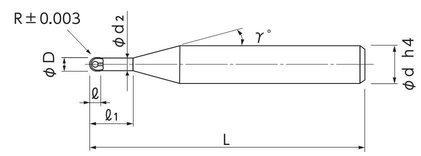
Work Material	PD613 60HRC	
Spindle speed	80,000min^{-1}	
Feed	Roughing：50mm/min	Finishing：30mm/min
Depth of cut ※	Roughing：1μm×2μm (ap×ae)	Finishing：1μm×1μm (ap×ae)
Machining time	4hr	
Machining length	10.4m	
Coolant	Oil mist	

- Full process done by one tool.

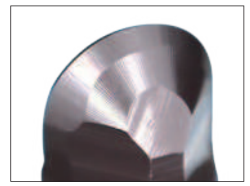
※ap: Axial Depth of Cut, ae: Radial Depth of Cut.

Realized nano level surface roughness even for milling with its R-center

2 0° R ±0. 003 φd h4 3D



- Sharpened edge at R-center improves shearing ability.
- Continuous 10 hours machining on hardened steel of 60HRC.
- Long-lasting high surface accuracy Rz1.0μm.
- Save significant time at polishing process.



Cutting edge shape

Sharp tooth edge guarantees long and consistent accuracy.

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00500-00100	R0.1	0.5	0.15	0.2	0.19	12°	4	50
01-00500-00200	R0.2	1	0.3	0.4	0.37	12°	4	50
01-00500-00250	R0.25	1.25	0.38	0.5	0.46	12°	4	50
01-00500-00300	R0.3	1.5	0.5	0.6	0.56	12°	4	50
01-00500-00400	R0.4	2	0.6	0.8	0.76	12°	4	50
01-00500-00500	R0.5	2.5	0.7	1	0.95	12°	4	50
01-00500-00600	R0.6	3	0.8	1.2	1.15	12°	4	50
01-00500-00700	R0.7	3.5	1	1.4	1.35	12°	4	52
01-00500-00750	R0.75	3.8	1	1.5	1.45	12°	4	52
01-00500-00800	R0.8	4	1	1.6	1.55	12°	4	52
01-00500-00900	R0.9	4.5	1.2	1.8	1.75	12°	4	52
01-00500-01000	R1	5	1.2	2	1.94	12°	4	52

How to Order When you order, indicate SFB200 (R). ※(γ) is reference value.

Work Material	Hardened Steels･High Speed Steels SKD･SKH･HAP (～68HRC)					
Radius	Depth of Cut		Normal Speed		High Speed	
			Feed	Spindle Speed	Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹	mm/min	min⁻¹
0.1 ～0.2	0.005	0.01	600	20,000	1,500	50,000
0.25～0.3	0.01	0.01	800		2,000	
0.4 ～0.6	0.01	0.02	1,200		3,000	
0.7 ～0.8	0.01	0.02	1,600		4,000	
0.9 ～1	0.02	0.05	2,000		5,000	
Notes	※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 SFB200 is a Super-Finish Ball End Mill recommended to use after the finish process of carbide end mill. ※3 Cutting depth must be fixed all through the milling process according to the recommended milling conditions. ※4 Pay a special attention when choosing tool path and deciding a milling condition for corner milling. ※5 We recommend using oil mist coolant. ※6 Machine, tool chuck must be sufficiently accurate.					

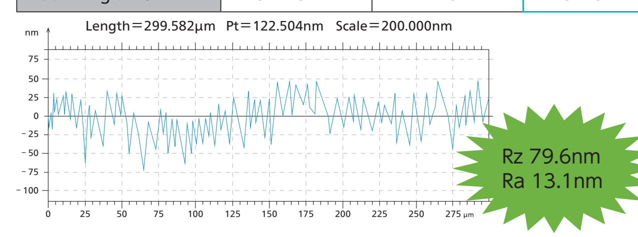
Machining Case 1

Reflector

- Work Material : ELMAX 60HRC
- Coolant : Oil mist
- Total machining time : 19hr 10min

Process	Roughing	Semi-finishing	Finishing
Tool	MSBH230 R0.2	SSBL200 R0.2×1.2	SFB200 R0.2
Spindle speed [min⁻¹]	40,000		
Feed [mm/min]	800	700	400
Depth of cut ap×ae[mm]	0.015×0.05	0.005×0.01	0.004×0.002
Machining time	3hr 23min	2hr 10min	13hr 37min

Work size : 20×20mm



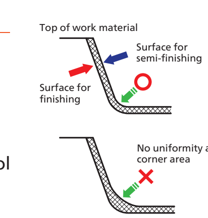
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSPB220

Size R0.1 ~ R3

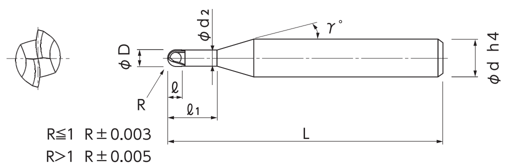
CBN ≦70 HRC

CBN Super Spiral Ball End Mill

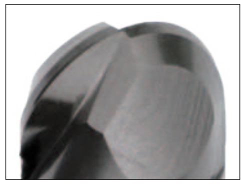
Total 30 sizes

Realized glossy finished surface

2 | 20° | R ±0.003 (R≦1) | R ±0.005 (R>1) | φd h4 | 3D



- Adopted spiral ball shape to improve sharpness of cutting edge.
- Adopted cutting edge shape to improve the chipping resistance of cutting edge.
- When peripheral cutting edge makes contact with cutting surface, vibration occurs by an increase in cutting resistance and it affects tool life and cutting surface quality.The influence can be reduced by adoption of the strong back taper shape.
- Enlarged standard tool size up to R3 to extend application range.



Cutting edge shape

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00505-00101	R0.1	0.3	0.15	0.2	0.19	15°	4	50
01-00505-00100		0.6	0.15	0.2	0.19	15°	4	50
01-00505-00150	R0.15	0.3	0.23	0.3	0.28	15°	4	50
01-00505-00151		0.5	0.23	0.3	0.28	15°	4	50
01-00505-00152		0.75	0.23	0.3	0.28	15°	4	50
01-00505-00201	R0.2	0.5	0.3	0.4	0.37	15°	4	50
01-00505-00202		0.75	0.3	0.4	0.37	15°	4	50
01-00505-00203		1	0.3	0.4	0.37	15°	4	50
01-00505-00200		1.2	0.3	0.4	0.37	15°	4	50
01-00505-00251	R0.25	1	0.38	0.5	0.46	15°	4	50
01-00505-00301	R0.3	1.2	0.5	0.6	0.56	15°	4	50
01-00505-00300		1.5	0.5	0.6	0.56	15°	4	50
01-00505-00401	R0.4	1.6	0.6	0.8	0.76	15°	4	50
01-00505-00400		2	0.6	0.8	0.76	15°	4	50
01-00505-00501	R0.5	2	0.7	1	0.95	15°	4	50
01-00505-00500		2.5	0.7	1	0.95	15°	4	50
01-00505-00601	R0.6	2.4	0.8	1.2	1.15	15°	4	50
01-00505-00600		3	0.8	1.2	1.15	15°	4	50
01-00505-00751	R0.75	3	1	1.5	1.45	15°	4	52
01-00505-00750		3.8	1	1.5	1.45	15°	4	52
01-00505-01000	R1	4	1.2	2	1.94	15°	4	52
01-00505-01001		5	1.2	2	1.94	15°	4	52
01-00505-01506	R1.5	6	1.8	3	2.85	12°	6	50
01-00505-01509		9	1.8	3	2.85	12°	6	70
01-00505-02008	R2	8	2.4	4	3.8	12°	6	50
01-00505-02012		12	2.4	4	3.8	12°	6	70
01-00505-02510	R2.5	10	3	5	4.8	12°	6	60
01-00505-02515		15	3	5	4.8	12°	6	80
01-00505-03012	R3	12	3.6	6	5.8	–	6	60
01-00505-03018		18	3.6	6	5.8	–	6	80

How to Order: When you order, indicate SSPB220 (R)×(ℓ1). ※(γ) is reference value.

Machining case S-004

Work Material		Hardened Steels STAVAX・SKD61 (~52HRC)				Hardened Steels SKD11・ELMAX (~62HRC)				High Speed Steels SKH・HAP (~68HRC)			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mms	ae mm	mm/min	min⁻¹
0.1	0.3	0.005	0.005	600	40,000	0.005	0.005	450	40,000	0.003	0.003	300	40,000
	0.6	0.005	0.005	500	40,000	0.005	0.005	350	40,000	0.003	0.003	250	40,000
0.15	0.3	0.005	0.005	800	40,000	0.005	0.005	600	40,000	0.003	0.003	450	40,000
	0.5	0.005	0.005	750	40,000	0.005	0.005	550	40,000	0.003	0.003	400	40,000
	0.75	0.005	0.005	700	40,000	0.005	0.005	500	40,000	0.003	0.003	400	40,000
0.2	0.5	0.005	0.01	1,200	40,000	0.005	0.01	900	40,000	0.005	0.005	600	40,000
	0.75	0.005	0.01	1,100	40,000	0.005	0.01	850	40,000	0.005	0.005	550	40,000
	1	0.005	0.01	1,000	40,000	0.005	0.01	800	40,000	0.005	0.005	500	40,000
	1.2	0.005	0.01	1,000	40,000	0.005	0.01	800	40,000	0.005	0.005	500	40,000
0.25	1	0.01	0.01	1,200	40,000	0.01	0.01	1,000	40,000	0.005	0.005	700	40,000
0.3	1.2	0.01	0.02	1,800	40,000	0.01	0.02	1,500	40,000	0.005	0.01	1,000	40,000
	1.5	0.01	0.02	1,500	40,000	0.01	0.02	1,200	40,000	0.005	0.01	800	40,000
0.4	1.6	0.01	0.02	1,800	40,000	0.01	0.02	1,500	40,000	0.005	0.01	1,000	40,000
	2	0.01	0.02	1,500	40,000	0.01	0.02	1,200	40,000	0.005	0.01	800	40,000
0.5	2	0.02	0.04	2,500	40,000	0.02	0.03	1,800	40,000	0.01	0.02	1,200	40,000
	2.5	0.02	0.04	2,000	40,000	0.02	0.03	1,500	40,000	0.01	0.02	1,000	40,000
0.6	2.4	0.02	0.04	2,500	40,000	0.02	0.03	2,000	40,000	0.01	0.02	1,500	40,000
	3	0.02	0.04	2,500	40,000	0.02	0.03	2,000	40,000	0.01	0.02	1,500	40,000
0.75	3	0.03	0.05	3,000	40,000	0.03	0.05	3,000	40,000	0.02	0.03	2,000	30,000
	3.8	0.03	0.05	3,000	40,000	0.03	0.05	3,000	40,000	0.02	0.03	2,000	30,000
1	4	0.05	0.1	3,000	30,000	0.03	0.05	3,000	30,000	0.03	0.03	2,000	25,000
	5	0.05	0.1	3,000	30,000	0.03	0.05	3,000	30,000	0.03	0.03	2,000	25,000
1.5	6	0.08	0.15	2,300	20,000	0.05	0.075	2,100	20,000	0.04	0.06	1,300	15,000
	9	0.06	0.12	2,200	20,000	0.04	0.06	2,000	20,000	0.04	0.05	1,200	15,000
2	8	0.1	0.18	2,300	17,000	0.06	0.09	2,100	15,000	0.05	0.07	1,300	12,000
	12	0.08	0.15	2,000	17,000	0.05	0.08	1,700	15,000	0.04	0.06	1,200	12,000
2.5	10	0.11	0.21	2,200	13,000	0.08	0.12	1,800	12,000	0.07	0.1	1,300	11,000
	15	0.1	0.18	1,900	13,000	0.06	0.1	1,500	12,000	0.06	0.08	1,100	11,000
3	12	0.13	0.24	2,000	10,000	0.09	0.15	1,600	10,000	0.08	0.12	1,200	10,000
	18	0.11	0.21	1,700	10,000	0.08	0.12	1,400	10,000	0.07	0.1	1,000	10,000

Notes

※1 Max. Depth of Cut for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※3 Required careful set up of milling conditions, tool path and etc. at cutting parts, such as corners where will become overloaded.
※4 Adjust both Depth of Cut and feed rate at 70% of the recommended milling conditions for high quality milling surface.
※5 Oil mist coolant is recommended.
※6 Adjust feed rate at same rate as spindle speed if necessary to adjust spindle speed from recommended milling conditions.

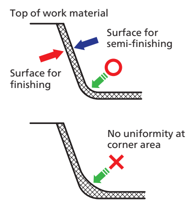
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSB200

Size R0.1～R1

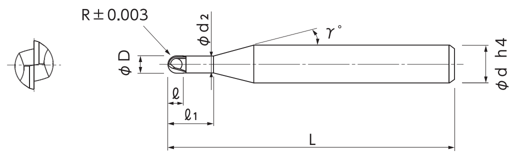
CBN ≦70 HRC

CBN Super Speed Ball End Mill

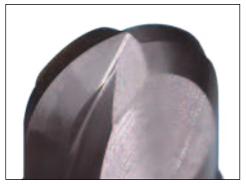
Total 15 sizes

Capable to machine with the same depth of cut as carbide tool finishing

2 0° R ±0.003 φd h4 3D



- This CBN Ball End Mill has realized both advantages of CBN and Carbide.
- Depth of Cut can be increased at the equivalent level to Carbide.
- Unique flute design with R-accuracy ±0.003 prevents chipping!
- Flute is smoothly tangent from straight line to R-curve.
- Applicable for hardened materials up to 70HRC!



Cutting edge shape

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00510-00100	R0.1	0.3	0.15	0.2	0.19	15°	4	50
01-00510-00150	R0.15	0.3	0.23	0.3	0.28	15°	4	50
01-00510-00151		0.5	0.23	0.3	0.28	15°	4	50
01-00510-00152		0.75	0.23	0.3	0.28	15°	4	50
01-00510-00200	R0.2	0.5	0.3	0.4	0.37	15°	4	50
01-00510-00201		0.75	0.3	0.4	0.37	15°	4	50
01-00510-00202		1	0.3	0.4	0.37	15°	4	50
01-00510-00250	R0.25	1	0.38	0.5	0.46	15°	4	50
01-00510-00300	R0.3	1.5	0.5	0.6	0.56	15°	4	50
01-00510-00400	R0.4	2	0.6	0.8	0.76	15°	4	50
01-00510-00500	R0.5	2.5	0.7	1	0.95	15°	4	50
01-00510-00600	R0.6	3	0.8	1.2	1.15	15°	4	50
01-00510-00750	R0.75	3.8	1	1.5	1.45	15°	4	52
01-00510-01001	R1	4	1.2	2	1.94	15°	4	52
01-00510-01000		5	1.2	2	1.94	15°	4	52

How to Order: When you order, indicate SSB200 (R)×(ℓ1). ※(γ) is reference value.

Machining case: S-005

Recommended Milling Conditions

Work Material		Hardened Steels STAVAX・SKD61 (～52HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Steels SKH・HAP (～68HRC)			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.1	0.3	0.005	0.005	720	50,000	0.005	0.005	540	50,000	0.003	0.003	360	50,000
0.15	0.3	0.005	0.01	1,400		0.005	0.01	800		0.005	0.005	500	
	0.5	0.005	0.005	1,200		0.005	0.005	640		0.003	0.005	460	
	0.75	0.005	0.005	1,000		0.005	0.005	540		0.003	0.005	400	
0.2	0.5	0.01	0.01	1,800		0.01	0.01	1,200		0.005	0.01	640	
	0.75	0.005	0.01	1,600		0.005	0.01	1,000		0.005	0.01	540	
	1	0.005	0.01	1,400		0.005	0.01	900		0.005	0.005	460	
0.25	1	0.015	0.015	1,800		0.01	0.015	1,500		0.01	0.01	1,100	
0.3	1.5	0.02	0.03	2,000		0.01	0.02	2,000		0.01	0.02	1,500	
0.4	2	0.03	0.05	2,000		0.02	0.03	2,000		0.01	0.03	1,500	
0.5	2.5	0.05	0.05	3,000		0.03	0.05	3,000		0.02	0.03	2,000	
0.6	3	0.05	0.05	3,000		0.03	0.05	3,000		0.02	0.03	2,000	
0.75	3.8	0.05	0.1	4,000		0.05	0.05	4,000		0.02	0.05	3,000	
1	4	0.1	0.1	5,000		0.05	0.05	5,000		0.03	0.05	3,000	
	5	0.1	0.1	5,000		0.05	0.05	5,000		0.03	0.05	3,000	

Notes

※1 Depth of Cut shows the maximum value for semi-finishing and finishing.
※2 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 We recommend using oil mist coolant.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.
※6 Length of tool overhang must be as short as possible.

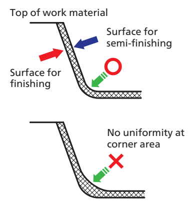
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSPBL220

Size R0.1 ~ R1

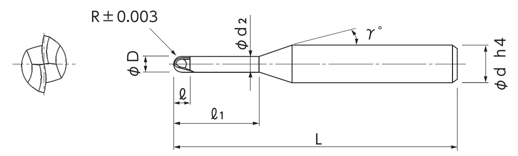
CBN ≦70 HRC

CBN Super Spiral Long Neck Ball End Mill

Total 27 sizes

Realized glossy finished surface by maximum L/D=10

2 | 20° | R ±0.003 | ϕd h4 | 3D



- Added longer under neck length type to SSPB220 series.
- Realized deeper milling by adoption of spiral ball shape and strong back taper shape to improve both sharpness and the chipping resistance of cutting edges.

Cutting edge shape

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00506-00101	R0.1	1	0.15	0.2	0.19	15°	4	50
01-00506-00151	R0.15	0.9	0.23	0.3	0.28	15°	4	50
01-00506-00152		1.5	0.23	0.3	0.28	15°	4	50
01-00506-00201	R0.2	2	0.3	0.4	0.37	15°	4	50
01-00506-00202		3	0.3	0.4	0.37	15°	4	52
01-00506-00251	R0.25	1.5	0.38	0.5	0.46	15°	4	50
01-00506-00252		2.5	0.38	0.5	0.46	15°	4	50
01-00506-00253		3.5	0.38	0.5	0.46	15°	4	52
01-00506-00301	R0.3	3	0.5	0.6	0.56	15°	4	50
01-00506-00302		4	0.5	0.6	0.56	15°	4	53
01-00506-00303		5	0.5	0.6	0.56	15°	4	53
01-00506-00304		6	0.5	0.6	0.56	15°	4	53
01-00506-00401	R0.4	4	0.6	0.8	0.76	15°	4	53
01-00506-00402		6	0.6	0.8	0.76	15°	4	53
01-00506-00501	R0.5	4	0.7	1	0.95	15°	4	51
01-00506-00502		6	0.7	1	0.95	15°	4	53
01-00506-00503		8	0.7	1	0.95	15°	4	53
01-00506-00504		10	0.7	1	0.95	15°	4	53
01-00506-00601	R0.6	6	0.8	1.2	1.15	15°	4	53
01-00506-00751	R0.75	7.5	1	1.5	1.45	15°	4	52
01-00506-00752		10	1	1.5	1.45	15°	4	52
01-00506-00753		15	1	1.5	1.45	15°	4	52
01-00506-01001	R1	6	1.2	2	1.94	15°	4	53
01-00506-01002		8	1.2	2	1.94	15°	4	53
01-00506-01003		10	1.2	2	1.94	15°	4	53
01-00506-01004		14	1.2	2	1.94	15°	4	53
01-00506-01005		20	1.2	2	1.94	15°	4	53

How to Order When you order, indicate SSPBL220 (R)×(ℓ1). ※(γ) is reference value.

Work Material		Hardened Steels STAVAX・SKD61 (~52HRC)				Hardened Steels SKD11・ELMAX (~62HRC)				High Speed Steels SKH・HAP (~68HRC)			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.1	1	0.005	0.005	200	40,000	0.005	0.005	150	40,000	0.003	0.003	100	40,000
0.15	0.9	0.005	0.005	600	40,000	0.005	0.005	400	40,000	0.003	0.005	300	40,000
	1.5	0.005	0.005	320	40,000	0.005	0.005	240	40,000	0.003	0.005	160	40,000
0.2	2	0.005	0.01	500	40,000	0.005	0.01	400	40,000	0.005	0.005	320	40,000
	3	0.005	0.005	250	40,000	0.005	0.005	200	40,000	0.003	0.005	120	40,000
0.25	1.5	0.01	0.01	1,200	40,000	0.01	0.01	1,000	40,000	0.005	0.01	600	40,000
	2.5	0.01	0.01	720	40,000	0.01	0.01	600	40,000	0.005	0.01	480	40,000
	3.5	0.01	0.01	400	36,000	0.005	0.01	320	36,000	0.005	0.005	240	36,000
0.3	3	0.01	0.02	1,200	40,000	0.01	0.02	800	40,000	0.01	0.01	600	40,000
	4	0.01	0.01	540	36,000	0.01	0.01	400	36,000	0.005	0.01	320	36,000
	5	0.01	0.01	360	30,000	0.005	0.01	320	30,000	0.005	0.005	240	30,000
	6	0.005	0.005	240	24,000	0.005	0.005	200	24,000	0.003	0.003	160	24,000
0.4	4	0.01	0.015	1,000	40,000	0.01	0.015	800	40,000	0.005	0.01	600	40,000
	6	0.005	0.01	720	30,000	0.005	0.01	540	30,000	0.005	0.005	400	30,000
0.5	4	0.02	0.03	1,600	40,000	0.02	0.02	1,200	40,000	0.01	0.015	800	40,000
	6	0.015	0.02	1,200	30,000	0.015	0.015	900	30,000	0.01	0.01	600	30,000
	8	0.01	0.015	720	20,000	0.01	0.01	540	20,000	0.005	0.01	400	20,000
	10	0.01	0.01	540	16,000	0.005	0.01	400	16,000	0.005	0.005	300	16,000
0.6	6	0.02	0.02	1,400	32,000	0.015	0.02	1,000	32,000	0.01	0.015	720	32,000
0.75	7.5	0.02	0.03	1,600	32,000	0.015	0.03	1,400	32,000	0.01	0.01	1,000	32,000
	10	0.015	0.02	900	20,000	0.01	0.02	720	20,000	0.01	0.01	540	20,000
	15	0.01	0.02	480	12,000	0.01	0.01	400	12,000	0.005	0.01	300	12,000
1	6	0.03	0.05	2,400	40,000	0.03	0.03	2,000	40,000	0.02	0.02	1,600	40,000
	8	0.03	0.03	2,000	36,000	0.02	0.03	1,400	36,000	0.01	0.02	1,000	36,000
	10	0.02	0.03	1,600	32,000	0.015	0.03	800	32,000	0.01	0.015	600	32,000
	14	0.02	0.02	900	20,000	0.01	0.02	720	20,000	0.01	0.01	540	20,000
	20	0.02	0.02	360	8,000	0.01	0.02	320	8,000	0.01	0.01	240	8,000

Notes

※1 Max. Depth of Cut for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Required careful set up of milling conditions, tool path and etc. at cutting parts, such as corners where will become overloaded.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Oil mist coolant is recommended.

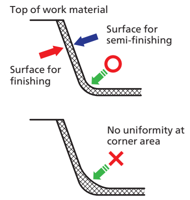
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSBL200

Size R0.05 ～ R1

CBN ≦70 HRC

CBN Core Line

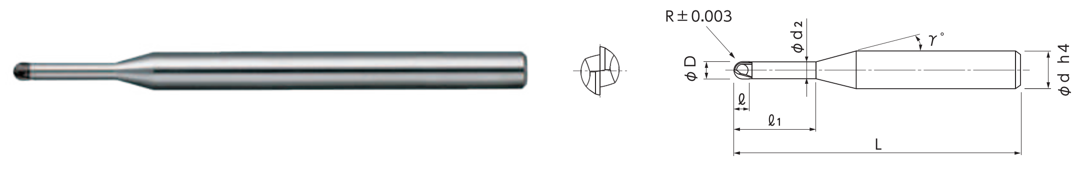
CBN Super Speed Long Neck Ball End Mill

Total 25 sizes

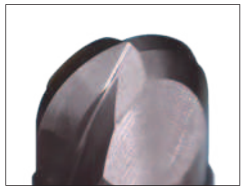
Recommended Milling Conditions

Capable to machine at deep area finishing by maximum L/D=10

2 0° R ±0.003 ϕd h4 3D



- Lineup of CBN tool with long neck applicable to deep milling, available 25 sizes in total.
- Enables milling more deeply by long under neck length up to 10mm.
- Enables wider application for milling by long neck in addition to long life and accurate finishing.
- Standardized in R0.05 at smallest.
- Unique flute design with R-accuracy ±0.003 prevents chipping!



Cutting edge shape

Unit : mm

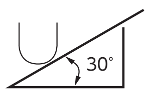
Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00511-00051	R0.05	0.3	0.08	0.1	0.09	15°	4	50
01-00511-00052		0.5	0.08	0.1	0.09	15°	4	50
01-00511-00075	R0.075	0.45	0.12	0.15	0.14	15°	4	50
01-00511-00076		0.75	0.12	0.15	0.14	15°	4	50
01-00511-00101	R0.1	0.6	0.15	0.2	0.19	15°	4	50
01-00511-00102		1	0.15	0.2	0.19	15°	4	50
01-00511-00151	R0.15	0.9	0.23	0.3	0.28	15°	4	50
01-00511-00152		1.5	0.23	0.3	0.28	15°	4	50
01-00511-00201	R0.2	1.2	0.3	0.4	0.37	15°	4	50
01-00511-00202		2	0.3	0.4	0.37	15°	4	50
01-00511-00251	R0.25	1.5	0.38	0.5	0.46	15°	4	50
01-00511-00252		2.5	0.38	0.5	0.46	15°	4	50
01-00511-00301	R0.3	3	0.5	0.6	0.56	15°	4	50
01-00511-00302		4	0.5	0.6	0.56	15°	4	52
01-00511-00303		5	0.5	0.6	0.56	15°	4	52
01-00511-00401	R0.4	4	0.6	0.8	0.76	12°	4	53
01-00511-00501	R0.5	4	0.7	1	0.95	12°	4	53
01-00511-00502		5	0.7	1	0.95	12°	4	53
01-00511-00504		6	0.7	1	0.95	15°	4	53
01-00511-00506		8	0.7	1	0.95	15°	4	53
01-00511-00508		10	0.7	1	0.95	15°	4	53
01-00511-00751	R0.75	7.5	1	1.5	1.45	15°	4	52
01-00511-01001	R1	6	1.2	2	1.94	15°	4	52
01-00511-01003		8	1.2	2	1.94	15°	4	52
01-00511-01005		10	1.2	2	1.94	15°	4	52

How to Order When you order, indicate SSBL200 (R)×(ℓ1). ※(γ) is reference value.

Work Material			Hardened Steels STAVAX･SKD61 (～52HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Steels SKH (～68HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.05	0.3	3	0.005	0.005	200	50,000	0.003	0.005	150	50,000	0.002	0.003	120	50,000
	0.5	5	0.003	0.003	120	50,000	0.003	0.003	100	50,000	0.002	0.003	80	50,000
0.075	0.45	3	0.005	0.005	300	50,000	0.003	0.005	200	50,000	0.002	0.003	150	50,000
	0.75	5	0.003	0.003	200	50,000	0.003	0.003	150	50,000	0.002	0.003	100	50,000
0.1	0.6	3	0.005	0.005	500	50,000	0.005	0.005	380	50,000	0.003	0.003	280	50,000
	1	5	0.005	0.005	300	50,000	0.005	0.005	260	50,000	0.003	0.003	120	50,000
0.15	0.9	3	0.005	0.005	800	50,000	0.005	0.005	460	50,000	0.003	0.005	360	50,000
	1.5	5	0.005	0.005	480	50,000	0.005	0.005	320	50,000	0.003	0.005	280	50,000
0.2	1.2	3	0.005	0.01	1,200	50,000	0.005	0.01	820	50,000	0.005	0.005	580	50,000
	2	5	0.005	0.01	620	50,000	0.005	0.01	580	50,000	0.005	0.005	380	50,000
0.25	1.5	3	0.01	0.01	1,500	50,000	0.01	0.01	1,200	50,000	0.005	0.01	860	50,000
	2.5	5	0.01	0.01	800	50,000	0.01	0.01	680	50,000	0.005	0.01	540	50,000
0.3	3	5	0.01	0.02	1,600	40,000	0.01	0.02	1,200	40,000	0.01	0.01	920	40,000
	4	6.7	0.01	0.01	1,200	30,000	0.01	0.01	960	30,000	0.005	0.01	640	30,000
	5	8.3	0.01	0.01	800	30,000	0.005	0.01	680	30,000	0.005	0.005	480	30,000
0.4	4	5	0.01	0.03	1,500	30,000	0.01	0.02	1,200	30,000	0.01	0.01	920	30,000
0.5	4	4	0.03	0.05	2,400	40,000	0.02	0.03	2,400	40,000	0.02	0.02	1,500	40,000
	5	5	0.02	0.05	2,000	32,000	0.02	0.03	2,000	32,000	0.01	0.02	1,200	32,000
	6	6	0.02	0.03	1,500	25,000	0.01	0.02	1,500	25,000	0.01	0.01	1,000	25,000
	8	8	0.01	0.03	1,200	16,000	0.01	0.02	1,000	16,000	0.01	0.01	840	16,000
	10	10	0.01	0.02	800	12,000	0.005	0.01	720	12,000	0.005	0.005	620	12,000
0.75	7.5	5	0.02	0.03	2,000	32,000	0.01	0.03	1,800	32,000	0.01	0.01	1,200	32,000
1	6	3	0.05	0.05	4,000	40,000	0.03	0.03	4,000	40,000	0.02	0.03	2,600	40,000
	8	4	0.03	0.05	3,000	32,000	0.02	0.03	2,600	32,000	0.01	0.02	1,800	32,000
	10	5	0.02	0.03	2,000	24,000	0.01	0.03	1,600	24,000	0.01	0.02	1,200	24,000

Notes

※1 Depth of Cut shows the maximum value for semi-finishing and finishing.
※2 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 We recommend using oil mist coolant.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.
※6 Length of tool overhang must be as short as possible.
※7 Recommended milling conditions for the sizes L/D (Effective length / Diameter) = 5 or longer are based on machining inclined angle 30 deg. or lower.



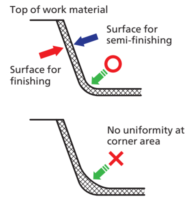
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSPBTN220

Size R0.1 × neck taper angle30′~ R1×neck taper angle2°

CBN ≤70 HRC

SSPBTN220

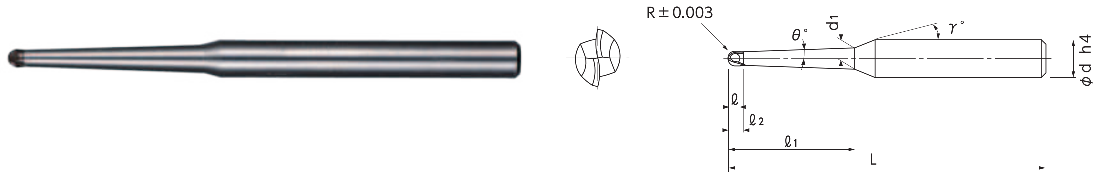
CBN Super Spiral Long Taper Neck Ball End Mill

Total 64 sizes

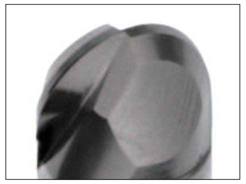
CBN Super Spiral Long Taper Neck Ball End Mill

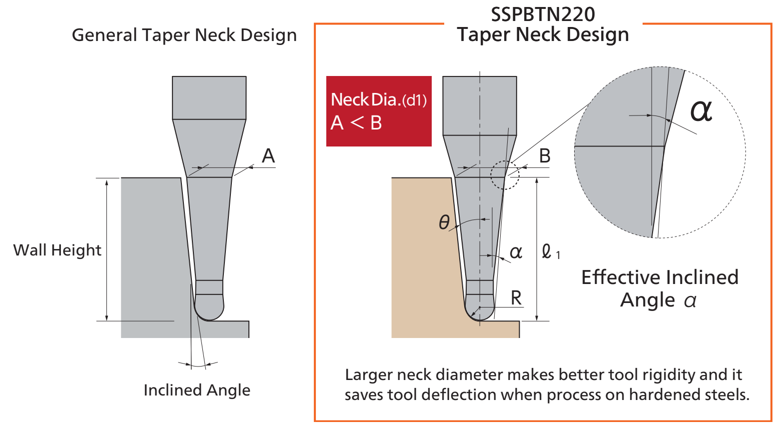
2 20° R ±0.003 φd h4 3D

Taper neck design for high rigidity.
Suitable for deep and high accurate finishing



- To realize more rigid, CBN long neck ball end mill with taper neck are adopted.
- Both efficiency and accuracy are increasing by taper neck design and spiral ball shape with improved sharpness in finish machining on deep milling.


Cutting edge shape



Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Effective Inclined Angle (α)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length2 (ℓ2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00507-01020	R0.1	30′	1.5	0°15′	0.22	0.15	0.25	15°	4	50
01-00507-01021			2	0°15′	0.22	0.15	0.25	15°	4	50
01-00507-01030		1°	1.5	0°45′	0.24	0.15	0.25	15°	4	50
01-00507-01031			2	0°45′	0.25	0.15	0.25	15°	4	50
01-00507-01040		1°30′	1.5	1°15′	0.27	0.15	0.25	15°	4	50
01-00507-01041			2	1°15′	0.29	0.15	0.25	15°	4	50
01-00507-01050		2°	1.5	1°45′	0.29	0.15	0.25	15°	4	50
01-00507-01051			2	1°45′	0.32	0.15	0.25	15°	4	50
01-00507-01520	R0.15	30′	2	0°16′	0.32	0.23	0.38	15°	4	50
01-00507-01521			3	0°16′	0.33	0.23	0.38	15°	4	52
01-00507-01530		1°	2	0°46′	0.35	0.23	0.38	15°	4	50
01-00507-01531			3	0°46′	0.38	0.23	0.38	15°	4	52
01-00507-01540		1°30′	2	1°16′	0.39	0.23	0.38	15°	4	50
01-00507-01541			3	1°16′	0.43	0.23	0.38	15°	4	52
01-00507-01550		2°	2	1°46′	0.42	0.23	0.38	15°	4	50
01-00507-01551			3	1°46′	0.48	0.23	0.38	15°	4	52
01-00507-02020	R0.2	30′	3	0°18′	0.43	0.3	0.5	15°	4	50
01-00507-02021			4	0°18′	0.44	0.3	0.5	15°	4	52
01-00507-02030		1°	3	0°48′	0.48	0.3	0.5	15°	4	50
01-00507-02031			4	0°48′	0.51	0.3	0.5	15°	4	52
01-00507-02040		1°30′	3	1°18′	0.53	0.3	0.5	15°	4	50
01-00507-02041			4	1°18′	0.58	0.3	0.5	15°	4	52
01-00507-02050		2°	3	1°48′	0.58	0.3	0.5	15°	4	50
01-00507-02051			4	1°48′	0.64	0.3	0.5	15°	4	52

How to Order When you order, indicate SSPBTN220 (R)×(θ)×(ℓ1). ※(γ) is reference value.

Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Effective Inclined Angle (α)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length2 (ℓ2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00507-02520	R0.25	30′	4	0°18′	0.54	0.38	0.62	15°	4	52
01-00507-02521			5	0°18′	0.55	0.38	0.62	15°	4	52
01-00507-02530		1°	4	0°48′	0.61	0.38	0.62	15°	4	52
01-00507-02531			5	0°48′	0.64	0.38	0.62	15°	4	52
01-00507-02540		1°30′	4	1°18′	0.67	0.38	0.62	15°	4	52
01-00507-02541			5	1°18′	0.72	0.38	0.62	15°	4	52
01-00507-02550		2°	4	1°48′	0.74	0.38	0.62	15°	4	52
01-00507-02551			5	1°48′	0.8	0.38	0.62	15°	4	52
01-00507-03020	R0.3	30′	5	0°18′	0.65	0.5	0.75	15°	4	53
01-00507-03021			6	0°18′	0.66	0.5	0.75	15°	4	53
01-00507-03030		1°	5	0°48′	0.74	0.5	0.75	15°	4	53
01-00507-03031			6	0°48′	0.76	0.5	0.75	15°	4	53
01-00507-03040		1°30′	5	1°18′	0.82	0.5	0.75	15°	4	53
01-00507-03041			6	1°18′	0.86	0.5	0.75	15°	4	53
01-00507-03050		2°	5	1°48′	0.9	0.5	0.75	15°	4	53
01-00507-03051			6	1°48′	0.96	0.5	0.75	15°	4	53
01-00507-05020	R0.5	30′	8	0°21′	1.1	0.7	1.25	15°	4	53
01-00507-05021			10	0°21′	1.12	0.7	1.25	15°	4	53
01-00507-05030		1°	8	0°51′	1.23	0.7	1.25	15°	4	53
01-00507-05031			10	0°51′	1.29	0.7	1.25	15°	4	53
01-00507-05040		1°30′	8	1°21′	1.36	0.7	1.25	15°	4	53
01-00507-05041			10	1°21′	1.45	0.7	1.25	15°	4	53
01-00507-05050		2°	8	1°51′	1.49	0.7	1.25	15°	4	53
01-00507-05051			10	1°51′	1.62	0.7	1.25	15°	4	53
01-00507-07520	R0.75	30′	10	0°22′	1.62	1	1.9	15°	4	52
01-00507-07521			15	0°22′	1.69	1	1.9	15°	4	52
01-00507-07530		1°	10	0°52′	1.78	1	1.9	15°	4	52
01-00507-07531			15	0°52′	1.94	1	1.9	15°	4	52
01-00507-07540		1°30′	10	1°22′	1.95	1	1.9	15°	4	52
01-00507-07541			15	1°22′	2.18	1	1.9	15°	4	52
01-00507-07550		2°	10	1°52′	2.11	1	1.9	15°	4	52
01-00507-07551			15	1°52′	2.43	1	1.9	15°	4	52
01-00507-10020	R1	30′	16	0°24′	2.21	1.2	2.5	15°	4	53
01-00507-10021			20	0°24′	2.27	1.2	2.5	15°	4	53
01-00507-10030		1°	16	0°54′	2.48	1.2	2.5	15°	4	53
01-00507-10031			20	0°54′	2.6	1.2	2.5	15°	4	53
01-00507-10040		1°30′	16	1°24′	2.74	1.2	2.5	15°	4	53
01-00507-10041			20	1°24′	2.93	1.2	2.5	15°	4	53
01-00507-10050		2°	16	1°54′	3	1.2	2.5	15°	4	53
01-00507-10051			20	1°54′	3.26	1.2	2.5	15°	4	53

Work Material			Hardened Steels STAVAX•SKD61 (~52HRC)				Hardened Steels SKD11•ELMAX (~62HRC)				High Speed Steels SKH•HAP (~68HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.1	30′	1.5	0.003	0.005	140	40,000	0.003	0.003	120	40,000	0.002	0.003	100	40,000
		2	0.003	0.003	120	40,000	0.002	0.003	100	40,000	0.002	0.002	80	40,000
	1°	1.5	0.003	0.005	160	40,000	0.003	0.003	140	40,000	0.002	0.003	120	40,000
		2	0.003	0.003	140	40,000	0.002	0.003	120	40,000	0.002	0.002	90	40,000
	1°30′	1.5	0.003	0.005	200	40,000	0.003	0.003	160	40,000	0.002	0.003	140	40,000
		2	0.003	0.003	160	40,000	0.002	0.003	140	40,000	0.002	0.002	100	40,000
	2°	1.5	0.003	0.005	240	40,000	0.003	0.003	200	40,000	0.002	0.003	160	40,000
		2	0.003	0.003	200	40,000	0.002	0.003	160	40,000	0.002	0.002	120	40,000
0.15	30′	2	0.005	0.005	200	40,000	0.005	0.005	160	40,000	0.003	0.005	120	40,000
		3	0.003	0.005	160	40,000	0.003	0.003	120	40,000	0.002	0.003	100	40,000
	1°	2	0.005	0.005	240	40,000	0.005	0.005	200	40,000	0.003	0.005	160	40,000
		3	0.003	0.005	200	40,000	0.003	0.003	160	40,000	0.002	0.003	120	40,000
	1°30′	2	0.005	0.005	320	40,000	0.005	0.005	240	40,000	0.003	0.005	200	40,000
		3	0.003	0.005	240	40,000	0.003	0.003	200	40,000	0.002	0.003	160	40,000
	2°	2	0.005	0.005	400	40,000	0.005	0.005	300	40,000	0.003	0.005	240	40,000
		3	0.003	0.005	300	40,000	0.003	0.003	240	40,000	0.002	0.003	180	40,000
0.2	30′	3	0.007	0.01	320	40,000	0.005	0.01	240	40,000	0.005	0.005	160	40,000
		4	0.005	0.005	240	36,000	0.005	0.005	180	36,000	0.003	0.005	120	36,000
	1°	3	0.007	0.01	400	40,000	0.005	0.01	300	40,000	0.005	0.005	200	40,000
		4	0.005	0.005	320	36,000	0.005	0.005	240	36,000	0.003	0.005	160	36,000
	1°30′	3	0.007	0.01	480	40,000	0.005	0.01	360	40,000	0.005	0.005	240	40,000
		4	0.005	0.005	400	36,000	0.005	0.005	320	36,000	0.003	0.005	200	36,000
	2°	3	0.007	0.01	540	40,000	0.005	0.01	400	40,000	0.005	0.005	300	40,000
		4	0.005	0.005	480	36,000	0.005	0.005	360	36,000	0.003	0.005	240	36,000
0.25	30′	4	0.01	0.01	400	36,000	0.005	0.01	320	36,000	0.005	0.005	240	36,000
		5	0.005	0.01	320	32,000	0.005	0.005	240	32,000	0.003	0.005	160	32,000
	1°	4	0.01	0.01	480	36,000	0.005	0.01	400	36,000	0.005	0.005	300	36,000
		5	0.005	0.01	400	32,000	0.005	0.005	320	32,000	0.003	0.005	240	32,000
	1°30′	4	0.01	0.01	640	36,000	0.005	0.01	480	36,000	0.005	0.005	360	36,000
		5	0.005	0.01	540	32,000	0.005	0.005	400	32,000	0.003	0.005	300	32,000
	2°	4	0.01	0.01	720	36,000	0.005	0.01	540	36,000	0.005	0.005	400	36,000
		5	0.005	0.01	640	32,000	0.005	0.005	480	32,000	0.003	0.005	360	32,000
0.3	30′	5	0.01	0.01	480	36,000	0.005	0.01	400	36,000	0.005	0.005	300	36,000
		6	0.005	0.01	400	32,000	0.005	0.005	360	32,000	0.003	0.005	240	32,000
	1°	5	0.01	0.01	640	36,000	0.005	0.01	480	36,000	0.005	0.005	400	36,000
		6	0.005	0.01	540	32,000	0.005	0.005	400	32,000	0.003	0.005	300	32,000
	1°30′	5	0.01	0.01	800	36,000	0.005	0.01	640	36,000	0.005	0.005	480	36,000
		6	0.005	0.01	720	32,000	0.005	0.005	540	32,000	0.003	0.005	400	32,000
	2°	5	0.01	0.01	900	36,000	0.005	0.01	720	36,000	0.005	0.005	540	36,000
		6	0.005	0.01	800	32,000	0.005	0.005	640	32,000	0.003	0.005	480	32,000

Work Material			Hardened Steels STAVAX•SKD61 (~52HRC)				Hardened Steels SKD11•ELMAX (~62HRC)				High Speed Steels SKH•HAP (~68HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	30′	8	0.01	0.02	900	20,000	0.01	0.02	800	20,000	0.01	0.01	640	20,000
		10	0.01	0.02	720	16,000	0.005	0.01	640	16,000	0.005	0.005	480	16,000
	1°	8	0.01	0.02	1,000	20,000	0.01	0.02	900	20,000	0.01	0.01	800	20,000
		10	0.01	0.02	800	16,000	0.005	0.01	720	16,000	0.005	0.005	640	16,000
	1°30′	8	0.01	0.02	1,200	20,000	0.01	0.02	1,000	20,000	0.01	0.01	900	20,000
		10	0.01	0.02	900	16,000	0.005	0.01	800	16,000	0.005	0.005	720	16,000
	2°	8	0.01	0.02	1,400	20,000	0.01	0.02	1,200	20,000	0.01	0.01	1,000	20,000
		10	0.01	0.02	1,000	16,000	0.005	0.01	900	16,000	0.005	0.005	800	16,000
0.75	30′	10	0.02	0.02	800	16,000	0.015	0.02	900	16,000	0.01	0.015	600	16,000
		15	0.01	0.02	540	12,000	0.01	0.01	480	12,000	0.005	0.01	400	12,000
	1°	10	0.02	0.02	900	16,000	0.015	0.02	1,000	16,000	0.01	0.015	720	16,000
		15	0.01	0.02	680	12,000	0.01	0.01	600	12,000	0.005	0.01	540	12,000
	1°30′	10	0.02	0.02	1,200	20,000	0.015	0.02	1,000	20,000	0.01	0.015	900	20,000
		15	0.01	0.02	900	16,000	0.01	0.01	800	16,000	0.005	0.01	720	16,000
	2°	10	0.02	0.02	1,400	20,000	0.015	0.02	1,200	20,000	0.01	0.015	1,000	20,000
		15	0.01	0.02	1,000	16,000	0.01	0.01	900	16,000	0.005	0.01	800	16,000
1	30′	16	0.02	0.03	720	12,000	0.015	0.03	540	12,000	0.01	0.02	400	12,000
		20	0.02	0.02	400	8,000	0.01	0.02	360	8,000	0.01	0.01	240	8,000
	1°	16	0.02	0.03	1,000	16,000	0.015	0.03	800	16,000	0.01	0.02	600	16,000
		20	0.02	0.02	600	12,000	0.01	0.02	540	12,000	0.01	0.01	400	12,000
	1°30′	16	0.02	0.03	1,200	20,000	0.015	0.03	1,000	20,000	0.01	0.02	800	20,000
		20	0.02	0.02	900	16,000	0.01	0.02	800	16,000	0.01	0.01	600	16,000
	2°	16	0.02	0.03	1,400	20,000	0.015	0.03	1,200	20,000	0.01	0.02	1,000	20,000
		20	0.02	0.02	1,000	16,000	0.01	0.02	900	16,000	0.01	0.01	800	16,000

Notes

※1 Max. Depth of Cut for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Required careful set up of milling conditions, tool path and etc. at cutting parts, such as corners where will become overloaded.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Oil mist coolant is recommended.

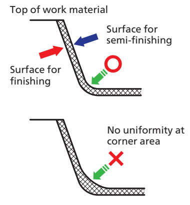
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



SSR200

Size ϕ 0.1 × R0.02 ～ ϕ 2 × R0.5

CBN ≦70 HRC

SSR200

CBN Core Line

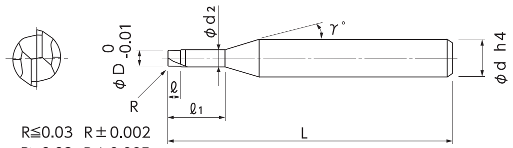
CBN Super Speed Radius End Mill

Total 172 sizes

CBN Super Speed Radius End Mill

Corner radius end mill with CBN material at the cutting edge.
Total 172 sizes. Applicable for various machining profiles

2 | 0° | Corner R ±0.002 (R≦0.03) | Corner R ±0.005 (R>0.03) | ϕd h4 | Slot | Face



- Realized high efficient machining with radius flute along with excellent wear resistance of CBN.
- Realized excellent surface roughness by introducing smooth tangent on all over flute.
- Compatible with hardened steels up to 70HRC.
- Lineup from Dia.0.1mm. 172 sizes in total.

Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00490-01022	0.1	R0.02	0.2	0.04	0.09	15°	4	50
01-00490-01023			0.3	0.04	0.09	15°	4	50
01-00490-01024			0.5	0.04	0.09	15°	4	50
01-00490-01032		R0.03	0.2	0.04	0.09	15°	4	50
01-00490-01033			0.3	0.04	0.09	15°	4	50
01-00490-01034			0.5	0.04	0.09	15°	4	50
01-00490-01522	0.15	R0.02	0.2	0.06	0.14	15°	4	50
01-00490-01523			0.3	0.06	0.14	15°	4	50
01-00490-01524			0.5	0.06	0.14	15°	4	50
01-00490-01532		R0.03	0.2	0.06	0.14	15°	4	50
01-00490-01533			0.3	0.06	0.14	15°	4	50
01-00490-01534			0.5	0.06	0.14	15°	4	50
01-00490-02020	0.2	R0.02	0.3	0.08	0.19	15°	4	50
01-00490-02021			0.5	0.08	0.19	15°	4	50
01-00490-02022			1	0.08	0.19	15°	4	50
01-00490-02030		R0.03	0.3	0.08	0.19	15°	4	50
01-00490-02031			0.5	0.08	0.19	15°	4	50
01-00490-02032			1	0.08	0.19	15°	4	50
01-00490-02050		R0.05	0.3	0.08	0.19	15°	4	50
01-00490-02051			0.5	0.08	0.19	15°	4	50
01-00490-02052			1	0.08	0.19	15°	4	50
01-00490-03021	0.3	R0.02	0.5	0.13	0.28	15°	4	50
01-00490-03020			0.75	0.13	0.28	15°	4	50
01-00490-03022			1	0.13	0.28	15°	4	50
01-00490-03023			1.5	0.13	0.28	15°	4	50
01-00490-03024			2	0.13	0.28	15°	4	50

How to Order When you order, indicate SSR200 (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case S-006, S-007

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00490-03031	0.3	R0.03	0.5	0.13	0.28	15°	4	50
01-00490-03030			0.75	0.13	0.28	15°	4	50
01-00490-03032			1	0.13	0.28	15°	4	50
01-00490-03033			1.5	0.13	0.28	15°	4	50
01-00490-03034			2	0.13	0.28	15°	4	50
01-00490-03051		R0.05	0.5	0.13	0.28	15°	4	50
01-00490-03050			0.75	0.13	0.28	15°	4	50
01-00490-03052			1	0.13	0.28	15°	4	50
01-00490-03053			1.5	0.13	0.28	15°	4	50
01-00490-03054			2	0.13	0.28	15°	4	50
01-00490-04021	0.4	R0.02	0.5	0.24	0.37	15°	4	50
01-00490-04022			1	0.24	0.37	15°	4	50
01-00490-04023			1.5	0.24	0.37	15°	4	50
01-00490-04024			2	0.24	0.37	15°	4	50
01-00490-04031		R0.03	0.5	0.24	0.37	15°	4	50
01-00490-04032			1	0.24	0.37	15°	4	50
01-00490-04033			1.5	0.24	0.37	15°	4	50
01-00490-04034			2	0.24	0.37	15°	4	50
01-00490-04051		R0.05	0.5	0.24	0.37	15°	4	50
01-00490-04052			1	0.24	0.37	15°	4	50
01-00490-04053			1.5	0.24	0.37	15°	4	50
01-00490-04054			2	0.24	0.37	15°	4	50
01-00490-04101		R0.1	0.5	0.24	0.37	15°	4	50
01-00490-04102			1	0.24	0.37	15°	4	50
01-00490-04103			1.5	0.24	0.37	15°	4	50
01-00490-04104			2	0.24	0.37	15°	4	50
01-00490-05020	0.5	R0.02	0.5	0.3	0.46	15°	4	48
01-00490-05022			1	0.3	0.46	15°	4	50
01-00490-05021			1.5	0.3	0.46	15°	4	50
01-00490-05023			2.5	0.3	0.46	15°	4	50
01-00490-05030		R0.03	0.5	0.3	0.46	15°	4	48
01-00490-05032			1	0.3	0.46	15°	4	50
01-00490-05031			1.5	0.3	0.46	15°	4	50
01-00490-05033			2.5	0.3	0.46	15°	4	50
01-00490-05050		R0.05	0.5	0.3	0.46	15°	4	48
01-00490-05052			1	0.3	0.46	15°	4	50
01-00490-05051			1.5	0.3	0.46	15°	4	50
01-00490-05053			2.5	0.3	0.46	15°	4	50
01-00490-05100		R0.1	0.5	0.3	0.46	15°	4	48
01-00490-05102			1	0.3	0.46	15°	4	50
01-00490-05101			1.5	0.3	0.46	15°	4	50
01-00490-05103			2.5	0.3	0.46	15°	4	50
01-00490-06021	0.6	R0.02	0.5	0.3	0.56	15°	4	48
01-00490-06022			1	0.3	0.56	15°	4	50
01-00490-06023			1.5	0.3	0.56	15°	4	50
01-00490-06024			2.5	0.3	0.56	15°	4	50
01-00490-06031		R0.03	0.5	0.3	0.56	15°	4	48
01-00490-06032			1	0.3	0.56	15°	4	50
01-00490-06033			1.5	0.3	0.56	15°	4	50
01-00490-06034			2.5	0.3	0.56	15°	4	50
01-00490-06051		R0.05	0.5	0.3	0.56	15°	4	48
01-00490-06052			1	0.3	0.56	15°	4	50
01-00490-06053			1.5	0.3	0.56	15°	4	50
01-00490-06054			2.5	0.3	0.56	15°	4	50
01-00490-06101		R0.1	0.5	0.3	0.56	15°	4	48
01-00490-06102			1	0.3	0.56	15°	4	50
01-00490-06103			1.5	0.3	0.56	15°	4	50
01-00490-06104			2.5	0.3	0.56	15°	4	50
01-00490-08021	0.8	R0.02	1.5	0.56	0.76	15°	4	50
01-00490-08022			2.5	0.56	0.76	15°	4	50
01-00490-08023			5	0.56	0.76	15°	4	53

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00490-08031	0.8	R0.03	1.5	0.56	0.76	15°	4	50
01-00490-08032			2.5	0.56	0.76	15°	4	50
01-00490-08033			5	0.56	0.76	15°	4	53
01-00490-08051		R0.05	1.5	0.56	0.76	15°	4	50
01-00490-08052			2.5	0.56	0.76	15°	4	50
01-00490-08053			5	0.56	0.76	15°	4	53
01-00490-08101		R0.1	1.5	0.56	0.76	15°	4	50
01-00490-08102			2.5	0.56	0.76	15°	4	50
01-00490-08103			5	0.56	0.76	15°	4	53
01-00490-10020	1	R0.02	1	0.7	0.95	15°	4	49
01-00490-10022			2	0.7	0.95	15°	4	50
01-00490-10021			3	0.7	0.95	15°	4	50
01-00490-10023			5	0.7	0.95	15°	4	53
01-00490-10030		R0.03	1	0.7	0.95	15°	4	49
01-00490-10032			2	0.7	0.95	15°	4	50
01-00490-10031			3	0.7	0.95	15°	4	50
01-00490-10033			5	0.7	0.95	15°	4	53
01-00490-10050		R0.05	1	0.7	0.95	15°	4	49
01-00490-10052			2	0.7	0.95	15°	4	50
01-00490-10051			3	0.7	0.95	15°	4	50
01-00490-10053			5	0.7	0.95	15°	4	53
01-00490-10100		R0.1	1	0.7	0.95	15°	4	49
01-00490-10102			2	0.7	0.95	15°	4	50
01-00490-10101			3	0.7	0.95	15°	4	50
01-00490-10103			5	0.7	0.95	15°	4	53
01-00490-10200		R0.2	1	0.7	0.95	15°	4	49
01-00490-10202			2	0.7	0.95	15°	4	50
01-00490-10201			3	0.7	0.95	15°	4	50
01-00490-10203			5	0.7	0.95	15°	4	53
01-00490-10300		R0.3	1	0.7	0.95	15°	4	49
01-00490-10302			2	0.7	0.95	15°	4	50
01-00490-10301			3	0.7	0.95	15°	4	50
01-00490-10303			5	0.7	0.95	15°	4	53
01-00490-15022	1.5	R0.02	2	1	1.45	15°	4	52
01-00490-15020			3	1	1.45	15°	4	52
01-00490-15021			4.5	1	1.45	15°	4	52
01-00490-15023			7.5	1	1.45	15°	4	52
01-00490-15032		R0.03	2	1	1.45	15°	4	52
01-00490-15030			3	1	1.45	15°	4	52
01-00490-15031			4.5	1	1.45	15°	4	52
01-00490-15033			7.5	1	1.45	15°	4	52
01-00490-15052		R0.05	2	1	1.45	15°	4	52
01-00490-15050			3	1	1.45	15°	4	52
01-00490-15051			4.5	1	1.45	15°	4	52
01-00490-15053			7.5	1	1.45	15°	4	52
01-00490-15102		R0.1	2	1	1.45	15°	4	52
01-00490-15100			3	1	1.45	15°	4	52
01-00490-15101			4.5	1	1.45	15°	4	52
01-00490-15103			7.5	1	1.45	15°	4	52

How to Order When you order, indicate SSR200 (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case S-006, S-007

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00490-15202	1.5	R0.2	2	1	1.45	15°	4	52
01-00490-15200			3	1	1.45	15°	4	52
01-00490-15201			4.5	1	1.45	15°	4	52
01-00490-15203			7.5	1	1.45	15°	4	52
01-00490-15302		R0.3	2	1	1.45	15°	4	52
01-00490-15300			3	1	1.45	15°	4	52
01-00490-15301			4.5	1	1.45	15°	4	52
01-00490-15303			7.5	1	1.45	15°	4	52
01-00490-20022	2	R0.02	3	1.2	1.94	15°	4	53
01-00490-20020			4	1.2	1.94	15°	4	53
01-00490-20021			6	1.2	1.94	15°	4	53
01-00490-20023			10	1.2	1.94	15°	4	53
01-00490-20032		R0.03	3	1.2	1.94	15°	4	53
01-00490-20030			4	1.2	1.94	15°	4	53
01-00490-20031			6	1.2	1.94	15°	4	53
01-00490-20033			10	1.2	1.94	15°	4	53
01-00490-20052		R0.05	3	1.2	1.94	15°	4	53
01-00490-20050			4	1.2	1.94	15°	4	53
01-00490-20051			6	1.2	1.94	15°	4	53
01-00490-20053			10	1.2	1.94	15°	4	53
01-00490-20102		R0.1	3	1.2	1.94	15°	4	53
01-00490-20100			4	1.2	1.94	15°	4	53
01-00490-20101			6	1.2	1.94	15°	4	52
01-00490-20103			10	1.2	1.94	15°	4	52
01-00490-20202		R0.2	3	1.2	1.94	15°	4	53
01-00490-20200			4	1.2	1.94	15°	4	53
01-00490-20201			6	1.2	1.94	15°	4	52
01-00490-20203			10	1.2	1.94	15°	4	52
01-00490-20302		R0.3	3	1.2	1.94	15°	4	53
01-00490-20300			4	1.2	1.94	15°	4	53
01-00490-20301			6	1.2	1.94	15°	4	52
01-00490-20303			10	1.2	1.94	15°	4	52
01-00490-20502		R0.5	3	1.2	1.94	15°	4	53
01-00490-20500			4	1.2	1.94	15°	4	53
01-00490-20501			6	1.2	1.94	15°	4	52
01-00490-20503			10	1.2	1.94	15°	4	52

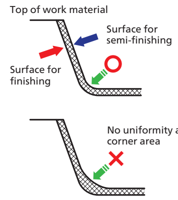
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



Work Material			Hardened Steels SKD61・STAVAX (~52HRC)				Hardened Steels DC53・ELMAX・PD613 (~62HRC)				High Speed Steels DRM3・YXR3 (~68HRC)			
Dia.	Corner Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.1	0.02・0.03	0.2	0.002	0.015	200	50,000	0.002	0.01	150	50,000	0.001	0.01	100	50,000
		0.3	0.002	0.015	150	50,000	0.001	0.01	100	50,000	0.001	0.01	50	50,000
		0.5	0.002	0.01	150	50,000	0.001	0.01	100	50,000	0.001	0.01	50	50,000
0.15	0.02・0.03	0.2	0.003	0.02	250	50,000	0.003	0.02	200	50,000	0.002	0.015	150	50,000
		0.3	0.003	0.02	200	50,000	0.003	0.02	150	50,000	0.002	0.015	100	50,000
		0.5	0.002	0.02	200	50,000	0.002	0.02	150	50,000	0.001	0.015	100	50,000
0.2	0.02・0.03・0.05	0.3	0.003	0.03	400	50,000	0.003	0.03	350	50,000	0.002	0.02	250	50,000
		0.5	0.003	0.03	300	50,000	0.003	0.03	300	50,000	0.002	0.02	200	50,000
		1	0.003	0.02	200	50,000	0.003	0.02	200	50,000	0.002	0.01	100	50,000
0.3	0.02・0.03・0.05	0.5・0.75・1	0.003	0.05	500	50,000	0.003	0.05	400	50,000	0.002	0.03	300	50,000
		1.5・2	0.003	0.03	400	50,000	0.003	0.03	300	50,000	0.002	0.02	200	50,000
0.4	0.02・0.03・0.05・0.1	0.5・1	0.005	0.1	700	50,000	0.005	0.1	600	50,000	0.003	0.03	400	50,000
		1.5・2	0.005	0.05	500	50,000	0.005	0.05	400	50,000	0.003	0.02	300	50,000
0.5	0.02・0.03	0.5・1・1.5	0.005	0.2	600	50,000	0.005	0.2	600	50,000	0.003	0.1	500	50,000
		2.5	0.005	0.1	600	50,000	0.005	0.1	600	50,000	0.003	0.05	500	50,000
	0.05	0.5・1・1.5	0.01	0.2	600	50,000	0.01	0.2	600	50,000	0.005	0.2	500	50,000
		2.5	0.01	0.1	600	50,000	0.01	0.1	600	50,000	0.005	0.1	500	50,000
	0.1	0.5・1・1.5	0.02	0.2	800	50,000	0.02	0.2	800	50,000	0.01	0.1	700	50,000
		2.5	0.01	0.1	800	50,000	0.01	0.1	800	50,000	0.01	0.05	700	50,000
0.6	0.02・0.03	0.5・1・1.5	0.005	0.2	600	50,000	0.005	0.2	600	50,000	0.003	0.1	500	50,000
		2.5	0.005	0.1	600	50,000	0.005	0.1	600	50,000	0.003	0.05	500	50,000
	0.05	0.5・1・1.5	0.01	0.2	600	50,000	0.01	0.2	600	50,000	0.005	0.2	500	50,000
		2.5	0.01	0.1	600	50,000	0.01	0.1	600	50,000	0.005	0.1	500	50,000
	0.1	0.5・1・1.5	0.02	0.2	1,000	50,000	0.02	0.2	1,000	50,000	0.01	0.1	700	50,000
		2.5	0.01	0.1	1,000	50,000	0.01	0.1	1,000	50,000	0.01	0.05	700	50,000
0.8	0.02・0.03	1.5・2.5	0.005	0.2	800	50,000	0.005	0.2	800	50,000	0.003	0.1	600	40,000
		5	0.005	0.1	800	50,000	0.005	0.1	800	50,000	0.003	0.05	600	40,000
	0.05	1.5・2.5	0.02	0.3	1,000	50,000	0.02	0.2	1,000	50,000	0.01	0.1	700	40,000
		5	0.01	0.2	1,000	50,000	0.01	0.1	1,000	50,000	0.01	0.05	700	40,000
	0.1	1.5・2.5	0.02	0.3	1,400	50,000	0.02	0.2	1,200	50,000	0.01	0.1	1,000	40,000
		5	0.01	0.2	1,400	50,000	0.01	0.1	1,200	50,000	0.01	0.05	1,000	40,000

SSR200

Recommended Milling Conditions

CBN Core Line

Work Material			Hardened Steels SKD61・STAVAX (~52HRC)				Hardened Steels DC53・ELMAX・PD613 (~62HRC)				High Speed Steels DRM3・YXR3 (~68HRC)			
Dia.	Corner Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
1	0.02・0.03	1・2	0.005	0.4	800	48,000	0.005	0.3	800	48,000	0.005	0.2	600	32,000
	0.05		0.01	0.4	1,000	48,000	0.01	0.3	1,000	48,000	0.01	0.2	800	32,000
	0.1・0.2・0.3		0.03	0.4	1,500	48,000	0.03	0.3	1,200	48,000	0.01	0.2	1,000	32,000
	0.02・0.03	3・5	0.005	0.3	800	48,000	0.005	0.2	800	48,000	0.005	0.1	600	32,000
	0.05		0.01	0.3	1,000	48,000	0.01	0.2	1,000	48,000	0.01	0.1	800	32,000
	0.1・0.2・0.3		0.02	0.3	1,500	48,000	0.02	0.2	1,200	48,000	0.01	0.1	1,000	32,000
1.5	0.02・0.03	2	0.005	0.7	1,200	32,000	0.005	0.6	1,100	32,000	0.005	0.3	900	20,000
	0.05		0.02	0.7	1,200	32,000	0.01	0.6	1,100	32,000	0.01	0.3	900	20,000
	0.1・0.2・0.3		0.04	0.7	2,400	32,000	0.04	0.6	1,800	32,000	0.01	0.3	1,300	20,000
	0.02・0.03	3・4.5	0.005	0.7	1,000	32,000	0.005	0.6	1,000	32,000	0.005	0.3	800	20,000
	0.05		0.02	0.7	1,000	32,000	0.01	0.6	1,000	32,000	0.01	0.3	800	20,000
	0.1・0.2・0.3		0.04	0.7	2,000	32,000	0.04	0.6	1,500	32,000	0.01	0.3	1,200	20,000
	0.02・0.03	7.5	0.005	0.5	1,000	32,000	0.005	0.4	1,000	32,000	0.005	0.2	800	20,000
	0.05		0.02	0.5	1,000	32,000	0.01	0.4	1,000	32,000	0.01	0.2	800	20,000
	0.1・0.2・0.3		0.03	0.5	2,000	32,000	0.03	0.4	1,500	32,000	0.01	0.2	1,200	20,000
2	0.02・0.03	3	0.005	0.8	1,200	24,000	0.005	0.7	1,100	24,000	0.005	0.5	900	16,000
	0.05		0.02	0.8	1,200	24,000	0.01	0.7	1,100	24,000	0.01	0.5	900	16,000
	0.1・0.2・0.3・0.5		0.05	0.8	2,400	24,000	0.05	0.7	1,800	24,000	0.01	0.5	1,300	16,000
	0.02・0.03	4・6	0.005	0.8	1,000	24,000	0.005	0.7	1,000	24,000	0.005	0.5	800	16,000
	0.05		0.02	0.8	1,000	24,000	0.01	0.7	1,000	24,000	0.01	0.5	800	16,000
	0.1・0.2・0.3・0.5		0.05	0.8	2,000	24,000	0.05	0.7	1,500	24,000	0.01	0.5	1,200	16,000
	0.02・0.03	10	0.005	0.6	1,000	24,000	0.005	0.5	1,000	24,000	0.005	0.3	800	16,000
	0.05		0.02	0.6	1,000	24,000	0.01	0.5	1,000	24,000	0.01	0.3	800	16,000
	0.1・0.2・0.3・0.5		0.03	0.6	2,000	24,000	0.03	0.5	1,500	24,000	0.01	0.3	1,200	16,000

Notes

※1 Depth of Cut shows the maximum value for semi-finishing and finishing. Adjust milling conditions depending on the rigidity of the machine and desired accuracy.
※2 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 Recommend to apply helical or ramping for approaching into axial direction.
※4 We recommend using oil mist coolant.
※5 Adjust both spindle speed and feed at the same rate.
※6 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.
※7 Length of tool overhang must be as short as possible.
※8 Machine, tool chuck must be sufficiently accurate.

Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H

Long Neck Corner Radius

CBN Core Line

SHR320

Size φ 0.5 × R0.1 ～ φ 2 × R0.3

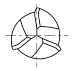
CBN ≤70 HRC

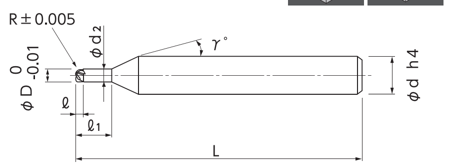
CBN High Efficient Radius End Mill

Total 14 sizes

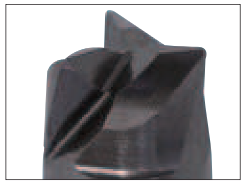
3-flute CBN corner radius end mill.
Realized high efficient and high accurate machining

3 · 20° · Corner R ±0. 005 · φd h4 · Slot · Face





- Realized high accuracy and high efficiency machining by adopting 3 flutes and corner R with spiral shape.



Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00495-05011	0.5	R0.1	1.5	0.25	0.46	15°	4	50
01-00495-05012			2.5	0.25	0.46	15°	4	50
01-00495-10011	1	R0.1	3	0.5	0.95	15°	4	50
01-00495-10012			5	0.5	0.95	15°	4	52
01-00495-10021		R0.2	3	0.5	0.95	15°	4	50
01-00495-10022			5	0.5	0.95	15°	4	52
01-00495-15011	1.5	R0.1	4.5	0.75	1.45	15°	4	52
01-00495-15012			7.5	0.75	1.45	15°	4	52
01-00495-15021		R0.2	4.5	0.75	1.45	15°	4	52
01-00495-15022			7.5	0.75	1.45	15°	4	52
01-00495-20011	2	R0.1	6	1	1.94	15°	4	52
01-00495-20012			10	1	1.94	15°	4	52
01-00495-20031		R0.3	6	1	1.94	15°	4	52
01-00495-20032			10	1	1.94	15°	4	52

How to Order When you order, indicate SHR320 (D)×(R)×(ℓ1). ※(γ) is reference value.

Long Neck Corner Radius

SHR320

CBN Core Line

Recommended Milling Conditions

Work Material			Hardened Steels STAVAX・SKD61 (～52HRC)				Hardened Steels SKD11・ELMAX (～62HRC)				High Speed Steels SKH・HAP (～68HRC)			
Dia.	Corner Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min-1	ap mm	ae mm	mm/min	min-1	ap mm	ae mm	mm/min	min-1
0.5	0.1	1.5	0.008	0.2	1,500	50,000	0.005	0.15	800	50,000	0.003	0.1	600	50,000
		2.5	0.006	0.15	1,000	40,000	0.005	0.1	500	40,000	0.003	0.05	300	40,000
1	0.1 0.2	3	0.012	0.4	2,000	40,000	0.007	0.25	1,000	40,000	0.006	0.15	800	35,000
		5	0.008	0.3	1,500	30,000	0.005	0.15	800	30,000	0.004	0.1	400	25,000
1.5	0.1 0.2	4.5	0.015	0.6	2,500	35,000	0.008	0.4	1,200	35,000	0.007	0.2	1,000	30,000
		7.5	0.012	0.4	1,800	25,000	0.006	0.3	1,000	25,000	0.005	0.15	500	20,000
2	0.1 0.3	6	0.02	0.8	3,000	30,000	0.01	0.6	1,500	30,000	0.008	0.3	1,200	25,000
		10	0.015	0.6	2,000	20,000	0.008	0.4	1,000	20,000	0.006	0.2	600	18,000

Notes

※1 Depth of Cut is for contour line milling as the value of reference. Please adjust it depending on machine rigidity and machining method.
※2 Ramping approach with angle 3° or smaller is recommended.
※3 Recommend leaving uniform finishing allowance on the machined surface in the pre-stage cutting (semi-finishing).
※4 When cutting high load sections or complex shapes, it requires attention to condition setting and tool path.
※5 Adjust both spindle speed and feed at the same rate.
※6 Oil mist coolant is recommended.

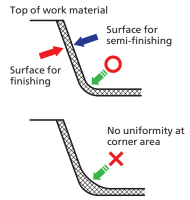
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel
H ~70 HRC Hardened Steel

Long Neck Corner Radius

SHPR400

Size ϕ 0.1 × R0.01 ～ ϕ 3 × R0.2

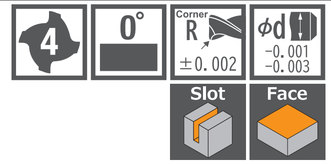
CBN ≦70 HRC

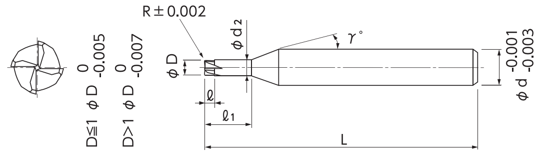
CBN Super High Precision Radius End Mill

Total 142 sizes

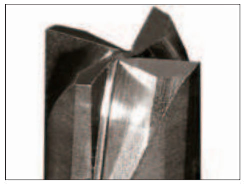
CBN Super High Precision Radius End Mill

4-flute corner radius end mill from Dia.0.1mm.
High precise type to pursue machining accuracy





- New tool design has been developed to reduce the cutting resistance and upgrade the finishing accuracy!
- Realized 4-Flute type from ϕ0.1! Achieved higher efficient machining and more stable tool life in micro machining!
- The shank diameter accuracy is 2μm (-0.001~-0.003), and also supports high precision shrink fit holders.



Cutting edge shape

Beware of stocks because there is no blade to the shaft center of endteeth of ϕ0.1 and ϕ0.15.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00485-01002	0.1	R0.01	0.2	0.04	0.09	15°	4	50
01-00485-01003			0.3	0.04	0.09	15°	4	50
01-00485-01005			0.5	0.04	0.09	15°	4	50
01-00485-01022		R0.02	0.2	0.04	0.09	15°	4	50
01-00485-01023			0.3	0.04	0.09	15°	4	50
01-00485-01025			0.5	0.04	0.09	15°	4	50
01-00485-01522	0.15	R0.02	0.2	0.06	0.14	15°	4	50
01-00485-01523			0.3	0.06	0.14	15°	4	50
01-00485-01525			0.5	0.06	0.14	15°	4	50
01-00485-01532		R0.03	0.2	0.06	0.14	15°	4	50
01-00485-01533			0.3	0.06	0.14	15°	4	50
01-00485-01535			0.5	0.06	0.14	15°	4	50
01-00485-02203	0.2	R0.02	0.3	0.08	0.19	15°	4	50
01-00485-02205			0.5	0.08	0.19	15°	4	50
01-00485-02210			1	0.08	0.19	15°	4	50
01-00485-02303		R0.03	0.3	0.08	0.19	15°	4	50
01-00485-02305			0.5	0.08	0.19	15°	4	50
01-00485-02310			1	0.08	0.19	15°	4	50
01-00485-03205	0.3	R0.02	0.5	0.13	0.285	15°	4	50
01-00485-03207			0.75	0.13	0.285	15°	4	50
01-00485-03210			1	0.13	0.285	15°	4	50
01-00485-03215			1.5	0.13	0.285	15°	4	50
01-00485-03220			2	0.13	0.285	15°	4	50

How to Order When you order, indicate SHPR400 (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case S-008

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00485-03405	0.3	R0.05	0.5	0.13	0.285	15°	4	50
01-00485-03407			0.75	0.13	0.285	15°	4	50
01-00485-03410			1	0.13	0.285	15°	4	50
01-00485-03415			1.5	0.13	0.285	15°	4	50
01-00485-03420			2	0.13	0.285	15°	4	50
01-00485-04205	0.4	R0.02	0.5	0.24	0.37	15°	4	50
01-00485-04210			1	0.24	0.37	15°	4	50
01-00485-04215			1.5	0.24	0.37	15°	4	50
01-00485-04220			2	0.24	0.37	15°	4	50
01-00485-04225			2.5	0.24	0.37	15°	4	50
01-00485-04405		R0.05	0.5	0.24	0.37	15°	4	50
01-00485-04410			1	0.24	0.37	15°	4	50
01-00485-04415			1.5	0.24	0.37	15°	4	50
01-00485-04420			2	0.24	0.37	15°	4	50
01-00485-04425			2.5	0.24	0.37	15°	4	50
01-00485-04505		R0.1	0.5	0.24	0.37	15°	4	50
01-00485-04510			1	0.24	0.37	15°	4	50
01-00485-04515			1.5	0.24	0.37	15°	4	50
01-00485-04520			2	0.24	0.37	15°	4	50
01-00485-04525			2.5	0.24	0.37	15°	4	50
01-00485-05205	0.5	R0.02	0.5	0.3	0.46	15°	4	48
01-00485-05210			1	0.3	0.46	15°	4	50
01-00485-05215			1.5	0.3	0.46	15°	4	50
01-00485-05220			2	0.3	0.46	15°	4	50
01-00485-05225			2.5	0.3	0.46	15°	4	50
01-00485-05405		R0.05	0.5	0.3	0.46	15°	4	48
01-00485-05410			1	0.3	0.46	15°	4	50
01-00485-05415			1.5	0.3	0.46	15°	4	50
01-00485-05420			2	0.3	0.46	15°	4	50
01-00485-05425			2.5	0.3	0.46	15°	4	50
01-00485-05505		R0.1	0.5	0.3	0.46	15°	4	48
01-00485-05510			1	0.3	0.46	15°	4	50
01-00485-05515			1.5	0.3	0.46	15°	4	50
01-00485-05520			2	0.3	0.46	15°	4	50
01-00485-05525			2.5	0.3	0.46	15°	4	50
01-00485-06205	0.6	R0.02	0.5	0.3	0.56	15°	4	48
01-00485-06210			1	0.3	0.56	15°	4	50
01-00485-06215			1.5	0.3	0.56	15°	4	50
01-00485-06220			2	0.3	0.56	15°	4	50
01-00485-06225			2.5	0.3	0.56	15°	4	50
01-00485-06405		R0.05	0.5	0.3	0.56	15°	4	48
01-00485-06410			1	0.3	0.56	15°	4	50
01-00485-06415			1.5	0.3	0.56	15°	4	50
01-00485-06420			2	0.3	0.56	15°	4	50
01-00485-06425			2.5	0.3	0.56	15°	4	50
01-00485-06505		R0.1	0.5	0.3	0.56	15°	4	48
01-00485-06510			1	0.3	0.56	15°	4	50
01-00485-06515			1.5	0.3	0.56	15°	4	50
01-00485-06520			2	0.3	0.56	15°	4	50
01-00485-06525			2.5	0.3	0.56	15°	4	50
01-00485-08215	0.8	R0.02	1.5	0.56	0.76	15°	4	50
01-00485-08225			2.5	0.56	0.76	15°	4	50
01-00485-08250			5	0.56	0.76	15°	4	53
01-00485-08415		R0.05	1.5	0.56	0.76	15°	4	50
01-00485-08425			2.5	0.56	0.76	15°	4	50
01-00485-08450			5	0.56	0.76	15°	4	53
01-00485-08515		R0.1	1.5	0.56	0.76	15°	4	50
01-00485-08525			2.5	0.56	0.76	15°	4	50
01-00485-08550			5	0.56	0.76	15°	4	53
01-00485-10201	1	R0.02	1	0.7	0.95	15°	4	49
01-00485-10202			2	0.7	0.95	15°	4	50
01-00485-10203			3	0.7	0.95	15°	4	50
01-00485-10205			5	0.7	0.95	15°	4	53

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00485-10401	1	R0.05	1	0.7	0.95	15°	4	49
01-00485-10402			2	0.7	0.95	15°	4	50
01-00485-10403			3	0.7	0.95	15°	4	50
01-00485-10405			5	0.7	0.95	15°	4	53
01-00485-10501		R0.1	1	0.7	0.95	15°	4	49
01-00485-10502			2	0.7	0.95	15°	4	50
01-00485-10503			3	0.7	0.95	15°	4	50
01-00485-10505			5	0.7	0.95	15°	4	53
01-00485-10601		R0.2	1	0.7	0.95	15°	4	49
01-00485-10602			2	0.7	0.95	15°	4	50
01-00485-10603			3	0.7	0.95	15°	4	50
01-00485-10605			5	0.7	0.95	15°	4	53
01-00485-15202	1.5	R0.02	2	1	1.45	15°	4	52
01-00485-15203			3	1	1.45	15°	4	52
01-00485-15204			4.5	1	1.45	15°	4	52
01-00485-15207			7.5	1	1.45	15°	4	52
01-00485-15402		R0.05	2	1	1.45	15°	4	52
01-00485-15403			3	1	1.45	15°	4	52
01-00485-15404			4.5	1	1.45	15°	4	52
01-00485-15407			7.5	1	1.45	15°	4	52
01-00485-15502		R0.1	2	1	1.45	15°	4	52
01-00485-15503			3	1	1.45	15°	4	52
01-00485-15504			4.5	1	1.45	15°	4	52
01-00485-15507			7.5	1	1.45	15°	4	52
01-00485-15602		R0.2	2	1	1.45	15°	4	52
01-00485-15603			3	1	1.45	15°	4	52
01-00485-15604			4.5	1	1.45	15°	4	52
01-00485-15607			7.5	1	1.45	15°	4	52
01-00485-20203	2	R0.02	3	1.2	1.94	15°	4	53
01-00485-20204			4	1.2	1.94	15°	4	53
01-00485-20206			6	1.2	1.94	15°	4	53
01-00485-20210			10	1.2	1.94	15°	4	53
01-00485-20403		R0.05	3	1.2	1.94	15°	4	53
01-00485-20404			4	1.2	1.94	15°	4	53
01-00485-20406			6	1.2	1.94	15°	4	53
01-00485-20410			10	1.2	1.94	15°	4	53
01-00485-20503		R0.1	3	1.2	1.94	15°	4	53
01-00485-20504			4	1.2	1.94	15°	4	53
01-00485-20506			6	1.2	1.94	15°	4	53
01-00485-20510			10	1.2	1.94	15°	4	53
01-00485-20603		R0.2	3	1.2	1.94	15°	4	53
01-00485-20604			4	1.2	1.94	15°	4	53
01-00485-20606			6	1.2	1.94	15°	4	53
01-00485-20610			10	1.2	1.94	15°	4	53
01-00485-30406	3	R0.05	6	1.8	2.85	15°	6	53
01-00485-30409			9	1.8	2.85	15°	6	53
01-00485-30412			12	1.8	2.85	15°	6	63
01-00485-30415			15	1.8	2.85	15°	6	63
01-00485-30506		R0.1	6	1.8	2.85	15°	6	53
01-00485-30509			9	1.8	2.85	15°	6	53
01-00485-30512			12	1.8	2.85	15°	6	63
01-00485-30515			15	1.8	2.85	15°	6	63
01-00485-30606		R0.2	6	1.8	2.85	15°	6	53
01-00485-30609			9	1.8	2.85	15°	6	53
01-00485-30612			12	1.8	2.85	15°	6	63
01-00485-30615			15	1.8	2.85	15°	6	63

How to Order When you order, indicate SHPR400 (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case S-008

Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H
Long Neck Corner Radius

Work Material				Hardened Steels STAVAX·SKD61 (~52HRC)				Hardened Steels SKD11·ELMAX (~62HRC)				High Speed Steels SKH·HAP (~68HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
				ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.1	R0.01	0.2	2	0.002	0.015	320	50,000	0.002	0.01	240	50,000	0.001	0.01	120	50,000
		0.3	3	0.002	0.015	240	50,000	0.001	0.01	160	50,000	0.001	0.01	60	50,000
		0.5	5	0.002	0.01	240	50,000	0.001	0.01	160	50,000	0.001	0.01	60	50,000
	R0.02	0.2	2	0.002	0.015	400	50,000	0.002	0.01	300	50,000	0.001	0.01	200	50,000
		0.3	3	0.002	0.015	300	50,000	0.001	0.01	200	50,000	0.001	0.01	100	50,000
		0.5	5	0.002	0.01	300	50,000	0.001	0.01	200	50,000	0.001	0.01	100	50,000
0.15	R0.02	0.2	1.3	0.003	0.02	500	50,000	0.003	0.02	400	50,000	0.002	0.015	300	50,000
		0.3	2	0.003	0.02	400	50,000	0.003	0.02	300	50,000	0.002	0.015	200	50,000
		0.5	3.3	0.002	0.02	400	50,000	0.002	0.02	300	50,000	0.001	0.015	200	50,000
	R0.03	0.2	1.3	0.003	0.02	500	50,000	0.003	0.02	400	50,000	0.002	0.015	300	50,000
		0.3	2	0.003	0.02	400	50,000	0.003	0.02	300	50,000	0.002	0.015	200	50,000
		0.5	3.3	0.002	0.02	400	50,000	0.002	0.02	300	50,000	0.001	0.015	200	50,000
0.2	R0.02	0.3	1.5	0.003	0.03	800	50,000	0.003	0.03	700	50,000	0.002	0.02	500	50,000
		0.5	2.5	0.003	0.03	600	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
		1	5	0.003	0.02	400	50,000	0.003	0.02	400	50,000	0.002	0.01	200	50,000
	R0.03	0.3	1.5	0.003	0.03	800	50,000	0.003	0.03	700	50,000	0.002	0.02	500	50,000
		0.5	2.5	0.003	0.03	600	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
		1	5	0.003	0.02	400	50,000	0.003	0.02	400	50,000	0.002	0.01	200	50,000
0.3	R0.02	0.5	1.7	0.003	0.05	800	50,000	0.003	0.05	700	50,000	0.002	0.03	500	50,000
		0.75	2.5	0.003	0.05	800	50,000	0.003	0.05	640	50,000	0.002	0.03	480	50,000
		1	3.3	0.003	0.05	800	50,000	0.003	0.05	640	50,000	0.002	0.03	480	50,000
		1.5	5	0.003	0.03	640	50,000	0.003	0.03	480	50,000	0.002	0.02	320	50,000
		2	6.7	0.003	0.03	640	50,000	0.003	0.03	480	50,000	0.002	0.02	320	50,000
	R0.05	0.5	1.7	0.003	0.05	1,000	50,000	0.003	0.05	800	50,000	0.002	0.03	600	50,000
		0.75	2.5	0.003	0.05	1,000	50,000	0.003	0.05	800	50,000	0.002	0.03	600	50,000
		1	3.3	0.003	0.05	1,000	50,000	0.003	0.05	800	50,000	0.002	0.03	600	50,000
		1.5	5	0.003	0.03	800	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
		2	6.7	0.003	0.03	800	50,000	0.003	0.03	600	50,000	0.002	0.02	400	50,000
0.4	R0.02	0.5	1.3	0.004	0.1	900	50,000	0.004	0.1	800	50,000	0.003	0.08	600	50,000
		1	2.5	0.004	0.1	900	50,000	0.004	0.1	800	50,000	0.003	0.08	600	50,000
		1.5	3.8	0.004	0.1	900	50,000	0.004	0.1	800	50,000	0.003	0.08	600	50,000
		2	5	0.004	0.08	800	50,000	0.004	0.08	700	50,000	0.003	0.05	500	50,000
		2.5	6.3	0.004	0.08	800	50,000	0.004	0.08	700	50,000	0.003	0.05	500	50,000
	R0.05	0.5	1.3	0.005	0.1	1,100	50,000	0.005	0.1	1,000	50,000	0.004	0.08	800	50,000
		1	2.5	0.005	0.1	1,100	50,000	0.005	0.1	1,000	50,000	0.004	0.08	800	50,000
		1.5	3.8	0.005	0.1	1,100	50,000	0.005	0.1	1,000	50,000	0.004	0.08	800	50,000
		2	5	0.005	0.08	1,000	50,000	0.005	0.08	800	50,000	0.004	0.05	600	50,000
		2.5	6.3	0.005	0.08	1,000	50,000	0.005	0.08	800	50,000	0.004	0.05	600	50,000
	R0.1	0.5	1.3	0.008	0.1	1,200	50,000	0.008	0.1	1,100	50,000	0.005	0.08	900	50,000
		1	2.5	0.008	0.1	1,200	50,000	0.008	0.1	1,100	50,000	0.005	0.08	900	50,000
		1.5	3.8	0.008	0.1	1,200	50,000	0.008	0.1	1,100	50,000	0.005	0.08	900	50,000
		2	5	0.005	0.08	1,200	50,000	0.005	0.08	1,100	50,000	0.004	0.05	900	50,000
		2.5	6.3	0.005	0.08	1,200	50,000	0.005	0.08	1,100	50,000	0.004	0.05	900	50,000
0.5	R0.02	0.5	1	0.005	0.15	1,000	50,000	0.005	0.15	1,000	50,000	0.003	0.1	800	50,000
		1	2	0.005	0.15	1,000	50,000	0.005	0.15	1,000	50,000	0.003	0.1	800	50,000
		1.5	3	0.005	0.15	1,000	50,000	0.005	0.15	1,000	50,000	0.003	0.1	800	50,000
		2	4	0.005	0.1	1,000	50,000	0.005	0.1	1,000	50,000	0.003	0.08	800	50,000
		2.5	5	0.005	0.08	1,000	50,000	0.005	0.08	1,000	50,000	0.003	0.05	800	50,000
	R0.05	0.5	1	0.01	0.15	1,200	50,000	0.01	0.15	1,200	50,000	0.007	0.1	1,000	50,000
		1	2	0.01	0.15	1,200	50,000	0.01	0.15	1,200	50,000	0.007	0.1	1,000	50,000
		1.5	3	0.01	0.15	1,200	50,000	0.01	0.15	1,200	50,000	0.007	0.1	1,000	50,000
		2	4	0.007	0.12	1,200	50,000	0.007	0.12	1,200	50,000	0.005	0.08	1,000	50,000
		2.5	5	0.007	0.1	1,200	50,000	0.007	0.1	1,200	50,000	0.005	0.07	1,000	50,000

Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H
Long Neck Corner Radius

Work Material				Hardened Steels STAVAX・SKD61 (~52HRC)				Hardened Steels SKD11・ELMAX (~62HRC)				High Speed Steels SKH・HAP (~68HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
				ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	R0.1	0.5	1	0.02	0.15	1,600	50,000	0.02	0.15	1,500	50,000	0.01	0.1	1,400	50,000
		1	2	0.02	0.15	1,600	50,000	0.02	0.15	1,500	50,000	0.01	0.1	1,400	50,000
		1.5	3	0.02	0.15	1,600	50,000	0.02	0.15	1,500	50,000	0.01	0.1	1,400	50,000
		2	4	0.01	0.12	1,600	50,000	0.01	0.12	1,500	50,000	0.008	0.08	1,400	50,000
		2.5	5	0.008	0.1	1,600	50,000	0.008	0.1	1,500	50,000	0.005	0.07	1,400	50,000
0.6	R0.02	0.5	0.8	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		1	1.7	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		1.5	2.5	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		2	3.3	0.005	0.18	1,200	50,000	0.005	0.18	1,200	50,000	0.003	0.15	1,000	50,000
		2.5	4.2	0.005	0.15	1,200	50,000	0.005	0.15	1,200	50,000	0.003	0.12	1,000	50,000
	R0.05	0.5	0.8	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		1	1.7	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		1.5	2.5	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		2	3.3	0.01	0.18	1,400	50,000	0.01	0.18	1,400	50,000	0.007	0.15	1,200	50,000
		2.5	4.2	0.01	0.15	1,400	50,000	0.01	0.15	1,400	50,000	0.007	0.12	1,200	50,000
	R0.1	0.5	0.8	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		1	1.7	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		1.5	2.5	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		2	3.3	0.02	0.2	1,800	50,000	0.02	0.18	1,600	50,000	0.01	0.15	1,400	50,000
		2.5	4.2	0.02	0.18	1,800	50,000	0.02	0.15	1,600	50,000	0.01	0.12	1,400	50,000
0.8	R0.02	1.5	1.9	0.005	0.2	1,400	45,000	0.005	0.2	1,400	45,000	0.003	0.1	1,000	40,000
		2.5	3.1	0.005	0.2	1,400	45,000	0.005	0.2	1,400	45,000	0.003	0.1	1,000	40,000
		5	6.3	0.005	0.1	1,400	45,000	0.005	0.1	1,400	45,000	0.003	0.05	1,000	40,000
	R0.05	1.5	1.9	0.01	0.25	1,800	45,000	0.01	0.2	1,600	45,000	0.007	0.1	1,200	40,000
		2.5	3.1	0.01	0.25	1,800	45,000	0.01	0.2	1,600	45,000	0.007	0.1	1,200	40,000
		5	6.3	0.01	0.2	1,800	45,000	0.01	0.15	1,600	45,000	0.005	0.1	1,200	40,000
	R0.1	1.5	1.9	0.02	0.3	2,200	45,000	0.02	0.2	1,800	45,000	0.01	0.1	1,400	40,000
		2.5	3.1	0.02	0.3	2,200	45,000	0.02	0.2	1,800	45,000	0.01	0.1	1,400	40,000
		5	6.3	0.01	0.2	2,200	45,000	0.01	0.15	1,800	45,000	0.005	0.1	1,400	40,000
1	R0.02	1	1	0.005	0.4	1,400	40,000	0.005	0.3	1,400	40,000	0.005	0.2	1,200	36,000
		2	2	0.005	0.4	1,400	40,000	0.005	0.3	1,400	40,000	0.005	0.2	1,200	36,000
		3	3	0.005	0.3	1,400	40,000	0.005	0.2	1,400	40,000	0.005	0.1	1,200	36,000
		5	5	0.005	0.3	1,400	40,000	0.005	0.2	1,400	40,000	0.005	0.1	1,200	36,000
	R0.05	1	1	0.015	0.4	2,000	40,000	0.01	0.3	1,600	40,000	0.01	0.2	1,200	36,000
		2	2	0.015	0.4	2,000	40,000	0.01	0.3	1,600	40,000	0.01	0.2	1,200	36,000
		3	3	0.015	0.3	2,000	40,000	0.01	0.2	1,600	40,000	0.01	0.1	1,200	36,000
		5	5	0.01	0.3	1,800	40,000	0.01	0.2	1,600	40,000	0.005	0.1	1,200	36,000
	R0.1	1	1	0.02	0.4	2,200	40,000	0.02	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		2	2	0.02	0.4	2,200	40,000	0.02	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		3	3	0.02	0.3	2,200	40,000	0.02	0.2	2,000	40,000	0.01	0.1	1,500	36,000
		5	5	0.015	0.3	2,200	40,000	0.015	0.2	2,000	40,000	0.007	0.1	1,500	36,000
	R0.2	1	1	0.03	0.4	2,500	40,000	0.03	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		2	2	0.03	0.4	2,500	40,000	0.03	0.3	2,000	40,000	0.01	0.2	1,500	36,000
		3	3	0.02	0.3	2,500	40,000	0.02	0.2	2,000	40,000	0.01	0.1	1,500	36,000
		5	5	0.02	0.3	2,500	40,000	0.02	0.2	2,000	40,000	0.007	0.1	1,500	36,000
1.5	R0.02	2	1.3	0.005	0.6	2,200	36,000	0.005	0.5	1,800	30,000	0.005	0.3	1,300	24,000
		3	2	0.005	0.6	2,200	36,000	0.005	0.5	1,800	30,000	0.005	0.3	1,300	24,000
		4.5	3	0.005	0.6	2,200	36,000	0.005	0.5	1,800	30,000	0.005	0.3	1,200	24,000
		7.5	5	0.005	0.5	2,000	36,000	0.005	0.4	1,700	30,000	0.005	0.2	1,200	24,000
	R0.05	2	1.3	0.02	0.6	2,500	36,000	0.02	0.5	2,000	30,000	0.01	0.3	1,500	24,000
		3	2	0.02	0.6	2,500	36,000	0.02	0.5	2,000	30,000	0.01	0.3	1,500	24,000
		4.5	3	0.02	0.6	2,500	36,000	0.01	0.5	2,000	30,000	0.01	0.3	1,500	24,000
		7.5	5	0.02	0.5	2,400	36,000	0.01	0.4	2,000	30,000	0.01	0.2	1,400	24,000

SHPR400

CBN Core Line

Recommended Milling Conditions

Work Material				Hardened Steels STAVAX・SKD61 (~52HRC)				Hardened Steels SKD11・ELMAX (~62HRC)				High Speed Steels SKH・HAP (~68HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
				ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
1.5	R0.1	2	1.3	0.04	0.6	4,000	36,000	0.03	0.5	3,200	30,000	0.015	0.3	2,000	24,000
		3	2	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.015	0.3	1,800	24,000
		4.5	3	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.01	0.3	1,800	24,000
		7.5	5	0.03	0.5	3,000	36,000	0.02	0.4	2,500	30,000	0.01	0.2	1,600	24,000
	R0.2	2	1.3	0.04	0.6	4,000	36,000	0.03	0.5	3,200	30,000	0.015	0.3	2,000	24,000
		3	2	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.015	0.3	1,800	24,000
		4.5	3	0.04	0.6	3,500	36,000	0.03	0.5	2,800	30,000	0.01	0.3	1,800	24,000
		7.5	5	0.03	0.5	3,000	36,000	0.02	0.4	2,500	30,000	0.01	0.2	1,600	24,000
2	R0.02	3	1.5	0.005	0.8	2,500	30,000	0.005	0.7	2,000	24,000	0.005	0.4	1,200	16,000
		4	2	0.005	0.8	2,300	30,000	0.005	0.7	1,800	24,000	0.005	0.4	1,100	16,000
		6	3	0.005	0.8	2,300	30,000	0.005	0.7	1,800	24,000	0.005	0.4	1,100	16,000
		10	5	0.005	0.6	2,200	30,000	0.005	0.5	1,700	24,000	0.005	0.3	1,000	16,000
	R0.05	3	1.5	0.025	0.8	2,700	30,000	0.02	0.7	2,200	24,000	0.015	0.4	1,300	16,000
		4	2	0.025	0.8	2,700	30,000	0.02	0.7	2,200	24,000	0.015	0.3	1,300	16,000
		6	3	0.025	0.8	2,700	30,000	0.02	0.7	2,200	24,000	0.015	0.3	1,300	16,000
		10	5	0.02	0.6	2,500	30,000	0.015	0.5	2,000	24,000	0.01	0.3	1,200	16,000
	R0.1	3	1.5	0.05	0.8	4,000	30,000	0.04	0.7	3,200	24,000	0.02	0.4	1,500	16,000
		4	2	0.05	0.8	3,500	30,000	0.04	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		6	3	0.04	0.8	3,500	30,000	0.03	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		10	5	0.03	0.6	3,000	30,000	0.02	0.5	2,400	24,000	0.01	0.3	1,300	16,000
	R0.2	3	1.5	0.05	0.8	4,000	30,000	0.04	0.7	3,200	24,000	0.02	0.4	1,500	16,000
		4	2	0.05	0.8	3,500	30,000	0.04	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		6	3	0.04	0.8	3,500	30,000	0.03	0.7	2,800	24,000	0.02	0.3	1,500	16,000
		10	5	0.03	0.6	3,000	30,000	0.02	0.5	2,400	24,000	0.01	0.3	1,300	16,000
3	R0.05	6	2	0.03	1	2,700	24,000	0.02	0.85	2,200	20,000	0.015	0.6	1,300	12,000
		9	3	0.03	1	2,700	24,000	0.02	0.85	2,200	20,000	0.015	0.6	1,300	12,000
		12	4	0.03	0.85	2,700	24,000	0.02	0.7	2,200	20,000	0.015	0.5	1,300	12,000
		15	5	0.02	0.85	2,500	24,000	0.02	0.7	2,000	20,000	0.01	0.5	1,200	12,000
	R0.1	6	2	0.05	1	4,000	24,000	0.04	0.85	3,200	20,000	0.02	0.6	1,500	12,000
		9	3	0.05	1	3,500	24,000	0.04	0.85	2,800	20,000	0.02	0.6	1,500	12,000
		12	4	0.04	0.85	3,500	24,000	0.04	0.7	2,800	20,000	0.02	0.5	1,500	12,000
		15	5	0.03	0.85	3,000	24,000	0.03	0.7	2,400	20,000	0.015	0.5	1,300	12,000
	R0.2	6	2	0.05	1	4,000	24,000	0.04	0.85	3,200	20,000	0.02	0.6	1,500	12,000
		9	3	0.05	1	3,500	24,000	0.04	0.85	2,800	20,000	0.02	0.6	1,500	12,000
		12	4	0.04	0.85	3,500	24,000	0.04	0.7	2,800	20,000	0.02	0.5	1,500	12,000
		15	5	0.03	0.85	3,000	24,000	0.03	0.7	2,400	20,000	0.015	0.5	1,300	12,000

Notes

※1 Depth of Cut shows maximum value for semi-finishing and finishing. Adjust milling conditions depending on rigidity of machine, desired accuracy and milling shape.
※2 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※3 To achieve better cutting surface, obtain uniform stock amount on cutting surface in semi-finishing.
※4 When machining at high load area, such as corners, please pay attention to set cutting condition and tool paths.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※7 We recommend using oil mist coolant.

Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H

Long Neck Corner Radius

SSF120

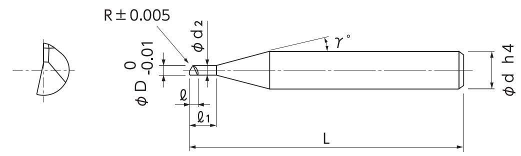
Size φ0.2 × R0.05 ～ φ2 × R0.1

SSF120

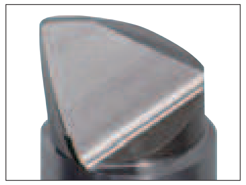
CBN Super Surface End Mill

Total 9 sizes

Single flute end mill for hardened steels
Specialized for accurate finishing on flat surface



- Appropriate for datum plane machining on precision machining.
- NS original design and corner R to realize stable machining surface.


Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Under Neck Length (ℓ1)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00470-00020	0.2	R0.05	0.1	0.5	0.19	15°	4	50
01-00470-00030	0.3	R0.05	0.15	0.75	0.28	15°	4	50
01-00470-00040	0.4	R0.05	0.2	1	0.37	15°	4	50
01-00470-00050	0.5	R0.05	0.25	1.25	0.46	15°	4	50
01-00470-00060	0.6	R0.05	0.3	1.5	0.56	15°	4	50
01-00470-00080	0.8	R0.05	0.4	2	0.76	15°	4	50
01-00470-00100	1	R0.1	0.5	2.5	0.95	15°	4	50
01-00470-00150	1.5	R0.1	0.75	3.8	1.45	15°	4	52
01-00470-00200	2	R0.1	1	5	1.94	15°	4	52

How to Order　When you order, indicate SSF120 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Hardened Steels･High Speed Steels STAVAX･SKD11･SKH (～68HRC)			
Dia.	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹
0.2	0.002	0.003	50	60,000
0.3	0.002	0.003	100	60,000
0.4	0.002	0.003	150	60,000
0.5	0.003	0.005	200	60,000
0.6	0.003	0.005	240	60,000
0.8	0.003	0.008	280	60,000
1	0.005	0.01	300	60,000
1.5	0.005	0.02	400	60,000
2	0.005	0.03	500	60,000
Notes	※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 We recommend using oil mist coolant. ※3 Machine, tool chuck must be sufficiently accurate. ※4 Length of tool overhang must be as short as possible.			

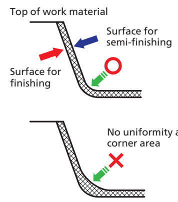
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

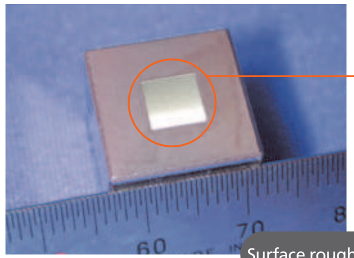
Advice on Finishing Allowance (stock amount)

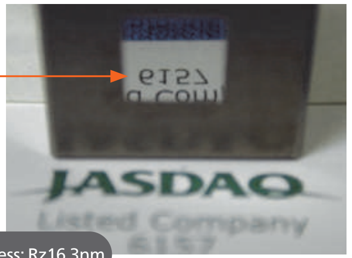
- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accuracy.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



Machining Case 1

Work Material　DC53 (SKD11)　60HRC　　Tool　SSF120 φ0.5





Surface roughness: Rz16.3nm
(1nm ＝ 0.001μm)

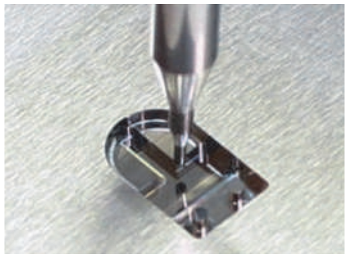
Conditions (Finishing process)

Spindle speed	120,000min⁻¹
Feed	300mm/min
Depth of cut	2μm×5μm (ap×ae)
Coolant	Oil mist
Machining time	30min

Sodick Nano Machining Center AZ150
Taylor Hobson Talysurf Measurement System

Machining Case 2

Work Material　DC53 (SKD11)　60HRC



Tool
SSF120 φ0.8

Work size
10×6×2mm

Surface roughness: Rz70nm
(1nm ＝ 0.001μm)

Conditions (Finishing process)

	Bottom face milling	Side face milling
Spindle speed	35,000min⁻¹	
Feed	150mm/min	
Depth of cut	3μm×8μm (ap×ae)	10μm×10μm (ap×ae)
Coolant	Oil mist	
Machining time	1hr 30min	

Taylor Hobson Talysurf Measurement System

Achieve a higher grade surface finished quality by machining

Polishing time is greatly reduced by machining into various shape

Mirror surface that also reflects the NS TOOL logo

Work Material : STAVAX (52HRC)

PCDRB R1 × Under neck length 5

Surface Roughness

Unit [μm]

Measuring position	Ra	Rz
1	0.016	0.119

Mirror finishing for flat surface

Work Material : Cemented Carbide (92.5HRA)

Machining case S-010

PCDSE ϕ0.5

Surface Roughness

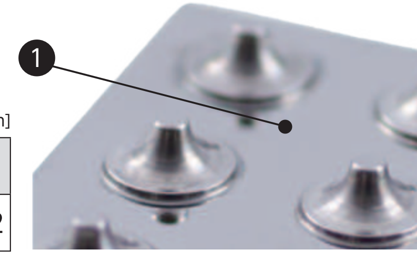
Unit [μm]

Measuring position	Ra	Rz
1	0.002	0.02

Surface Roughness

Unit [μm]

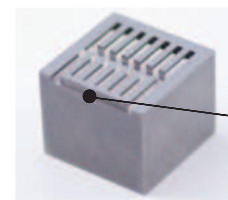
Measuring position	Ra	Rz
1 Bottom	0.0027	0.0192



PCDRS
ϕ0.5×R0.1×Under neck length 0.5

Work Material : Cemented Carbide (92.5HRA)
Work Size : 10×10mm (Machining depth 0.864mm)

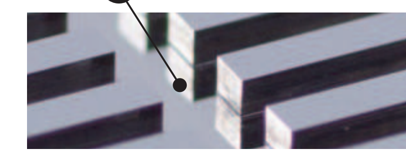
Machining case S-013



Surface Roughness

Unit [μm]

Measuring position	Ra	Rz
1 Side	0.017	0.096
2 Bottom	0.0007	0.008



PCDSE ϕ0.5

Work Material : Cemented Carbide (92.5HRA)
Work Size : 10×10 mm (Machining depth 0.5mm)

Machining case C-007

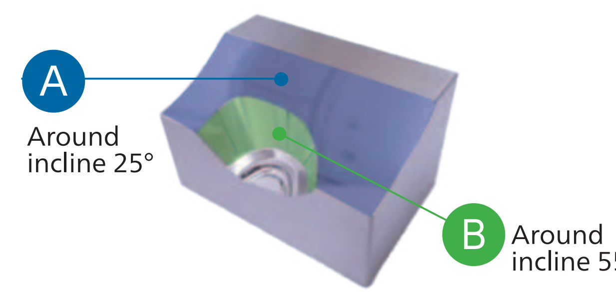
Cutting comparison with CBN end mill

Surface Roughness comparison

Work Material : STAVAX (52HRC)

Work Size : 60×40 mm
(Machining depth 19.48mm)

Finishing surface comparison under the same cutting condition



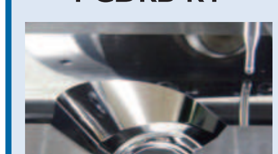
A Around incline 25°

CBN Ball End Mill

Surface Roughness Unit [μm]

Ra	0.068

PCDRB R1

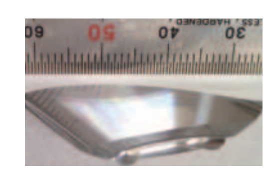


Surface Roughness Unit [μm]

Ra	0.030

B Around incline 55°

CBN Ball End Mill



Surface Roughness Unit [μm]

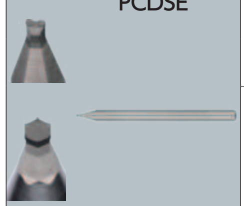
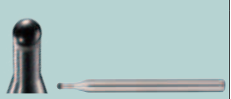
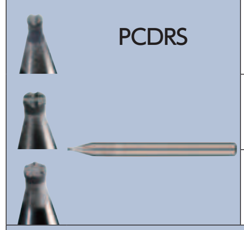
Ra	0.042

PCDRB R1

Surface Roughness Unit [μm]

Ra	0.012

Achieves nano-level surface roughness like a mirror surface by milling

Model	Size	Under Neck Length	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
PCD Long Neck Square																							
PCDSE 	ϕ0.1 ～ ϕ0.3	1D	2	0°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	3	C-006
	ϕ0.4 ～ ϕ1		6																			5	
PCD square end mill. Realized nano level finished surface roughness on hard brittle materials																							
PCD Long Neck Ball																							
PCDRB 	R0.05 ～ R3	≒2.5D	-	-	-	-	-	3D	-	-	-	◎	◎	◎	-	-	-	-	-	-	◎	13	C-008
Capable to machine nano level surface roughness, and mirror finishing																							
PCD Long Neck Corner Radius																							
PCDRS 	ϕ0.3× R0.05	1D	2	0°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	1	C-010
	ϕ0.4× R0.05 ～ ϕ0.5× R0.1		4																			3	
	ϕ0.6× R0.05 ～ ϕ1× R0.1		6																			6	
PCD corner radius end mill. Realized nano level finished surface roughness on hard brittle materials																							

PCDSE

Size φ0.1 ~ φ1

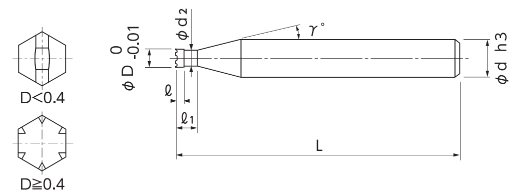
PCD ≤92.5 HRA

PCD Square End Mill

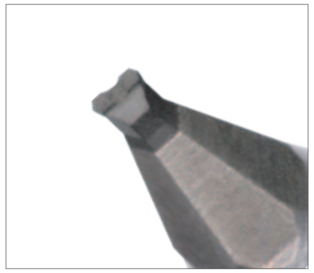
Total 8 sizes

PCD square end mill. Realized nano level finishined surface roughness on hard brittle materials

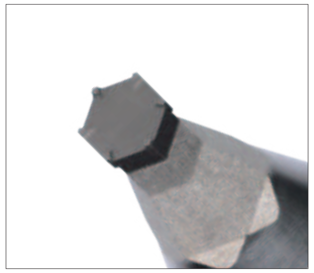
2 6 0° φd h3 Face



- Fine and stable milling surface realized on cemented carbide material.
- Possible to get the nano-level surface roughness required on ultra-high precision machining.
- NS original flute design of cutting edge enabled a strong resistance against wear and chipping.



Cutting edge shape 2-Flute



Cutting edge shape 6-Flute

Actual diameter is indicated in 1 micron units on product label, and enables high precision machining.
※Micron units dimensions cannot be specified.

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Number of Flute
04-00300-00100	0.1	0.1	0.02	0.09	15°	4	48	2
04-00300-00200	0.2	0.2	0.04	0.18	15°	4	48	2
04-00300-00300	0.3	0.3	0.06	0.27	15°	4	48	2
04-00300-00400	0.4	0.4	0.08	0.36	15°	4	48	6
04-00300-00500	0.5	0.5	0.1	0.45	15°	4	48	6
04-00300-00600	0.6	0.6	0.12	0.54	15°	4	48	6
04-00300-00800	0.8	0.8	0.16	0.72	15°	4	48	6
04-00300-01000	1	1	0.2	0.9	15°	4	48	6

How to Order: When you order, indicate PCDSE (D). ※(γ) is reference value.

Machining case: S-009, S-010

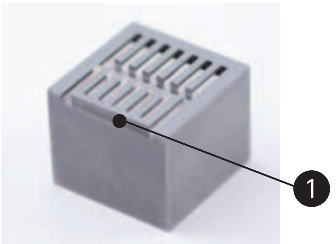
Hard Brittle Material 0
Long Neck Square

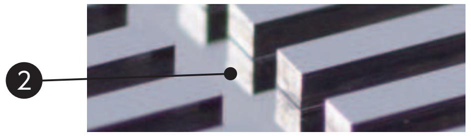
Recommended Milling Conditions

Work Material	Cemented Carbide		
Dia.	Spindle Speed	Feed	Depth of Cut
	min⁻¹	mm/min	ap mm
0.1	40,000	25	0.0002
0.2	40,000	25	0.0002
0.3	40,000	25	0.0002
0.4	40,000	50	0.0005
0.5	40,000	50	0.0005
0.6	40,000	50	0.0005
0.8	40,000	50	0.0005
1	40,000	50	0.0005
Notes	※1 Minimum tool runout is required to avoid the tool breakage and to increase the work accuracy. ※2 Due to infinitesimal Depth of Cut (ap), recommend to assess the machine characters, such as expansion of the spindle and others before using the tool. ※3 Water-insoluble fluid is recommended. ※4 ap : Axial Depth of Cut.		

Machining Case 1

Connector Model





- Work Material : Cemented Carbide 92.5HRA
- Coolant : Water-insoluble fluid

Work size : 10×10mm
Cutting depth : 0.5mm

Surface Roughness		
1	Side	Ra0.017μm / Rz0.096μm
2	Bottom	Ra0.0007μm / Rz0.008μm

Process	Contour line finishing	Bottom finishing
Tool	PCDSE φ0.5	
Spindle speed [min⁻¹]	120,000	
Feed [mm/min]	100	50
Depth of cut ap×ae[mm]	0.002×0.001	0.0005×0.002
Cutting length[m]	64	
Machining time	11hr 2min	

Hard Brittle Material 0
Long Neck Square

PCDRB *Size expansion*

Size R0.05 ~ R3

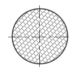
PCD ≦92.5 HRA

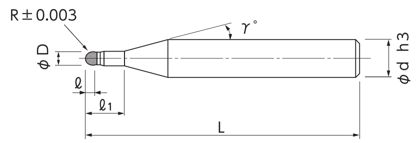
PCD Ball End Mill

Total 13 sizes

R ±0.003 ϕd h3 3D

Capable to machine nano level surface roughness, and mirror finishing





- Unique tool geometry makes stable surface.
- Polish-less machining become reality by nano-level roughness on profiling finish.
- Upgraded tool edge design makes stable high quality surface.

Actual diameter is indicated in 1 micron units on product label, and enables high precision machining.
※Micron units dimensions cannot be specified.

Cutting edge shape

◆ New Size

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00500-00501	R0.05	0.15	0.05	0.1	15°	4	48
04-00500-00502		0.25	0.05	0.1	15°	4	48
04-00500-00751	R0.075	0.23	0.075	0.15	15°	4	48
04-00500-00752		0.38	0.075	0.15	15°	4	48
04-00500-01001	R0.1	0.5	0.1	0.2	15°	4	48
04-00500-02001	R0.2	1	0.2	0.4	15°	4	48
04-00500-03001	R0.3	1.5	0.3	0.6	15°	4	48
04-00500-05001	R0.5	2.5	0.5	1	15°	4	50
04-00500-07501	R0.75	3.8	0.75	1.5	15°	4	48
04-00500-10001	R1	5	1	2	15°	4	48
◆ 04-00500-15001	R1.5	7.5	1.5	3	15°	6	59
◆ 04-00500-20001	R2	10	2	4	15°	6	60
◆ 04-00500-30001	R3	15	3	6	-	6	62

How to Order When you order, indicate PCDRB (R)×(ℓ1). ※(γ) is reference value.

Machining case S-011, S-012

Recommended Milling Conditions

Work Material		Hardened Steels･High Speed Tool Steels (~68HRC)					Cemented Carbide				
Radius	Under Neck Length	Spindle Speed	Feed	Stock	Depth of Cut		Spindle Speed	Feed	Stock	Depth of Cut	
		min⁻¹	mm/min	mm	ap mm	ae mm	min⁻¹	mm/min	mm	ap mm	ae mm
0.05	0.15	40,000	50	0.001	0.001	0.001	40,000	50	0.001	0.001	0.001
	0.25	40,000	25	0.001	0.001	0.001	40,000	25	0.001	0.001	0.001
0.075	0.23	40,000	100	0.001	0.001	0.001	40,000	100	0.001	0.001	0.001
	0.38	40,000	50	0.001	0.001	0.001	40,000	50	0.001	0.001	0.001
0.1	0.5	40,000	100	0.001	0.001	0.001	40,000	100	0.001	0.001	0.001
0.2	1	40,000	200	0.002	0.002	0.002	40,000	150	0.002	0.001	0.002
0.3	1.5	40,000	400	0.003	0.003	0.003	40,000	200	0.002	0.002	0.002
0.5	2.5	40,000	500	0.005	0.005	0.005	40,000	300	0.003	0.003	0.003
0.75	3.8	40,000	600	0.005	0.005	0.005	40,000	400	0.004	0.004	0.004
1	5	40,000	800	0.005	0.005	0.005	40,000	500	0.005	0.005	0.005
1.5	7.5	30,000	800	0.005	0.006	0.006	30,000	500	0.005	0.005	0.005
2	10	22,000	800	0.005	0.007	0.007	20,000	500	0.005	0.006	0.006
3	15	16,000	800	0.005	0.009	0.009	12,000	500	0.005	0.007	0.007

Notes

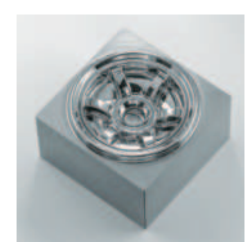
※1 ap: Axial Depth of Cut, ae: Radial Depth of Cut.
※2 Described Depth of Cut is max value. Adjust it depending on machine rigidity, main spindle rigidty, and required precision.
※3 Obtain uniform stock amount on the cutting surface in the pre-stage cutting (semi-finishing).
※4 In order to perform lubricity and chip flow well, coolant must be always reached cutting points.
※5 Careful set up for milling condition and tool path are required especially when operate with high cutting load such as corner area and slotting.
※6 Water-insoluble fluid is recommended.
※7 Using water-insoluble fluid could lead to fires due to sparks generated during machining or heat caused by breakage. Ensure that you take proper fire-prevention measures.

Machining Case 1

Wheel model

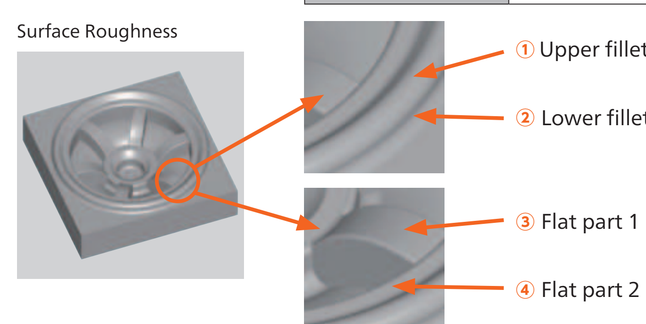
- Work Material : ELMAX 60HRC
- Coolant : Water-insoluble fluid
- Total machining time : 50hr 13min

Work size : 50×50mm



Process	Roughing①	Roughing②	Semi-finishing	Finishing
Tool	MRBH230 R1×6	MRBH230 R1×6	SSPB220 R1×5	PCDRB R1×5
Spindle speed [min⁻¹]	25,000	25,000	40,000	40,000
Feed [mm/min]	2,000	1,000	800	500
Depth of cut [mm]	ap 0.15 ae 0.3	ap 0.02 ae 0.05	ap 0.01 ae 0.01	ap 0.003 ae 0.003
Stock [mm]	0.033	0.013	0.003	0
Machining time	2hr 17min	1hr 45min	7hr 12min	38hr 58min

Surface Roughness



	Rz[μm]
①	0.209
②	0.212
③	0.159
④	0.330

- PCDRB can realize mirror like finishing on full surface machining and achieve the sub-micro level surface roughness, even for approx. 39hrs finishing process.
- Before finishing, use CBN to process semi-finishing. Leaving constant stock amount on semi-finished surface will have great affects in the finishing process.

PCDRS

Size ϕ 0.3 × R0.05 ～ ϕ 1 × R0.1

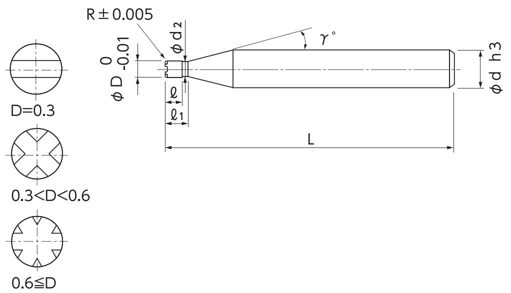
PCD ≦92.5 HRA

PCD Radius End Mill

Total 10 sizes

PCD corner radius end mill.
Realized nano level finishined surface roughness on hard brittle materials

2 4 6 0° Corner R ±0.005 φd h3 Face



● Ultimate high quality surface is realized in the corner radius shape with superior cutting performance on curved and plane surface!


Cutting edge shape 2-Flute


Cutting edge shape 4-Flute


Cutting edge shape 6-Flute

Actual diameter is indicated in 1 micron units on product label, and enables high precision machining.
※Micron units dimensions cannot be specified.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Number of Flute
04-00700-03050	0.3	R0.05	0.3	0.09	0.27	15°	4	48	2
04-00700-04050	0.4	R0.05	0.4	0.12	0.36	15°	4	48	4
04-00700-05050	0.5	R0.05	0.5	0.15	0.45	15°	4	48	4
04-00700-05100		R0.1	0.5	0.15	0.45	15°	4	48	4
04-00700-06050	0.6	R0.05	0.6	0.18	0.54	15°	4	48	6
04-00700-06100		R0.1	0.6	0.18	0.54	15°	4	48	6
04-00700-08050	0.8	R0.05	0.8	0.24	0.72	15°	4	48	6
04-00700-08100		R0.1	0.8	0.24	0.72	15°	4	48	6
04-00700-10050	1	R0.05	1	0.3	0.9	15°	4	48	6
04-00700-10100		R0.1	1	0.3	0.9	15°	4	48	6

How to Order — When you order, indicate PCDRS (D)x(R). ※(γ) is reference value.

Machining case — S-013

Recommended Milling Conditions

Work Material		Cemented Carbide			
Dia.	Corner Radius	Spindle Speed	Feed	Depth of Cut for Finishing	
		min⁻¹	mm/min	ap mm	ae mm
0.3	R0.05	50,000	50	0.001	0.005
0.4	R0.05	50,000	100	0.001	0.01
0.5	R0.05	50,000	100	0.001	0.01
	R0.1	50,000	150	0.001	0.015
0.6	R0.05	50,000	100	0.001	0.01
	R0.1	50,000	150	0.001	0.015
0.8	R0.05	50,000	150	0.001	0.015
	R0.1	50,000	200	0.001	0.03
1	R0.05	50,000	150	0.001	0.015
	R0.1	50,000	200	0.001	0.03
Notes		※1 Minimal tool runout is required to avoid the tool breakage and to increase the work accuracy. ※2 Due to infinitesimal Depth of Cut (ap), recommend to assess the machine characters, such as expansion of the spindle and others before using the tool. ※3 Water-insoluble fluid is recommended.			

Hard Brittle Material 0

0 Hard Brittle Material

Long Neck Corner Radius

Long Neck Corner Radius

Machining Case 1

- Work Material : Cemented Carbide 92.5HRA
- Coolant : Water-insoluble fluid
- Total machining time : 9hr 48min

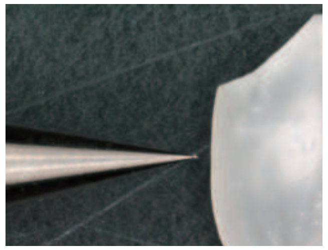
Work size : ϕ15mm
Machining depth : 0.924mm


Surface roughness

Process	Finishing	
	Contour line milling	Scanning line milling
Tool	PCDRS ϕ0.3×R0.05×0.3	
Spindle speed [min⁻¹]	40,000	
Feed [mm/min]	70	
Depth of cut ap×ae[mm]	0.002～0.006×0.002	0.001×0.005～0.01
Stock [mm]	0.002	0.001
Cutting length	28m	12m
Machining time	6hr23min	3hr25min

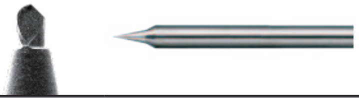
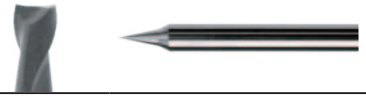
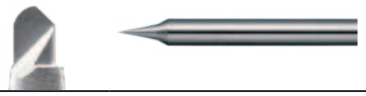
Various lineup for micro manufacturing

Engraving letters on a hair 「NS TOOL MICRO EDGE」



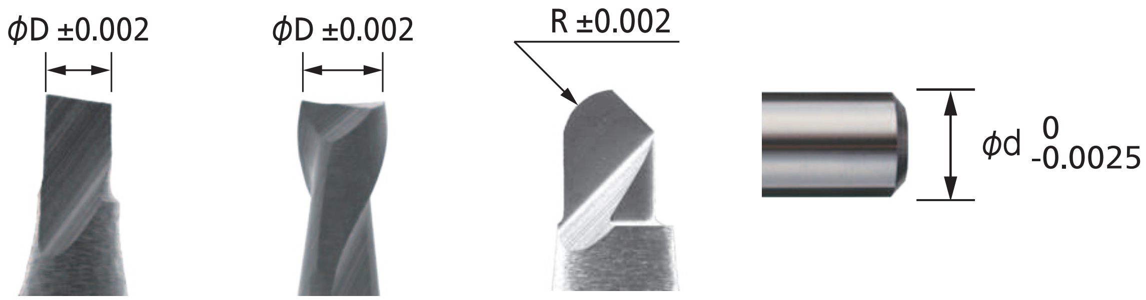
Comparison with a grain of rice

Among the small-diameter size end mills, a major strength of NS TOOL, these products enable ultrafine precision milling with standardized end mills of Dia.0.01mm to Dia.0.1mm.
A tool that has firmly established the position of "NS TOOL as small-diameter tool giant". It can engrave letters even on hair.

Shape	Model		Size	Features
CBN Micro Edge for hardened steel				
Square	**SMEZ120**		ϕ 0.03 ～ ϕ 0.1 Total 8 sizes	Micro CBN square end mills with standardized of Dia.0.1 or less
Ball	**SMB120**		R0.01 ～ R0.05 Total 7 sizes	Micro CBN ball end mill that enables ultrafine miling
Micro Edge for work material up to 40HRC				
Shape	Model		Size	Features
Square	**NSME100**		ϕ 0.01 ～ ϕ 0.05 Total 5 sizes	Standardized minimum Dia.0.01. One straight flute for ultrafine milling
Square	**NSME230**		ϕ 0.03 ～ ϕ 0.09 Total 7 sizes	From Dia.0.03, 2-flute 30°helix angle Micro square end mill
Ball	**NSMB100**		R0.005 ～ R0.05 Total 8 sizes	Standardized minimum R0.005 Ball end mill for ultrafine milling

High-precision design for ultrafine milling

Ultrafine milling possible by high precision designs for all of diameter, radius, shank diameter, and runout accurace.

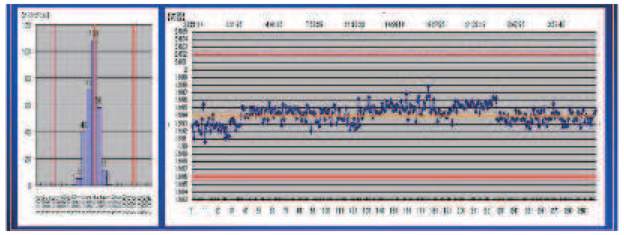


Uniquely developed equipment for production of Micro Edge

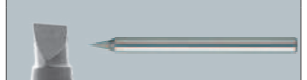
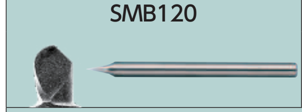
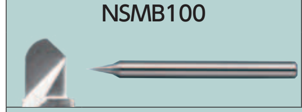
In manufacturing, we value the quality and stability of our products, which means that we always maintain a high level of quality as well as a high level of precision and continue to deliver high accurate products.
We are responsible for delivering small-diameter end mills to our customers, and our self-developed tool grinder TGM has been developed to realize this responsibility and to deliver products with consistent accuracy and quality every time.

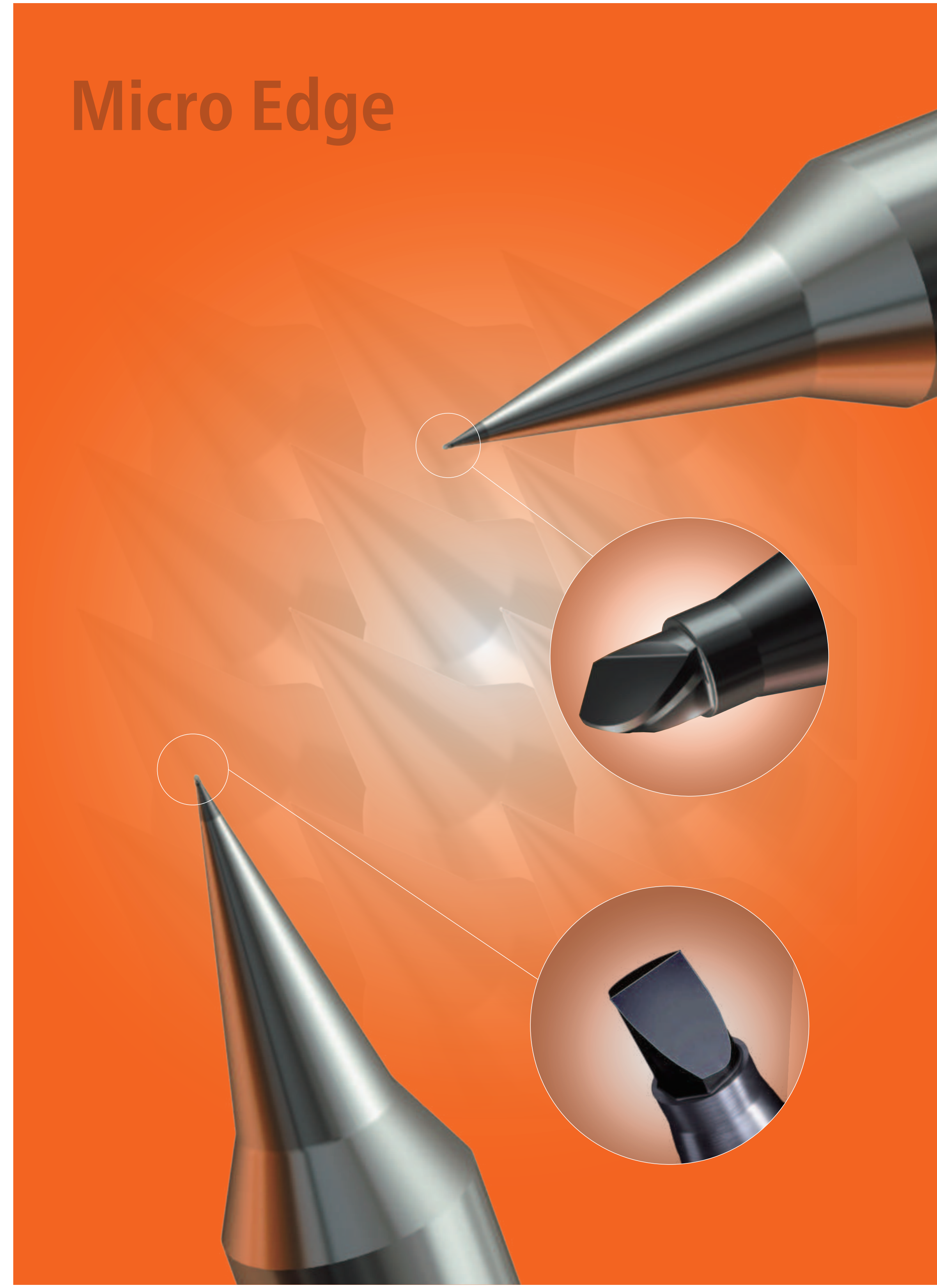
Sendai Factory Development Center

In-house developed tool grinder TGM



Stable production accuracy

Model	Size	Length of Cut	Number of Flute	Helix Angle	Supplement	Slot Milling	Face Milling	3D Milling	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Numberof sizes	Page
CBN Micro Edge Square																							
SMEZ120 	ϕ0.03 ~ ϕ0.1	1D	1	-20°	90°	Slot	-	-	-	-	○	◎	◎	○	-	-	-	-	-	-	-	8	D-006
CBN micro end mill with standardized of Dia.0.1mm or smaller ※ Listed at "CBN Core Line" as well (Page B-006)																							
Micro Edge Square																							
NSME100 	ϕ0.01 ~ ϕ0.05	1D	1	0°	90°	Slot	Face	-	○	○	○	-	-	-	○	-	○	○	○	-	-	5	D-008
Smallest Dia.0.01mm. Single straight flute end mill for ultra micro milling																							
NSME230 	ϕ0.03 ~ ϕ0.09	1.5D	2	30°	-	Slot	Face	-	○	○	○	-	-	-	○	-	○	○	○	-	-	7	D-010
2-flute 30° square end mill for micro milling. Dia.0.03mm to Dia.0.09mm																							
CBN Micro Edge Ball																							
SMB120 	R0.01 ~ R0.05	1D	1	-20°	-	-	-	3D	-	-	○	◎	◎	○	-	-	-	-	-	-	-	7	D-012
Realized micro milling by size line up R0.01 - R0.05 ※ Listed at "CBN Core Line" as well (Page B-012)																							
Micro Edge Ball																							
NSMB100 	R0.005 ~ R0.05	1D	1	0°	-	-	-	3D	○	○	○	-	-	-	○	-	○	○	○	-	-	8	D-014
Standardized from the smallest R0.005 for ultra micro milling																							



SMEZ120

Size φ 0.03～φ 0.1

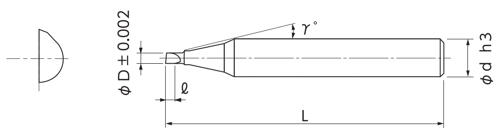
CBN ≦70 HRC

CBN "MICRO EDGE Z" Total 8 sizes

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H

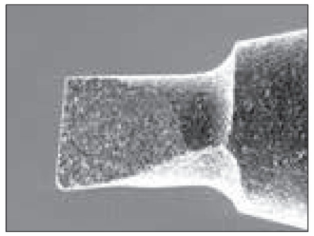
CBN micro end mill with standardized of Dia.0.1mm or smaller

1 -20° 90° φd h3 Slot



※ Listed at "CBN Core Line" as well (Page B-006)

- NS engineering technology and selected CBN material realize sharp edge.
- Tolerance of flute diameter is ±2μm.
- Tolerance of shank diameter is h3 (0～-0.0025).



Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00480-00030	0.03	0.03	15°	4	50
01-00480-00040	0.04	0.04	15°	4	50
01-00480-00050	0.05	0.05	15°	4	50
01-00480-00060	0.06	0.06	15°	4	50
01-00480-00070	0.07	0.07	15°	4	50
01-00480-00080	0.08	0.08	15°	4	50
01-00480-00090	0.09	0.09	15°	4	50
01-00480-00100	0.1	0.1	15°	4	50

How to Order — When you order, indicate SMEZ120 (D). ※(γ) is reference value.

Square

Recommended Milling Conditions

P Prehardened Steel
H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel
H ~70 HRC Hardened Steel

Work Material	Prehardened Steels・Hardened Steels NAK・STAVAX・SKD11・PD613 (～62HRC)			
Dia.	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹
0.03	0.0005	0.003	10	60,000
0.04	0.001	0.003	20	60,000
0.05	0.001	0.005	30	60,000
0.06	0.002	0.005	40	60,000
0.07	0.002	0.01	50	60,000
0.08	0.003	0.015	65	60,000
0.09	0.003	0.02	80	60,000
0.1	0.003	0.025	100	60,000
Notes	※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 We recommend using oil mist coolant. ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.) ※5 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.			

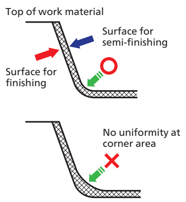
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

Advice on Finishing Allowance (stock amount)

- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.



Square

NSME100

Size ϕ 0.01 ～ ϕ 0.05

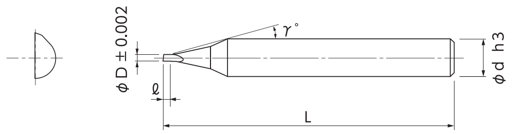
SMG ≦40 HRC

Micro End Mill "MICRO EDGE"

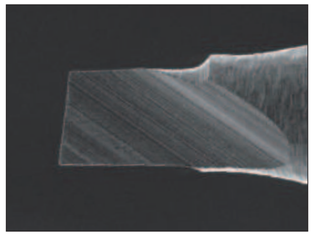
Total 5 sizes

Smallest Dia.0.01mm
Single straight flute end mill for ultra micro milling

1 0° 90° ϕd h3 Slot Face



- Ultra-high-precision accuracy is guaranteed with ±2μm tolerance of flute diameter and h3 tolerance of shank diameter (circularity 0.1μm).
- One straight flute, 5 items from 0.01 to 0.05mm diameter.



Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00001-00010	0.01	0.01	15°	4	45
01-00001-00020	0.02	0.02	15°	4	45
01-00001-00030	0.03	0.03	15°	4	45
01-00001-00040	0.04	0.04	15°	4	45
01-00001-00050	0.05	0.05	15°	4	45

How to Order   When you order, indicate NSME100 (D).   ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Tough Pitch Copper・Aluminium Alloy			
Dia	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹
0.01	0.0001	0.0005	10	60,000
0.02	0.0003	0.001	15	60,000
0.03	0.0005	0.001	20	60,000
0.04	0.001	0.001	20	60,000
0.05	0.001	0.002	30	60,000
Notes	※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 We recommend using oil mist coolant. ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.) ※5 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.			

NSME230

Size ϕ 0.03 ~ ϕ 0.09

SMG ≦40 HRC

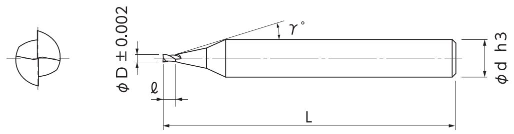
Micro End Mill "MICRO EDGE"

Total 7 sizes

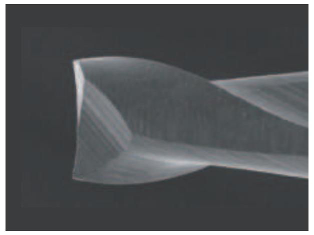
Carbon Steel P
Alloy Steel P
Prehardened Steel P
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O
Square

2-flute 30° square end mill for micro milling
Dia.0.03mm to Dia.0.09mm

30° ϕd h3 Slot Face



- Ultra-high-precision accuracy is guaranteed with ±2μm tolerance of flute diameter and h3 tolerance of shank diameter (circularity 0.1μm).
- Two flutes in 30 deg. 7 items from 0.03 to 0.09mm diameter.



Cutting edge shape

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00002-00030	0.03	0.045	15°	4	45
01-00002-00040	0.04	0.060	15°	4	45
01-00002-00050	0.05	0.075	15°	4	45
01-00002-00060	0.06	0.090	15°	4	45
01-00002-00070	0.07	0.105	15°	4	45
01-00002-00080	0.08	0.120	15°	4	45
01-00002-00090	0.09	0.135	15°	4	45

How to Order When you order, indicate NSME230 (D). ※(γ) is reference value.

NSME230

Recommended Milling Conditions

Micro Edge

Work Material	Tough Pitch Copper・Aluminium Alloy			
Dia	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min^{-1}
0.03	0.0015	0.002	20	60,000
0.04	0.0015	0.002	25	60,000
0.05	0.002	0.003	30	60,000
0.06	0.002	0.004	40	60,000
0.07	0.0025	0.005	50	60,000
0.08	0.003	0.005	70	60,000
0.09	0.004	0.01	80	60,000
Notes	※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 We recommend using oil mist coolant. ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.) ※5 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.			

P Carbon Steel
P Alloy Steel
P Prehardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Square

SMB120

Size R0.01 ～ R0.05

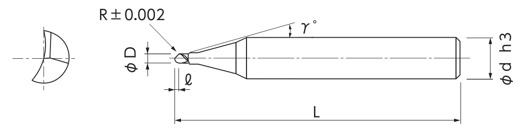
CBN ≤70 HRC

CBN Ball End Mill for precision machining "CBN Micro Ball"

Total 7 sizes

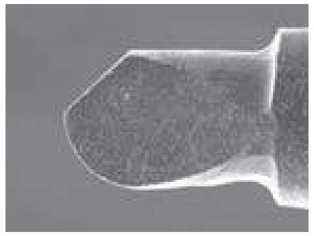
Realized micro milling by size line up R0.01 - R0.05

-20° R ±0.002 φd h3 3D



※ Listed at "CBN Core Line" as well (Page B-012)

- CBN Micro Ball develops new machining capability in high-precision technology.
- Standarized sizes from R0.01.
- Realized sharp edge by maximizing features of CBN.
- Long machining on pre-hardened to high-hardened steels (60HRC～).



Cutting edge shape

Unit : mm

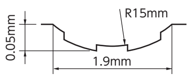
Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00460-00010	R0.01	0.02	0.02	15°	4	50
01-00460-00015	R0.015	0.03	0.03	15°	4	50
01-00460-00020	R0.02	0.04	0.04	15°	4	50
01-00460-00025	R0.025	0.05	0.05	15°	4	50
01-00460-00030	R0.03	0.06	0.06	15°	4	50
01-00460-00040	R0.04	0.08	0.08	15°	4	50
01-00460-00050	R0.05	0.1	0.1	15°	4	50

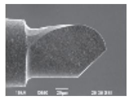
How to Order When you order, indicate SMB120 (R). ※(γ) is reference value.

Machining case S-003

Machining Case 1

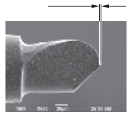
R0.05 NS Logo





Before machining

Wear rate 1.83μm



After machining

Work Material	STAVAX 52HRC	
Spindle speed	80,000min⁻¹	
Feed	Roughing : 200mm/min	Finishing : 50mm/min
Depth of cut	Roughing : 2μm×5μm (ap×ae)	Finishing : 2μm×2μm (ap×ae)
Machining time	1hr 50min	
Machining length	7.7m	
Coolant	Oil mist	

●Full process done by one tool.

Recommended Milling Conditions

Work Material	Prehardened Steels・Hardened Steels NAK・STAVAX・SKD11・PD613 (～62HRC)				
Radius	Depth of Cut		Feed	Approaching Feed	Spindle Speed
	ap mm	ae mm	mm/min	mm/min	min⁻¹
0.01	0.0005	0.001	5	3	80,000
0.02	0.001	0.001	30	5	80,000
0.03	0.001	0.002	70	10	80,000
0.04	0.002	0.003	100	30	80,000
0.05	0.002	0.005	200	30	80,000
Notes	※1 Depth of Cut：ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 We recommend using oil mist coolant. ※4 Minimize chucking runout. (Recommend to measure actual runout at activated spindle speed.) ※5 Tool approaching angle must be 3 degrees or below. ※6 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.				

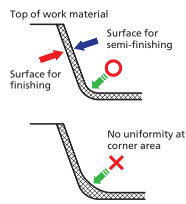
Points in Use

Advice on Cutting Environment

- Minimize the deflection of cutting edge.
- To understand the nature of the expansion of the main spindle and machine posture transformation, and take measures against them.

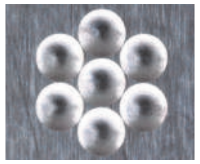
Advice on Finishing Allowance (stock amount)

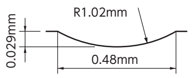
- When using small CBN End Mill, uniform finishing allowance (stock amount) is important.
- When tool is used on roughing and semi-finishing and it has a big abrasion, finishing allowance (stock amount) on semi-finishing and finishing is increasing and it affects tool life and cutting accurary.Therefore,it is important to get uniform stock amount in the pre-stage cutting.

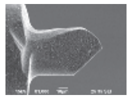


Machining Case 2

R0.03 Lens Array Model

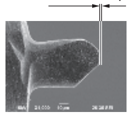






Before machining

Wear rate 3.33μm



After machining

Work Material	PD613 60HRC	
Spindle speed	80,000min⁻¹	
Feed	Roughing : 50mm/min	Finishing : 30mm/min
Depth of cut	Roughing : 1μm×2μm (ap×ae)	Finishing : 1μm×1μm (ap×ae)
Machining time	4hr	
Machining length	10.4m	
Coolant	Oil mist	

●Full process done by one tool.

NSMB100

Size R0.005 ～ R0.05

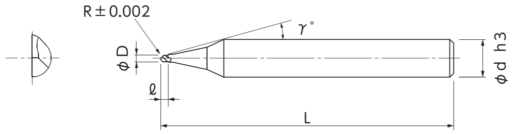
SMG ≦40 HRC

Ball End Mill for precision machining “Micro Ball”

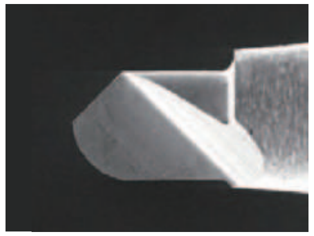
Total 8 sizes

Standardized from the smallest R0.005 for ultra micro milling

1 0° R ±0. 002 ϕd h3 3D



- The world’s first standardization of Ball size R0.005. Micro Ball develops new machining field in high-precision technology.
- The world’s smallest ball end mill “Micro Ball” extends precision machining field.
- NS original R design exericises fine finishing surface.



Cutting edge shape

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00003-00005	R0.005	0.01	0.01	15°	4	45
01-00003-00010	R0.01	0.02	0.02	15°	4	45
01-00003-00015	R0.015	0.03	0.03	15°	4	45
01-00003-00020	R0.02	0.04	0.04	15°	4	45
01-00003-00025	R0.025	0.05	0.05	15°	4	45
01-00003-00030	R0.03	0.06	0.06	15°	4	45
01-00003-00040	R0.04	0.08	0.08	15°	4	45
01-00003-00050	R0.05	0.1	0.1	15°	4	45

How to Order When you order, indicate NSMB100 (R). ※(γ) is reference value.

Recommended Milling Conditions

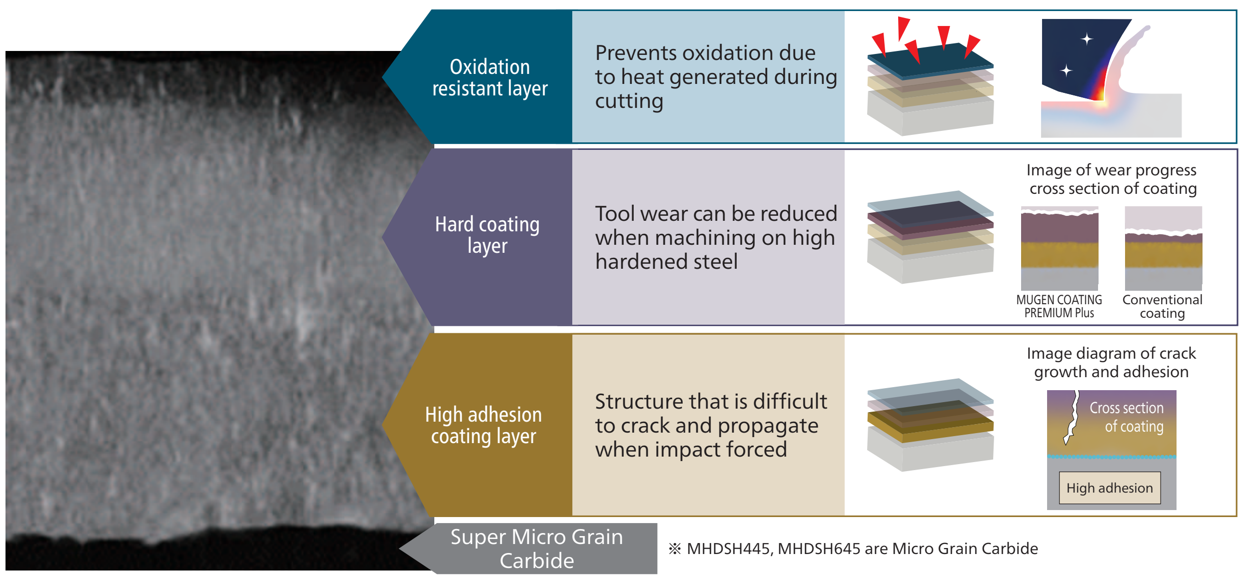
Work Material	Tough Pitch Copper・Aluminium Alloy				
Radius	Depth of Cut		Feed	Approaching Feed	Spindle Speed
	ap mm	ae mm	mm/min	mm/min	min^{-1}
0.005	0.0003	0.0005	5	2	60,000
0.01	0.0005	0.001	10	3	60,000
0.02	0.001	0.002	20	5	60,000
0.03	0.002	0.003	80	10	60,000
0.04	0.002	0.004	200	30	60,000
0.05	0.003	0.005	300	30	60,000
Notes	※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Handle with care when exchanging and presetting tool. ※3 Use proper type of coolant for material and machining process. ※4 Minimize chucking runout (Recommend to measure actual runout at activated spindle speed.) ※5 Tool approaching angle must be 3 degrees or below. ※6 Increase of Depth of Cut may cause a tool breakage, especially careful for Axial Depth of Cut.				

Optimized for machining hardened steels up to 60 to 70HRC

Range of NS TOOL original coating by work material hardness

MUGEN COATING PREMIUM Plus with high oxidation resistance and abrasion resistance is suitable for machining above 60HRC. Demonstrates same performance with MUGEN COATING PREMIUM even on machining 45 ~ 60HRC.

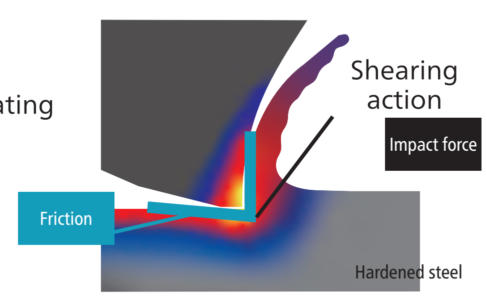
Coating Structure



※ MHDSH445, MHDSH645 are Micro Grain Carbide

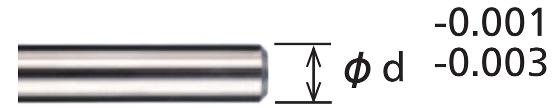
As a phenomenon when machining hardened steel of 60 to 70 HRC, the cutting load during processing is extremely high because hardness and toughness of work material are high. Therefore, the "shearing action" at tool edge cause that…

- Tools to wear easily causing frict
- Tools tends to wear to reduced hardness of material on coating oxidizes of cutting heat
- Tool is easily damaged if impact force is large



High precision and long tool life even for hardened steel up to 70 HRC

High precision shank realize no fluctuate machining



Achieved high precision machining with high accuracy ball radius or corner radius

MRBSH230SF

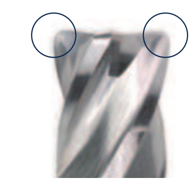
Ball radius R±0.003

R accuracy is based on a half value of actual diameter

MHRSH430RSF

Corner radius R±0.003

(D ≦ ϕ 2)



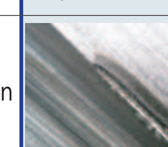
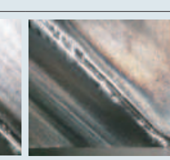
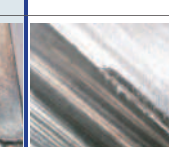
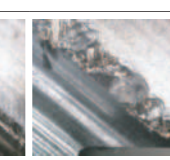
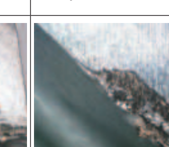
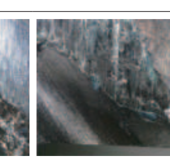
Ball end mill tool life comparison to HAP40 (64HRC)

Cutting condition n= 20,000 min^{-1}, vf= 1,600mm/min, ap 0.15×ae 0.3mm, Coolant: Oil mist

	MRBSH230SF	Other tool brand A	Other tool brand B	Other tool brand C
After 70 min				
Tool wear	0.102 mm	0.137 mm	0.190 mm	0.157 mm

Square end mill tool life comparison to HAP40 (64HRC)

Cutting condition n= 4,200 min^{-1}, vf= 600mm/min, ap 9 × ae 0.12mm, Coolant: Oil mist

	MHDSH645 ϕ 6x18		Other tool brand A		Other tool brand B	
	Major flank notch	End edge	Major flank notch	End edge	Major flank notch	End edge
After 120 min						
Tool wear	0.060 mm	0.080 mm	0.097 mm	Wear width cannot be measured because great damage	Wear width cannot be measured because great damage	

NEW	Model	Size	Maximum Cutting Depth	Coating	Number of Flutes	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																									
NEW	MHDSH445	φ1～φ4	3D	Plus	4	45°	Side	Slot	Slot	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	10	E-006
	High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel																								
NEW	MHDSH645	φ5～φ6	3D	Plus	6	45°	Side	Slot	Slot	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	4	E-008
	High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel																								
Ball																									
	MSBSH330-5X	R0.1～R1	0.6D	Plus	3	30°	-	-	-	3D	-	-	-	○	◎	◎	-	-	-	-	-	-	-	8	E-010
	3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining																								
Long Neck Ball																									
	MRBSH230SF	R0.05～R3	6D	Plus	2	30°	-	-	-	3D	-	-	-	○	◎	◎	-	-	-	-	-	-	-	83	E-012
	High precision and long tool life even for hardened steels up to 70HRC																								
Size Expansion	MRBSH330	R0.1～R3	3D	Plus	3	30°	-	-	-	3D	-	-	-	○	◎	◎	-	-	-	-	-	-	-	31	E-016
	High efficiency 3-flute ball end mill optimizes shape of ball center and enables high depth of cut and high feed machining																								
Long Neck Corner Radius																									
Size Expansion	MHRSH430RSF	φ0.1×R0.01～φ6×R1	5D	Plus	4	30°	Side	Slot	Slot	-	-	-	-	○	◎	◎	-	-	-	-	-	-	-	205	E-018
	Wiper and seamless shape improve surface roughness. Corner R accuracy ± 0.003mm enhances finishing performance on hardened steels																								

MHDSH445

New

Size ϕ1～ϕ4

≦70 HRC

Plus

MUGEN COATING PREMIUM Plus 4-Flute Square End Mill for Hardened Steel

Total 10 sizes

High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel

MG 4 45° ϕd −0.001 −0.003

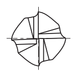
Connect

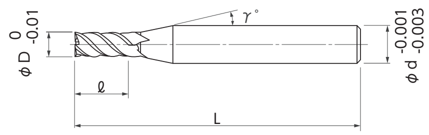
Side Slot Face

Hardened Steel ~55 HRC H

Hardened Steel ~65 HRC H

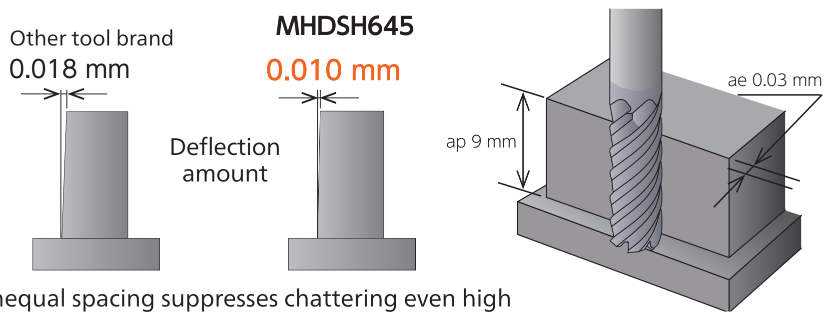
Hardened Steel ~70 HRC H





- 4-flute is lineup of length of cut expands 2D and 3D.
- MUGEN COATING PREMIUM Plus realizes long tool life even for hardened steel up to 70HRC.
- High rigidity tool design improves machining accuracy.

Leaflet



Unequal spacing suppresses chattering even high feed rate machining

Square Coating

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00429-00102	1	2	12°	6	60
08-00429-00103		3	12°	6	60
08-00429-00152	1.5	3	12°	6	60
08-00429-00153		4.5	12°	6	60
08-00429-00202	2	4	12°	6	60
08-00429-00203		6	12°	6	60
08-00429-00302	3	6	12°	6	60
08-00429-00303		9	12°	6	60
08-00429-00402	4	8	12°	6	60
08-00429-00403		12	12°	6	60

How to Order When you order, indicate MHDSH445(D)x(ℓ). ※(γ) is reference value.

Machining case S-014, S-015

Work Material			High Speed Steels / Hardened Steels SKH51・SKD11 (～62HRC)				High Speed Steels SKH55・HAP40 (～66HRC)				High Speed Steels SKH57・HAP72 (～70HRC)			
	Dia.	Length of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
Side milling	1	2	25,000	500	1.5	0.02	20,000	240	1.5	0.02	16,000	160	1.5	0.02
		3	22,000	360	1.5	0.02	18,000	200	1.5	0.02	14,000	120	1.5	0.02
	1.5	3	16,000	560	2.25	0.03	14,000	330	2.25	0.03	10,000	240	2.25	0.03
		4.5	14,000	420	2.25	0.03	12,000	240	2.25	0.03	8,000	160	2.25	0.03
	2	4	12,000	630	3	0.04	10,000	480	3	0.04	8,000	320	3	0.04
		6	10,000	500	3	0.04	8,000	330	3	0.04	6,000	240	3	0.04
	3	6	8,000	700	4.5	0.06	7,000	560	4.5	0.06	5,600	400	4.5	0.06
		9	7,600	600	4.5	0.06	6,400	480	4.5	0.06	5,000	320	4.5	0.06
	4	8	7,000	800	6	0.08	6,000	600	6	0.08	5,000	400	6	0.08
		12	6,600	700	6	0.08	5,600	560	6	0.08	4,600	320	6	0.08
Slotting	1	2	20,000	300	0.02	-	16,000	120	0.01	-	14,000	100	0.01	-
		3	18,000	240	0.02	-	14,000	80	0.01	-	12,000	50	0.01	-
	1.5	3	12,000	380	0.03	-	10,000	160	0.015	-	8,000	120	0.015	-
		4.5	10,000	260	0.03	-	9,000	100	0.015	-	7,500	60	0.015	-
	2	4	10,000	420	0.04	-	8,000	240	0.02	-	7,000	160	0.02	-
		6	8,000	300	0.04	-	7,000	120	0.02	-	6,000	80	0.02	-
	3	6	7,500	500	0.06	-	6,000	280	0.03	-	5,000	180	0.03	-
		9	7,000	320	0.06	-	5,600	140	0.03	-	4,500	100	0.03	-
	4	8	6,000	540	0.08	-	5,000	300	0.04	-	4,500	180	0.04	-
		12	5,600	360	0.08	-	4,800	160	0.04	-	4,000	100	0.04	-

Notes

Side Milling Slotting

※1 Use a rigid and precise machine and chuck holder.
※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use oil mist coolant.

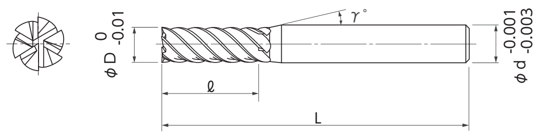
MHDSH645 New

Size φ5〜φ6

MUGEN COATING PREMIUM Plus 6-Flute Square End Mill for Hardened Steel

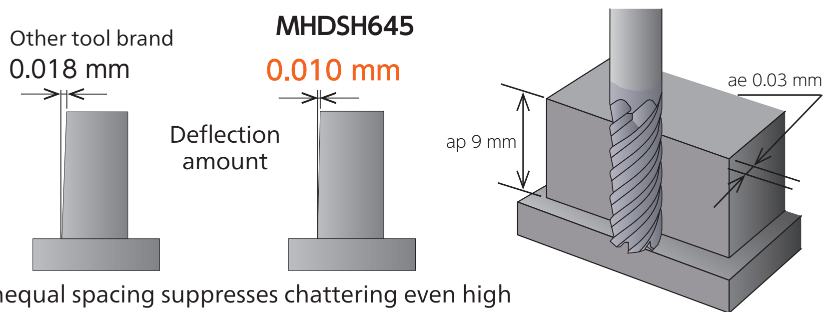
Total 4 sizes

High rigidity tool design suppresses deflection and realizes long tool life on machining 70HRC hardened steel



- 6-flute is lineup of length of cut expands 2D and 3D.
- MUGEN COATING PREMIUM Plus realizes long tool life even for hardened steel up to 70HRC.
- High rigidity tool design improves machining accuracy.

Leaflet



Unequal spacing suppresses chattering even high feed rate machining

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00430-00502	5	10	12°	6	60
08-00430-00503		15	12°	6	65
08-00430-00602	6	12	-	6	60
08-00430-00603		18	-	6	65

How to Order When you order, indicate MHDSH645(D)x(ℓ). ※(γ) is reference value.

Machining case S-016

Recommended Milling Conditions

Work Material			High Speed Steels / Hardened Steels SKH51・SKD11 (〜62HRC)				High Speed Steels SKH55・HAP40 (〜66HRC)				High Speed Steels SKH57・HAP72 (〜70HRC)			
	Dia.	Length of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
Side milling	5	10	6,200	1,200	7.5	0.1	5,300	800	7.5	0.1	4,600	560	7.5	0.1
		15	5,600	1,000	7.5	0.1	4,800	600	7.5	0.1	4,200	480	7.5	0.1
	6	12	5,300	1,200	9	0.12	4,600	800	9	0.12	4,000	560	9	0.12
		18	4,800	1,000	9	0.12	4,200	600	9	0.12	3,600	480	9	0.12
Slotting	5	10	5,600	600	0.1	-	4,800	350	0.05	-	4,000	200	0.05	-
		15	5,000	400	0.1	-	4,200	200	0.05	-	3,600	120	0.05	-
	6	12	4,800	600	0.12	-	4,200	350	0.06	-	3,600	200	0.06	-
		18	4,200	400	0.12	-	3,600	200	0.06	-	3,200	120	0.06	-

Notes

Side Milling　　Slotting

※1 Use a rigid and precise machine and chuck holder.
※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use oil mist coolant.

MSBSH330-5X

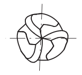
Size R0.1 ～ R1

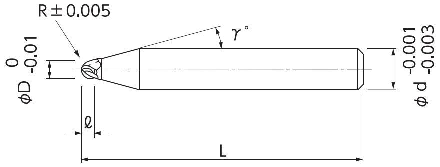
MSBSH330-5X

MUGEN COATING PREMIUM Plus 3-Flute Ball End Mill for 5-axis machining

Total 8 sizes

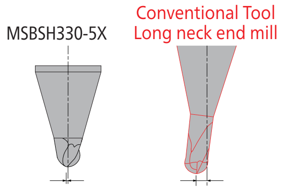
3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining



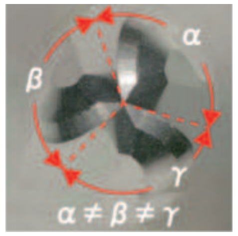


- 3-flute high rigidity ball design conforms features of 5-axis machine to reduce total manufacturing cost with high precision and high efficiency machining.
- Even hardened steel of 45 to 70HRC can be machining with long tool life and high efficiency.
- By adopting positive cutting edge for carbide material emphasized breakage resistance that suppresses chattering by 3-flute and unequal flute.
- R accuracy is ±0.005mm (R accuracy is based on a half value of actual diameter).
- Shank diameter tolerance , high accuracy type, is - 0.001 ～ - 0.003.

Leaflet



Tool design suppressing the amount of deflection



Unequal spacing suppresses chattering even high feed rate machining

Machining case

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00610-00100	R0.1	0.12	0.2	15°	6	50
08-00610-00150	R0.15	0.18	0.3	15°	6	50
08-00610-00200	R0.2	0.24	0.4	15°	6	50
08-00610-00250	R0.25	0.3	0.5	15°	6	50
08-00610-00300	R0.3	0.36	0.6	15°	6	50
08-00610-00500	R0.5	0.6	1	15°	6	50
08-00610-00750	R0.75	0.9	1.5	15°	6	50
08-00610-01000	R1	1.2	2	15°	6	50

How to Order When you order, indicate MSBSH330-5X(R). ※(γ) is reference value.

Machining case S-017

Recommended Milling Conditions

Work Material	Hardened Steels STAVAX・SKD11 (～60HRC)				High Speed Steels SKH51・HAP40 (～65HRC)				High Speed Steels SKH57・HAP72 (～70HRC)			
Radius	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
R0.1	0.005 ～ 0.007	0.005	400	40,000	0.003 ～ 0.005	0.003	300	40,000	0.003 ～ 0.005	0.003	220	40,000
R0.15	0.005 ～ 0.007	0.007	450	40,000	0.003 ～ 0.005	0.005	400	40,000	0.003 ～ 0.005	0.005	270	40,000
R0.2	0.02 ～ 0.03	0.03	1,100	40,000	0.008 ～ 0.012	0.02	850	40,000	0.008 ～ 0.012	0.02	650	35,000
R0.25	0.02 ～ 0.03	0.03	1,300	40,000	0.01 ～ 0.015	0.02	1,000	35,000	0.01 ～ 0.015	0.02	700	30,000
R0.3	0.03 ～ 0.045	0.06	1,500	40,000	0.02 ～ 0.03	0.05	1,100	30,000	0.02 ～ 0.03	0.05	800	25,000
R0.5	0.1 ～ 0.15	0.2	3,000	30,000	0.08 ～ 0.12	0.1	2,000	25,000	0.05 ～ 0.075	0.1	1,500	20,000
R0.75	0.1 ～ 0.15	0.3	3,800	30,000	0.1 ～ 0.15	0.2	3,000	25,000	0.06 ～ 0.09	0.2	2,200	20,000
R1	0.2 ～ 0.3	0.5	3,800	25,000	0.15 ～ 0.22	0.3	3,000	20,000	0.1 ～ 0.15	0.3	2,200	16,000

Notes

※1 Depth of cut ap indicates Axial Depth of Cut, ae indicates Radial Depth of Cut.
※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
※3 Since the neck angle is 15°, please be careful to set the inclined angle to avoid interfering.
※4 Adjust milling condition with necessity when high cutting load occurred by angle of tool or work material and feed direction.
※5 The depth of cut ap is a guideline value according to the inclined angle of the tool or work material.
※6 In case of chattering etc., please adjust cutting conditions if necessary.
※7 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly.
※8 Adjust both spindle speed and feed at the same rate.
※9 Attention to a risk of chipping and breakage when insufficient chip flow.
※10 We recommend using oil mist coolant.

MRBSH230SF

Size R0.05 ~ R3

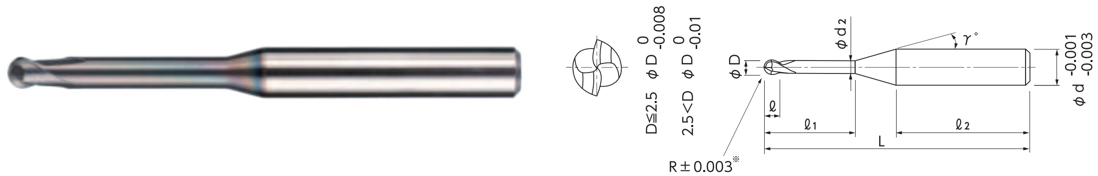
≤70 HRC

MUGEN COATING PREMIUM Plus 2-Flute Long Neck Ball End Mill with Short Shank for Hardened Steel and High accuracy cutting

Total 83 sizes

SMG 2 30° R ±0.003 φd −0.001 −0.003 3D

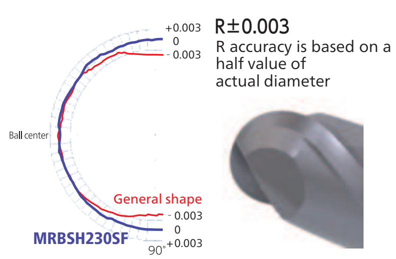
High precision and long tool life even for hardened steels up to 70HRC



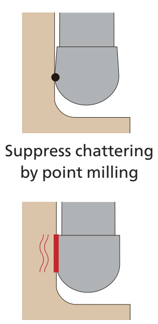
※ R accuracy is based on a half value of actual diameter

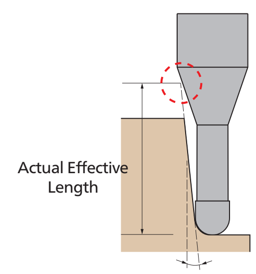
- Realize stable cutting performance even for 70 HRC hardened steels.
- Developed new MUGEN COATING PREMIUM Plus to upgrade oxidation resistance and abrasion resistance.
- Adopt optimized new tool material and tool design to reduce cutting load.
- R accuracy is ±0.003mm (R accuracy is based on a half value of actual diameter).
- Shank diameter tolerance, high accuracy type, is - 0.001mm / - 0.003mm.

Leaflet



Seamless design on rake face and flank face from R-curve to peripheral cutting edge. Realized high precision R accuracy





Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										30′	1°	1°30′	2°	3°
08-00537-00052		0.2	0.07	0.1	0.085	15°	4	27.4	35	0.23	0.24	0.24	0.25	0.27
08-00537-00053	R0.05	0.3	0.07	0.1	0.085	15°	4	27.3	35	0.33	0.34	0.35	0.36	0.39
08-00537-00055		0.5	0.07	0.1	0.085	15°	4	27.1	35	0.54	0.56	0.57	0.59	0.64
08-00537-00072	R0.075	0.3	0.1	0.15	0.13	15°	4	27.4	35	0.34	0.35	0.36	0.37	0.40
08-00537-00073		0.5	0.1	0.15	0.13	15°	4	27.2	35	0.55	0.56	0.58	0.60	0.65
08-00537-00101		0.3	0.15	0.2	0.18	15°	4	27.5	35	0.34	0.35	0.36	0.37	0.39
08-00537-00102	R0.1	0.5	0.15	0.2	0.18	15°	4	27.3	35	0.55	0.56	0.58	0.60	0.64
08-00537-00103		0.75	0.15	0.2	0.18	15°	4	27.1	35	0.81	0.83	0.86	0.89	0.95
08-00537-00105		1	0.15	0.2	0.18	15°	4	26.8	35	1.06	1.10	1.13	1.17	1.26
08-00537-00150		0.5	0.2	0.3	0.28	15°	4	27.5	35	0.55	0.56	0.57	0.59	0.63
08-00537-00151		0.6	0.2	0.3	0.28	15°	4	27.4	35	0.65	0.67	0.69	0.71	0.75
08-00537-00152	R0.15	0.75	0.2	0.3	0.28	15°	4	27.3	35	0.80	0.83	0.85	0.88	0.94
08-00537-00153		1	0.2	0.3	0.28	15°	4	27.0	35	1.06	1.09	1.13	1.17	1.25
08-00537-00155		1.5	0.2	0.3	0.28	15°	4	26.5	35	1.58	1.63	1.68	1.74	1.87
08-00537-00201		0.5	0.3	0.4	0.37	15°	4	27.7	35	0.56	0.58	0.59	0.60	0.64
08-00537-00202		0.8	0.3	0.4	0.37	15°	4	27.4	35	0.87	0.90	0.92	0.95	1.01
08-00537-00203		1	0.3	0.4	0.37	15°	4	27.2	35	1.08	1.11	1.14	1.18	1.26
08-00537-00204	R0.2	1.5	0.3	0.4	0.37	15°	4	26.7	35	1.60	1.65	1.70	1.75	1.88
08-00537-00205		2	0.3	0.4	0.37	15°	4	26.2	35	2.11	2.18	2.25	2.33	2.50
08-00537-00206		2.5	0.3	0.4	0.37	15°	4	25.7	35	2.63	2.72	2.81	2.90	3.13
08-00537-00252		1	0.35	0.5	0.46	15°	4	27.3	35	1.10	1.13	1.16	1.19	1.27
08-00537-00253		1.5	0.35	0.5	0.46	15°	4	26.8	35	1.61	1.66	1.71	1.77	1.89
08-00537-00254	R0.25	2	0.35	0.5	0.46	15°	4	26.3	35	2.13	2.20	2.27	2.34	2.51
08-00537-00255		2.5	0.35	0.5	0.46	15°	4	25.8	35	2.65	2.73	2.82	2.92	3.14
08-00537-00256		3	0.35	0.5	0.46	15°	4	25.3	35	3.16	3.27	3.38	3.49	3.76

How to Order — When you order, indicate MRBSH230SF (R)×(ℓ1). ※(γ) is reference value.

Machining case — S-018, S-019

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
										30′	1°	1°30′	2°	3°
08-00537-00300		1	0.45	0.6	0.56	15°	4	27.5	35	1.10	1.12	1.15	1.19	1.26
08-00537-00301		1.5	0.45	0.6	0.56	15°	4	27.0	35	1.61	1.66	1.71	1.76	1.88
08-00537-00302		2	0.45	0.6	0.56	15°	4	26.5	35	2.13	2.19	2.26	2.34	2.50
08-00537-00303	R0.3	2.5	0.45	0.6	0.56	15°	4	26.0	35	2.65	2.73	2.82	2.91	3.12
08-00537-00304		3	0.45	0.6	0.56	15°	4	25.5	35	3.16	3.26	3.37	3.49	3.75
08-00537-00305		3.5	0.45	0.6	0.56	15°	4	25.0	35	3.68	3.80	3.92	4.06	4.37
08-00537-00306		4	0.45	0.6	0.56	15°	4	29.5	40	4.20	4.33	4.48	4.64	4.99
08-00537-00402		2	0.6	0.8	0.76	15°	4	26.9	35	2.13	2.19	2.25	2.32	2.48
08-00537-00403		3	0.6	0.8	0.76	15°	4	25.9	35	3.16	3.26	3.36	3.47	3.72
08-00537-00405	R0.4	4	0.6	0.8	0.76	15°	4	24.9	35	4.19	4.33	4.47	4.62	4.97
08-00537-00406		5	0.6	0.8	0.76	15°	4	28.9	40	5.23	5.40	5.58	5.77	6.21
08-00537-00501		2	0.75	1	0.95	15°	4	27.3	35	2.14	2.20	2.26	2.33	2.48
08-00537-00502		2.5	0.75	1	0.95	15°	4	26.8	35	2.66	2.73	2.82	2.90	3.10
08-00537-00503		3	0.75	1	0.95	15°	4	26.3	35	3.18	3.27	3.37	3.48	3.72
08-00537-00504	R0.5	4	0.75	1	0.95	15°	4	25.3	35	4.21	4.34	4.48	4.63	4.97
08-00537-00505		5	0.75	1	0.95	15°	4	29.3	40	5.24	5.41	5.59	5.78	6.21
08-00537-00506		6	0.75	1	0.95	15°	4	28.3	40	6.28	6.48	6.69	6.93	7.45
08-00537-00602		2.4	0.9	1.2	1.15	15°	4	27.2	35	2.55	2.62	2.69	2.77	2.95
08-00537-00603		4	0.9	1.2	1.15	15°	4	25.6	35	4.21	4.33	4.47	4.61	4.94
08-00537-00605	R0.6	6	0.9	1.2	1.15	15°	4	28.6	40	6.27	6.47	6.68	6.91	7.43
08-00537-00606		8	0.9	1.2	1.15	15°	4	26.6	40	8.34	8.61	8.90	9.21	9.91
08-00537-00752		3	1.1	1.5	1.45	15°	4	27.2	35	3.17	3.25	3.34	3.44	3.66
08-00537-00753		4	1.1	1.5	1.45	15°	4	26.2	35	4.20	4.32	4.45	4.59	4.91
08-00537-00754	R0.75	6	1.1	1.5	1.45	15°	4	29.2	40	6.27	6.46	6.67	6.89	7.39
08-00537-00755		8	1.1	1.5	1.45	15°	4	27.2	40	8.34	8.60	8.88	9.19	9.88
08-00537-00756		10	1.1	1.5	1.45	15°	4	25.2	40	10.40	10.74	11.10	11.49	12.36
08-00537-00805	R0.8	8	1.2	1.6	1.55	15°	4	27.4	40	8.33	8.60	8.88	9.18	9.87
08-00537-01000		3	1.5	2	1.94	15°	4	28.1	35	3.18	3.25	3.34	3.43	3.63
08-00537-01001		4	1.5	2	1.94	15°	4	27.1	35	4.21	4.32	4.45	4.58	4.87
08-00537-01002	R1	6	1.5	2	1.94	15°	4	25.1	35	6.28	6.46	6.66	6.88	7.36
08-00537-01003		8	1.5	2	1.94	15°	4	28.1	40	8.35	8.60	8.88	9.18	9.84
08-00537-01004		10	1.5	2	1.94	15°	4	26.1	40	10.41	10.74	11.10	11.48	12.33
08-00537-01005		12	1.5	2	1.94	15°	4	29.1	45	12.48	12.88	13.31	13.77	14.82
08-00537-01252		6	2.3	2.5	2.4	15°	4	26.0	35	6.35	6.53	6.72	6.92	7.39
08-00537-01253	R1.25	8	2.3	2.5	2.4	15°	4	29.0	40	8.42	8.67	8.93	9.22	9.88
08-00537-01254		10	2.3	2.5	2.4	15°	4	27.0	40	10.48	10.81	11.15	11.52	12.36
08-00537-01256		15	2.3	2.5	2.4	15°	4	27.0	45	15.65	16.15	16.69	17.27	Free
08-00537-01500		6	2.5	3	2.85	15°	6	33.1	45	6.44	6.61	6.79	7.00	7.45
08-00537-01501		8	2.5	3	2.85	15°	6	31.1	45	8.50	8.75	9.01	9.29	9.93
08-00537-01502		10	2.5	3	2.85	15°	6	29.1	45	10.57	10.89	11.23	11.59	12.42
08-00537-01503	R1.5	12	2.5	3	2.85	15°	6	27.1	45	12.64	13.03	13.44	13.89	14.91
08-00537-01504		14	2.5	3	2.85	15°	6	30.1	50	14.71	15.17	15.66	16.19	17.39
08-00537-01505		16	2.5	3	2.85	15°	6	28.1	50	16.77	17.31	17.88	18.49	19.88
08-00537-01506		20	2.5	3	2.85	15°	6	29.1	55	20.91	21.58	22.31	23.09	24.85
08-00537-02000		8	3	4	3.8	15°	6	32.8	45	8.58	8.81	9.06	9.33	9.93
08-00537-02001		10	3	4	3.8	15°	6	30.8	45	10.65	10.95	11.28	11.63	12.42
08-00537-02002	R2	12	3	4	3.8	15°	6	28.8	45	12.72	13.09	13.49	13.93	14.90
08-00537-02004		15	3	4	3.8	15°	6	30.8	50	15.82	16.30	16.82	17.38	18.63
08-00537-02005		20	3	4	3.8	15°	6	30.8	55	20.99	21.65	22.36	23.13	Free
08-00537-02006		25	3	4	3.8	15°	6	30.8	60	26.16	27.00	27.90	28.88	Free
08-00537-02502		10	3.5	5	4.8	15°	6	32.7	45	10.63	10.92	11.22	11.55	Free
08-00537-02503	R2.5	15	3.5	5	4.8	15°	6	27.7	45	15.80	16.27	16.77	Free	Free
08-00537-02504		20	3.5	5	4.8	15°	6	27.7	50	20.97	21.62	Free	Free	Free
08-00537-03000		10	6	6	5.7	–	6	34.4	45	Free	Free	Free	Free	Free
08-00537-03001		15	6	6	5.7	–	6	29.4	45	Free	Free	Free	Free	Free
08-00537-03002	R3	20	6	6	5.7	–	6	29.4	50	Free	Free	Free	Free	Free
08-00537-03003		25	6	6	5.7	–	6	29.4	55	Free	Free	Free	Free	Free
08-00537-03004		30	6	6	5.7	–	6	29.4	60	Free	Free	Free	Free	Free

MRBSH230SF

Recommended Milling Conditions

Regular Line
MUGEN PREMIUM Plus

Work Material			SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
R0.05	0.2	2	0.002	0.005	100	40,000	0.002	0.003	70	40,000	0.002	0.003	50	40,000
	0.3	3	0.002	0.005	70	40,000	0.002	0.003	50	40,000	0.002	0.003	40	40,000
	0.5	5	0.001	0.003	50	40,000	0.001	0.002	30	40,000	0.001	0.002	20	40,000
R0.075	0.3	2	0.002	0.005	150	40,000	0.002	0.003	100	40,000	0.002	0.003	80	40,000
	0.5	3.3	0.002	0.005	120	40,000	0.002	0.003	70	40,000	0.002	0.003	50	40,000
R0.1	0.3	1.5	0.005	0.005	300	40,000	0.003	0.003	200	40,000	0.003	0.003	150	40,000
	0.5	2.5	0.005	0.005	280	40,000	0.003	0.003	180	40,000	0.003	0.003	130	40,000
	0.75	3.75	0.003	0.005	200	40,000	0.002	0.003	150	40,000	0.002	0.003	110	40,000
	1	5	0.002	0.003	160	40,000	0.001	0.002	120	40,000	0.001	0.002	90	40,000
R0.15	0.5	1.7	0.007	0.01	300	40,000	0.003	0.005	280	40,000	0.003	0.005	210	40,000
	0.6	2	0.005	0.007	300	40,000	0.003	0.005	250	40,000	0.003	0.005	180	40,000
	0.75	2.5	0.005	0.007	280	40,000	0.003	0.005	230	40,000	0.003	0.005	170	40,000
	1	3.3	0.005	0.007	250	40,000	0.003	0.005	200	40,000	0.003	0.005	150	40,000
	1.5	5	0.003	0.005	180	40,000	0.002	0.003	120	40,000	0.002	0.003	90	40,000
R0.2	0.5	1.25	0.03	0.03	720	40,000	0.009	0.02	580	40,000	0.009	0.02	420	35,000
	0.8	2	0.02	0.03	720	40,000	0.008	0.02	580	40,000	0.008	0.02	420	35,000
	1	2.5	0.02	0.03	720	40,000	0.008	0.02	580	40,000	0.008	0.02	400	35,000
	1.5	3.75	0.01	0.02	500	40,000	0.005	0.01	400	40,000	0.005	0.01	280	35,000
	2	5	0.007	0.01	380	40,000	0.005	0.007	300	40,000	0.005	0.007	220	35,000
	2.5	6.25	0.005	0.007	300	40,000	0.003	0.005	260	40,000	0.003	0.005	190	35,000
R0.25	1	2	0.02	0.03	860	40,000	0.01	0.02	650	35,000	0.01	0.02	450	30,000
	1.5	3	0.01	0.03	720	40,000	0.007	0.02	520	35,000	0.007	0.02	350	30,000
	2	4	0.01	0.02	650	40,000	0.007	0.01	400	35,000	0.007	0.01	270	30,000
	2.5	5	0.007	0.01	530	40,000	0.005	0.007	360	35,000	0.005	0.007	240	30,000
	3	6	0.007	0.01	420	35,000	0.005	0.007	320	35,000	0.005	0.007	220	30,000
R0.3	1	1.7	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000	0.02	0.05	540	25,000
	1.5	2.5	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000	0.02	0.05	540	25,000
	2	3.3	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000	0.02	0.05	540	25,000
	2.5	4.1	0.02	0.04	840	40,000	0.02	0.03	640	30,000	0.02	0.03	480	25,000
	3	5	0.02	0.04	840	40,000	0.02	0.03	600	30,000	0.02	0.03	450	25,000
	3.5	5.9	0.01	0.03	600	30,000	0.01	0.02	420	30,000	0.01	0.02	310	25,000
	4	6.7	0.01	0.03	600	30,000	0.01	0.02	420	30,000	0.01	0.02	310	25,000
R0.4	2	2.5	0.07	0.1	1,600	35,000	0.05	0.1	1,200	30,000	0.03	0.1	900	25,000
	3	3.75	0.05	0.1	1,600	35,000	0.05	0.05	1,200	30,000	0.03	0.05	900	25,000
	4	5	0.04	0.06	1,200	30,000	0.03	0.05	860	25,000	0.02	0.05	640	20,000
	5	6.25	0.03	0.05	1,000	25,000	0.02	0.03	620	25,000	0.015	0.03	460	20,000
R0.5	2	2	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000	0.05	0.1	1,000	20,000
	2.5	2.5	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000	0.05	0.1	1,000	20,000
	3	3	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000	0.05	0.1	1,000	20,000
	4	4	0.05	0.15	1,600	28,000	0.05	0.1	1,200	25,000	0.03	0.1	900	20,000
	5	5	0.04	0.1	1,400	25,000	0.03	0.05	920	20,000	0.02	0.05	700	16,000
	6	6	0.04	0.05	1,200	22,000	0.02	0.05	740	20,000	0.015	0.05	550	16,000
R0.6	2.4	2	0.1	0.2	2,000	30,000	0.08	0.1	1,600	25,000	0.05	0.1	1,200	20,000
	4	3.3	0.1	0.2	2,000	30,000	0.06	0.1	1,600	25,000	0.05	0.1	1,200	20,000
	6	5	0.05	0.1	1,400	25,000	0.03	0.07	1,000	20,000	0.02	0.07	750	16,000
	8	6.7	0.03	0.07	1,200	22,000	0.02	0.05	850	20,000	0.015	0.05	650	16,000
R0.75	3	2	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000	0.06	0.2	1,500	20,000
	4	2.7	0.1	0.3	2,000	25,000	0.1	0.2	1,600	22,000	0.06	0.2	1,200	18,000
	6	4	0.1	0.2	1,600	22,000	0.1	0.1	1,200	20,000	0.06	0.1	950	16,000
	8	5.3	0.05	0.2	1,400	20,000	0.05	0.1	1,000	18,000	0.03	0.1	700	13,000
	10	6.7	0.05	0.1	1,200	18,000	0.05	0.05	850	16,000	0.03	0.05	650	13,000
R0.8	8	5	0.07	0.2	1,400	20,000	0.05	0.1	1,000	16,000	0.03	0.1	750	13,000

Work Material			High Speed Steels/Hardened Steels SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
R1	3	1.5	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000	0.1	0.3	1,500	16,000
	4	2	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000	0.1	0.3	1,500	16,000
	6	3	0.2	0.3	2,000	22,000	0.15	0.3	1,600	20,000	0.1	0.3	1,200	16,000
	8	4	0.1	0.2	1,600	18,000	0.1	0.15	1,200	16,000	0.06	0.15	950	13,000
	10	5	0.1	0.2	1,400	16,000	0.1	0.1	1,000	14,000	0.06	0.1	750	11,000
	12	6	0.07	0.1	1,200	14,000	0.05	0.1	850	12,000	0.03	0.1	650	9,500
R1.25	6	2.4	0.2	0.5	2,500	20,000	0.15	0.4	2,000	18,000	0.1	0.4	1,500	14,000
	8	3.2	0.2	0.3	2,100	20,000	0.15	0.3	1,800	18,000	0.1	0.3	1,300	14,000
	10	4	0.15	0.2	1,800	18,000	0.1	0.15	1,500	16,000	0.06	0.15	1,100	13,000
	15	6	0.07	0.15	1,200	14,000	0.05	0.1	900	12,000	0.03	0.1	700	9,500
R1.5	6	2	0.2	0.6	2,500	18,000	0.2	0.5	2,000	15,000	0.12	0.5	1,500	12,000
	8	2.7	0.2	0.6	2,500	18,000	0.2	0.5	2,000	15,000	0.12	0.5	1,500	12,000
	10	3.3	0.2	0.4	2,100	18,000	0.15	0.3	1,800	15,000	0.1	0.3	1,300	12,000
	12	4	0.2	0.4	2,000	18,000	0.1	0.3	1,500	15,000	0.06	0.3	1,100	12,000
	14	4.7	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000	0.06	0.2	900	10,000
	16	5.3	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000	0.06	0.2	900	10,000
	20	6.7	0.08	0.2	1,200	14,000	0.08	0.1	850	12,000	0.06	0.1	650	9,500
R2	8	2	0.2	0.8	2,500	15,000	0.2	0.6	2,000	12,000	0.15	0.6	1,500	9,500
	10	2.5	0.2	0.8	2,500	15,000	0.2	0.6	2,000	12,000	0.15	0.6	1,500	9,500
	12	3	0.2	0.8	2,500	15,000	0.2	0.6	2,000	12,000	0.15	0.6	1,500	9,500
	15	3.75	0.2	0.8	2,000	15,000	0.15	0.6	1,600	12,000	0.12	0.6	1,200	9,500
	20	5	0.1	0.6	1,700	14,000	0.1	0.4	1,200	10,000	0.08	0.4	900	8,000
	25	6.25	0.1	0.4	1,200	14,000	0.1	0.2	850	12,000	0.08	0.2	650	8,000
R2.5	10	2	0.2	1.2	2,500	12,000	0.2	0.7	2,000	10,000	0.15	0.7	1,500	8,000
	15	3	0.2	1.2	2,500	12,000	0.2	0.7	2,000	10,000	0.15	0.7	1,500	8,000
	20	4	0.2	1	2,000	10,000	0.15	0.6	1,600	8,500	0.12	0.6	1,200	6,500
R3	10	1.7	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000	0.15	1	1,500	5,500
	15	2.5	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000	0.15	1	1,500	5,500
	20	3.3	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000	0.15	1	1,500	5,500
	25	4.1	0.2	1	2,200	8,000	0.15	0.7	1,600	7,000	0.12	0.7	1,200	5,500
	30	5	0.2	1	1,800	7,000	0.15	0.7	1,300	6,500	0.12	0.7	950	5,000

Notes

※1 Depth of Cut ap indicates Axial Depth of Cut, ae indicates Radial Depth of Cut.
※2 In case of chattering etc., please adjust cutting conditions if necessary.
※3 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly.
※4 Adjust both spindle speed and feed at the same rate.
※5 A shrink fit type is recommended for tool holder. When using collet type or others, strictly adhere to minimum gripping length.
※6 We recommend using oil mist coolant.

MRBSH330

Size expansion

Size R0.1 ～ R3

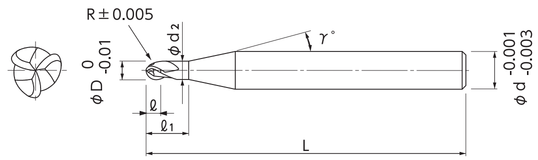
≦70 HRC

MUGEN COATING PREMIUM Plus High Efficient 3-Flute small-diameter Long Neck Ball End Mill for Hardened Steel

Total 31 sizes

SMG 3 30° R ±0.005 φd −0.001 −0.003 Connect 3D

High efficiency 3-flute ball end mill optimizes shape of ball center and enables high depth of cut and high feed machining

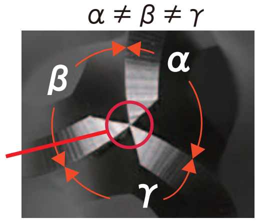


- High-efficiency 3-flute ball end mill optimizes a shape of central edge and enables high depth of cutting.
- Even hardened steel of 45 to 70HRC can be machining with long tool life and high efficiency.
- R accuracy is ±0.005mm (R accuracy is based on a half value of actual diameter).
- Shank diameter tolerance , high accuracy type, is - 0.001 ～ - 0.003.

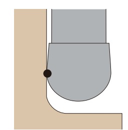
Leaflet

Unequal spacing suppresses chattering even high feed rate machining

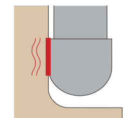
$\alpha \neq \beta \neq \gamma$



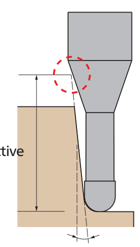
Optimizes center edge shape, enables high depth of cut and high feed machining



Suppress chattering by point milling



General End Mill



Inclined Angle

◆ New Size

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00634-01003	R0.1	0.3	0.15	0.2	0.18	12°	4	45	0.35	0.36	0.38	0.39	0.42
08-00634-01005		0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
08-00634-01505	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67
08-00634-01506		0.6	0.2	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81
08-00634-01507		0.75	0.2	0.3	0.28	12°	4	45	0.82	0.85	0.88	0.92	1.01
08-00634-01510		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
08-00634-02005	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69
08-00634-02008		0.8	0.3	0.4	0.37	12°	4	45	0.89	0.93	0.96	1.00	1.09
08-00634-02010		1	0.3	0.4	0.37	12°	4	45	1.1	1.14	1.19	1.24	1.35
08-00634-02510	R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
08-00634-02515		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
08-00634-03010	R0.3	1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
08-00634-03015		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
08-00634-03020		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
08-00634-05020	R0.5	2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
08-00634-05025		2.5	0.75	1	0.95	12°	4	45	2.7	2.80	2.91	3.03	3.31
08-00634-05030		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
08-00634-07503	R0.75	3	1.1	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
08-00634-07504		4	1.1	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
08-00634-10003	R1	3	1.5	2	1.94	12°	4	45	3.23	3.33	3.44	3.56	3.85
08-00634-10004		4	1.5	2	1.94	12°	4	45	4.27	4.42	4.58	4.76	5.17
08-00634-10006		6	1.5	2	1.94	12°	4	45	6.36	6.60	6.86	7.15	7.83
◆ 08-00634-15006	R1.5	6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
◆ 08-00634-15008		8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
◆ 08-00634-15010		10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
◆ 08-00634-20008	R2	8	3	4	3.8	12°	6	65	8.74	9.05	9.38	9.74	10.60
◆ 08-00634-20010		10	3	4	3.8	12°	6	65	10.83	11.22	11.66	12.14	13.25
◆ 08-00634-20012		12	3	4	3.8	12°	6	65	12.91	13.40	13.94	14.53	15.91
◆ 08-00634-30010	R3	10	6	6	5.7	-	6	65	Free	Free	Free	Free	Free
◆ 08-00634-30015		15	6	6	5.7	-	6	65	Free	Free	Free	Free	Free
◆ 08-00634-30020		20	6	6	5.7	-	6	65	Free	Free	Free	Free	Free

How to Order When you order, indicate MRBSH330 (R)×(ℓ1). ※(γ) is reference value.

Recommended Milling Conditions

Work Material			High Speed Steels/Hardened Steels SKH51･SKD11 (～62HRC)				High Speed Steels SKH55･HAP40 (～66HRC)				High Speed Steels SKH57･HAP72 (～70HRC)			
Radius	Under Neck Length	L/D	Depth of Cut ap mm	ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	ae mm	Feed mm/min	Spindle Speed min⁻¹
R0.1	0.3	1.5	0.006	0.007	450	40,000	0.004	0.005	300	40,000	0.004	0.005	220	40,000
	0.5	2.5	0.006	0.007	400	40,000	0.004	0.005	250	40,000	0.004	0.005	190	40,000
R0.15	0.5	1.7	0.01	0.01	450	40,000	0.005	0.005	400	40,000	0.005	0.005	300	40,000
	0.6	2	0.007	0.007	450	40,000	0.005	0.005	350	40,000	0.005	0.005	270	40,000
	0.75	2.5	0.007	0.007	400	40,000	0.005	0.005	350	40,000	0.005	0.005	250	40,000
	1	3.3	0.007	0.007	350	40,000	0.005	0.005	300	40,000	0.005	0.005	220	40,000
R0.2	0.5	1.25	0.035	0.04	1,100	40,000	0.013	0.02	850	40,000	0.013	0.02	650	35,000
	0.8	2	0.03	0.03	1,000	40,000	0.012	0.02	850	40,000	0.012	0.02	600	35,000
	1	2.5	0.03	0.03	1,000	40,000	0.012	0.02	850	40,000	0.012	0.02	600	35,000
R0.25	1	2	0.03	0.03	1,300	40,000	0.015	0.02	1,000	35,000	0.015	0.02	700	30,000
	1.5	3	0.015	0.03	1,000	40,000	0.01	0.02	800	35,000	0.01	0.02	500	30,000
R0.3	1	1.7	0.045	0.06	1,500	40,000	0.03	0.05	1,100	30,000	0.03	0.05	800	25,000
	1.5	2.5	0.045	0.06	1,500	40,000	0.03	0.05	1,100	30,000	0.03	0.05	800	25,000
	2	3.3	0.045	0.06	1,500	40,000	0.03	0.05	1,100	30,000	0.03	0.05	800	25,000
R0.5	2	2	0.15	0.2	3,000	30,000	0.12	0.1	2,000	25,000	0.075	0.1	1,500	20,000
	2.5	2.5	0.15	0.2	3,000	30,000	0.12	0.1	2,000	25,000	0.075	0.1	1,500	20,000
	3	3	0.15	0.2	3,000	30,000	0.12	0.1	2,000	25,000	0.075	0.1	1,500	20,000
R0.75	3	2	0.15	0.3	3,800	30,000	0.15	0.2	3,000	25,000	0.09	0.2	2,200	20,000
	4	2.7	0.15	0.3	3,000	25,000	0.15	0.2	2,400	22,000	0.09	0.2	1,800	18,000
R1	3	1.5	0.3	0.5	3,800	25,000	0.22	0.3	3,000	20,000	0.15	0.3	2,200	16,000
	4	2	0.3	0.5	3,800	25,000	0.22	0.3	3,000	20,000	0.15	0.3	2,200	16,000
	6	3	0.3	0.3	3,000	22,000	0.22	0.3	2,400	20,000	0.15	0.3	1,800	16,000
R1.5	6	2.0	0.3	0.6	3,800	18,000	0.25	0.5	3,000	15,000	0.15	0.5	2,250	12,000
	8	2.7	0.3	0.6	3,800	18,000	0.25	0.5	3,000	15,000	0.15	0.5	2,250	12,000
	10	3.3	0.3	0.6	3,200	18,000	0.25	0.5	2,600	15,000	0.15	0.5	2,000	12,000
R2	8	2	0.3	0.8	3,800	15,000	0.25	0.6	3,000	12,000	0.18	0.6	2,250	9,500
	10	2.5	0.3	0.8	3,800	15,000	0.25	0.6	3,000	12,000	0.18	0.6	2,250	9,500
	12	3	0.3	0.8	3,800	15,000	0.25	0.6	3,000	12,000	0.18	0.6	2,250	9,500
R3	10	1.7	0.38	1.2	3,800	8,000	0.25	1	3,000	7,000	0.18	1	2,250	5,500
	15	2.5	0.38	1.2	3,800	8,000	0.25	1	3,000	7,000	0.18	1	2,250	5,500
	20	3.3	0.38	1.2	3,800	8,000	0.25	1	3,000	7,000	0.18	1	2,250	5,500

Notes

※1 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
※3 In case of chattering etc., please adjust cutting conditions if necessary.
※4 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly.
※5 If machine tool vibration is high during machining, adjust the feed rate as necessary.
※6 Attention to a risk of chipping and breakage when insufficient chip flow.
※7 Adjust both spindle speed and feed at the same rate.
※8 Overhang of end mill should be as short as possible form spindle nose.
※9 We recommend using oil mist coolant.

MHRSH430RSF

Size expansion

Size ϕ0.1×R0.01～ϕ6×R1

Plus ≦70 HRC

MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Total 205 sizes

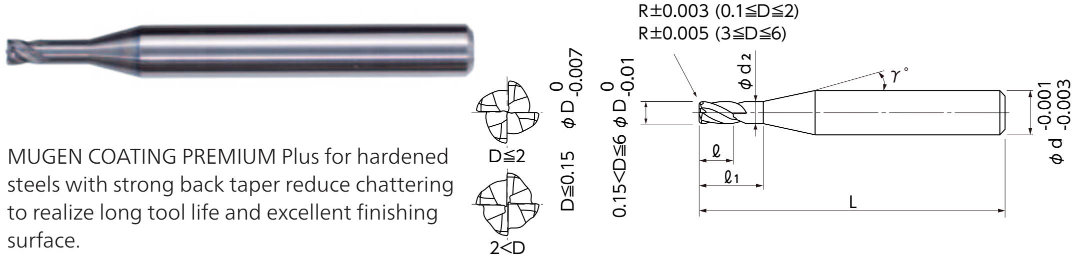
MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Regular Line
MUGEN PREMIUM Plus

SMG 4 30° Corner R ±0.003 (D≦2) Corner R ±0.005 (D≧3) ϕd −0.001 −0.003 Connect Side Slot Face

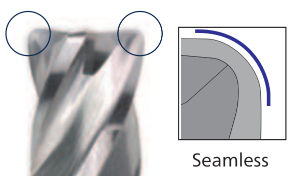
Wiper and seamless shape improve surface roughness
High accuracy corner R enhance finishing performance on hardened steels

Hardened Steel ~55HRC H
Hardened Steel ~65HRC H
Hardened Steel ~70HRC H



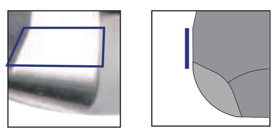
- MUGEN COATING PREMIUM Plus for hardened steels with strong back taper reduce chattering to realize long tool life and excellent finishing surface.
- 4-flute end mill for high efficiency machining.
- 4-Flute end mill has 205 sizes in total that lineup from the smallest diameter ϕ0.1 to ϕ6.

Enhances accuracy on side machining
R ± 0.003 (0.1 ≦ D ≦ 2)
R ± 0.005 (3 ≦ D ≦ 6)

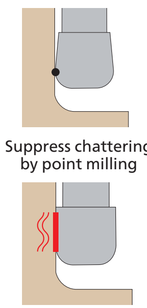


Seamless

Enhances surface roughness on bottom by wiper (D≧ϕ0.4)

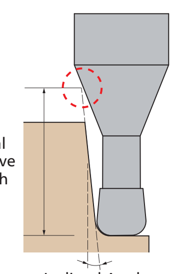


By adopting wiper at the end tooth, improves the surface roughness on bottom surface machining



Suppress chattering by point milling

General End Mill



Inclined Angle

◆ New Size

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00239-01002	0.1	R0.01	0.2	0.08	0.085	15°	4	35	0.23	0.24	0.25	0.26	0.28
08-00239-01003			0.3	0.08	0.085	15°	4	35	0.33	0.35	0.36	0.37	0.4
08-00239-01503	0.15	R0.01	0.3	0.12	0.135	15°	4	35	0.33	0.35	0.36	0.37	0.4
08-00239-01505			0.5	0.12	0.135	15°	4	35	0.54	0.56	0.58	0.6	0.65
08-00239-01523		R0.02	0.3	0.12	0.135	15°	4	35	0.33	0.34	0.36	0.37	0.4
08-00239-01525			0.5	0.12	0.135	15°	4	35	0.54	0.56	0.58	0.6	0.65
08-00239-02203	0.2	R0.02	0.3	0.15	0.18	15°	4	35	0.34	0.35	0.37	0.38	0.41
08-00239-02205			0.5	0.15	0.18	15°	4	35	0.55	0.57	0.59	0.61	0.66
08-00239-02207			0.75	0.15	0.18	15°	4	35	0.81	0.84	0.87	0.9	0.97
08-00239-02210			1	0.15	0.18	15°	4	35	1.07	1.1	1.14	1.18	1.28
08-00239-02403		R0.05	0.3	0.15	0.18	15°	4	35	0.34	0.35	0.36	0.38	0.4
08-00239-02405			0.5	0.15	0.18	15°	4	35	0.55	0.57	0.59	0.61	0.65
08-00239-02407			0.75	0.15	0.18	15°	4	35	0.81	0.83	0.86	0.89	0.96
08-00239-02410			1	0.15	0.18	15°	4	35	1.07	1.1	1.14	1.18	1.27
08-00239-03205	0.3	R0.02	0.5	0.25	0.28	15°	4	35	0.55	0.57	0.59	0.61	0.66
08-00239-03207			0.75	0.25	0.28	15°	4	35	0.81	0.84	0.87	0.9	0.97
08-00239-03210			1	0.25	0.28	15°	4	35	1.07	1.1	1.14	1.18	1.28
08-00239-03215			1.5	0.25	0.28	15°	4	35	1.58	1.64	1.7	1.76	1.9
08-00239-03405		R0.05	0.5	0.25	0.28	15°	4	35	0.55	0.57	0.59	0.61	0.65
08-00239-03407			0.75	0.25	0.28	15°	4	35	0.81	0.83	0.86	0.89	0.96
08-00239-03410			1	0.25	0.28	15°	4	35	1.07	1.1	1.14	1.18	1.27
08-00239-03415			1.5	0.25	0.28	15°	4	35	1.58	1.64	1.69	1.76	1.89

How to Order — When you order, indicate MHRSH430RSF (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case — S-020, S-021

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00239-04205	0.4	R0.02	0.5	0.3	0.37	15°	4	35	0.57	0.59	0.61	0.63	0.68
08-00239-04210			1	0.3	0.37	15°	4	35	1.09	1.12	1.16	1.21	1.3
08-00239-04215			1.5	0.3	0.37	15°	4	35	1.6	1.66	1.72	1.78	1.92
08-00239-04220			2	0.3	0.37	15°	4	35	2.12	2.19	2.27	2.36	2.55
08-00239-04405		R0.05	0.5	0.3	0.37	15°	4	35	0.57	0.59	0.61	0.63	0.67
08-00239-04410			1	0.3	0.37	15°	4	35	1.08	1.12	1.16	1.2	1.3
08-00239-04415			1.5	0.3	0.37	15°	4	35	1.6	1.66	1.71	1.78	1.92
08-00239-04420			2	0.3	0.37	15°	4	35	2.12	2.19	2.27	2.35	2.54
08-00239-05210	0.5	R0.02	1	0.4	0.46	15°	4	35	1.11	1.14	1.18	1.23	1.33
08-00239-05215			1.5	0.4	0.46	15°	4	35	1.62	1.68	1.74	1.8	1.95
08-00239-05220			2	0.4	0.46	15°	4	35	2.14	2.21	2.29	2.38	2.57
08-00239-05225			2.5	0.4	0.46	15°	4	35	2.66	2.75	2.85	2.95	3.19
08-00239-05410		R0.05	1	0.4	0.46	15°	4	35	1.1	1.14	1.18	1.22	1.32
08-00239-05415			1.5	0.4	0.46	15°	4	35	1.62	1.68	1.73	1.8	1.94
08-00239-05420			2	0.4	0.46	15°	4	35	2.14	2.21	2.29	2.37	2.56
08-00239-05425			2.5	0.4	0.46	15°	4	35	2.65	2.75	2.84	2.95	3.18
08-00239-05510		R0.1	1	0.4	0.46	15°	4	35	1.1	1.14	1.18	1.22	1.31
08-00239-05515			1.5	0.4	0.46	15°	4	35	1.62	1.67	1.73	1.79	1.93
08-00239-05520			2	0.4	0.46	15°	4	35	2.14	2.21	2.28	2.37	2.55
08-00239-05525			2.5	0.4	0.46	15°	4	35	2.65	2.74	2.84	2.94	3.17
08-00239-06210	0.6	R0.02	1	0.5	0.56	15°	4	35	1.11	1.14	1.18	1.23	1.33
08-00239-06220			2	0.5	0.56	15°	4	35	2.14	2.21	2.29	2.38	2.57
08-00239-06230			3	0.5	0.56	15°	4	35	3.17	3.28	3.4	3.53	3.81
08-00239-06410		R0.05	1	0.5	0.56	15°	4	35	1.1	1.14	1.18	1.22	1.32
08-00239-06420			2	0.5	0.56	15°	4	35	2.14	2.21	2.29	2.37	2.56
08-00239-06430			3	0.5	0.56	15°	4	35	3.17	3.28	3.4	3.52	3.81
08-00239-06510		R0.1	1	0.5	0.56	15°	4	35	1.1	1.14	1.18	1.22	1.31
08-00239-06520			2	0.5	0.56	15°	4	35	2.14	2.21	2.28	2.37	2.55
08-00239-06530			3	0.5	0.56	15°	4	35	3.17	3.28	3.39	3.52	3.79
08-00239-08202	0.8	R0.02	2	0.65	0.76	15°	4	35	2.14	2.21	2.29	2.38	2.57
08-00239-08203			3	0.65	0.76	15°	4	35	3.17	3.28	3.4	3.53	3.81
08-00239-08204			4	0.65	0.76	15°	4	35	4.21	4.35	4.51	4.68	5.06
08-00239-08402		R0.05	2	0.65	0.76	15°	4	35	2.14	2.21	2.29	2.37	2.56
08-00239-08403			3	0.65	0.76	15°	4	35	3.17	3.28	3.4	3.52	3.81
08-00239-08404			4	0.65	0.76	15°	4	35	4.21	4.35	4.51	4.67	5.05
08-00239-08502		R0.1	2	0.65	0.76	15°	4	35	2.14	2.21	2.28	2.37	2.55
08-00239-08503			3	0.65	0.76	15°	4	35	3.17	3.28	3.39	3.52	3.79
08-00239-08504			4	0.65	0.76	15°	4	35	4.2	4.35	4.5	4.67	5.04
08-00239-08602		R0.2	2	0.65	0.76	15°	4	35	2.13	2.2	2.27	2.35	2.53
08-00239-08603			3	0.65	0.76	15°	4	35	3.17	3.27	3.38	3.5	3.77
08-00239-08604			4	0.65	0.76	15°	4	35	4.2	4.34	4.49	4.65	5.01
08-00239-10202	1	R0.02	2	0.8	0.95	15°	4	35	2.16	2.23	2.31	2.4	2.59
08-00239-10203			3	0.8	0.95	15°	4	35	3.19	3.3	3.42	3.55	3.84
08-00239-10204			4	0.8	0.95	15°	4	35	4.23	4.37	4.53	4.7	5.08
08-00239-10205			5	0.8	0.95	15°	4	40	5.26	5.44	5.64	5.85	6.32
08-00239-10402		R0.05	2	0.8	0.95	15°	4	35	2.16	2.23	2.31	2.39	2.59
08-00239-10403			3	0.8	0.95	15°	4	35	3.19	3.3	3.42	3.54	3.83
08-00239-10404			4	0.8	0.95	15°	4	35	4.22	4.37	4.53	4.69	5.07
08-00239-10405			5	0.8	0.95	15°	4	40	5.26	5.44	5.63	5.84	6.31
08-00239-10502		R0.1	2	0.8	0.95	15°	4	35	2.16	2.23	2.3	2.39	2.57
08-00239-10503			3	0.8	0.95	15°	4	35	3.19	3.3	3.41	3.54	3.82
08-00239-10504			4	0.8	0.95	15°	4	35	4.22	4.37	4.52	4.69	5.06
08-00239-10505			5	0.8	0.95	15°	4	40	5.26	5.44	5.63	5.84	6.3

Long Neck Corner Radius Coating

Hardened Steel ~55HRC H
Hardened Steel ~65HRC H
Hardened Steel ~70HRC H

Long Neck Corner Radius Coating

MHRSH430RSF

Size expansion

MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

MHRSH430RSF

MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Hardened Steel ~70 HRC H

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00239-10602	1	R0.2	2	0.8	0.95	15°	4	35	2.15	2.22	2.29	2.37	2.55
08-00239-10603			3	0.8	0.95	15°	4	35	3.19	3.29	3.4	3.52	3.79
08-00239-10604			4	0.8	0.95	15°	4	35	4.22	4.36	4.51	4.67	5.04
08-00239-10605			5	0.8	0.95	15°	4	40	5.25	5.43	5.62	5.82	6.28
08-00239-10702		R0.3	2	0.8	0.95	15°	4	35	2.15	2.21	2.28	2.36	2.53
08-00239-10703			3	0.8	0.95	15°	4	35	3.18	3.28	3.39	3.51	3.77
08-00239-10704			4	0.8	0.95	15°	4	35	4.22	4.35	4.5	4.66	5.01
08-00239-10705			5	0.8	0.95	15°	4	40	5.25	5.42	5.61	5.81	6.26
08-00239-15203	1.5	R0.02	3	1.2	1.43	15°	4	35	3.23	3.34	3.46	3.59	3.88
08-00239-15204			4	1.2	1.43	15°	4	35	4.26	4.41	4.57	4.74	5.13
08-00239-15206			6	1.2	1.43	15°	4	40	6.33	6.55	6.79	7.04	7.61
08-00239-15208			8	1.2	1.43	15°	4	40	8.4	8.69	9	9.34	10.1
08-00239-15403		R0.05	3	1.2	1.43	15°	4	35	3.23	3.34	3.46	3.59	3.87
08-00239-15404			4	1.2	1.43	15°	4	35	4.26	4.41	4.57	4.74	5.12
08-00239-15406			6	1.2	1.43	15°	4	40	6.33	6.55	6.78	7.04	7.6
08-00239-15408			8	1.2	1.43	15°	4	40	8.4	8.69	9	9.34	10.09
08-00239-15503		R0.1	3	1.2	1.43	15°	4	35	3.23	3.34	3.45	3.58	3.86
08-00239-15504			4	1.2	1.43	15°	4	35	4.26	4.41	4.56	4.73	5.11
08-00239-15506			6	1.2	1.43	15°	4	40	6.33	6.55	6.78	7.03	7.59
08-00239-15508			8	1.2	1.43	15°	4	40	8.4	8.69	9	9.33	10.08
08-00239-15603		R0.2	3	1.2	1.43	15°	4	35	3.22	3.33	3.44	3.57	3.84
08-00239-15604			4	1.2	1.43	15°	4	35	4.26	4.4	4.55	4.72	5.08
08-00239-15606			6	1.2	1.43	15°	4	40	6.33	6.54	6.77	7.01	7.57
08-00239-15608			8	1.2	1.43	15°	4	40	8.39	8.68	8.98	9.31	10.06
08-00239-15703		R0.3	3	1.2	1.43	15°	4	35	3.22	3.32	3.43	3.55	3.82
08-00239-15704			4	1.2	1.43	15°	4	35	4.25	4.39	4.54	4.7	5.06
08-00239-15706			6	1.2	1.43	15°	4	40	6.32	6.53	6.76	7	7.55
08-00239-15708			8	1.2	1.43	15°	4	40	8.39	8.67	8.97	9.3	10.03
08-00239-15803		R0.5	3	1.2	1.43	15°	4	35	3.21	3.31	3.41	3.52	3.77
08-00239-15804			4	1.2	1.43	15°	4	35	4.25	4.38	4.52	4.67	5.01
08-00239-15806			6	1.2	1.43	15°	4	40	6.32	6.52	6.74	6.97	7.5
08-00239-15808			8	1.2	1.43	15°	4	40	8.38	8.66	8.95	9.27	9.98
08-00239-20204	2	R0.02	4	1.6	1.91	15°	4	35	4.3	4.45	4.61	4.78	5.17
08-00239-20206			6	1.6	1.91	15°	4	35	6.37	6.59	6.83	7.08	7.66
08-00239-20208			8	1.6	1.91	15°	4	40	8.44	8.73	9.05	9.38	10.14
08-00239-20210			10	1.6	1.91	15°	4	40	10.5	10.87	11.26	11.68	12.63
08-00239-20404		R0.05	4	1.6	1.91	15°	4	35	4.3	4.45	4.61	4.78	5.16
08-00239-20406			6	1.6	1.91	15°	4	35	6.37	6.59	6.83	7.08	7.65
08-00239-20408			8	1.6	1.91	15°	4	40	8.44	8.73	9.04	9.38	10.14
08-00239-20410			10	1.6	1.91	15°	4	40	10.5	10.87	11.26	11.68	12.62
08-00239-20504		R0.1	4	1.6	1.91	15°	4	35	4.3	4.45	4.6	4.77	5.15
08-00239-20506			6	1.6	1.91	15°	4	35	6.37	6.59	6.82	7.07	7.64
08-00239-20508			8	1.6	1.91	15°	4	40	8.43	8.73	9.04	9.37	10.13
08-00239-20510			10	1.6	1.91	15°	4	40	10.5	10.86	11.25	11.67	12.61
08-00239-20604		R0.2	4	1.6	1.91	15°	4	35	4.3	4.44	4.59	4.76	5.13
08-00239-20606			6	1.6	1.91	15°	4	35	6.36	6.58	6.81	7.06	7.62
08-00239-20608			8	1.6	1.91	15°	4	40	8.43	8.72	9.03	9.36	10.1
08-00239-20610			10	1.6	1.91	15°	4	40	10.5	10.86	11.24	11.66	12.59
08-00239-20704		R0.3	4	1.6	1.91	15°	4	35	4.29	4.43	4.58	4.74	5.11
08-00239-20706			6	1.6	1.91	15°	4	35	6.36	6.57	6.8	7.04	7.59
08-00239-20708			8	1.6	1.91	15°	4	40	8.43	8.71	9.02	9.34	10.08
08-00239-20710			10	1.6	1.91	15°	4	40	10.5	10.85	11.23	11.64	12.56
08-00239-20804		R0.5	4	1.6	1.91	15°	4	35	4.29	4.42	4.56	4.71	5.06
08-00239-20806			6	1.6	1.91	15°	4	35	6.35	6.56	6.78	7.01	7.54
08-00239-20808			8	1.6	1.91	15°	4	40	8.42	8.7	8.99	9.31	10.03
08-00239-20810			10	1.6	1.91	15°	4	40	10.49	10.84	11.21	11.61	12.52

How to Order　When you order, indicate MHRSH430RSF (D)×(R)×(ℓ1).

Machining case　S-020, S-021

Unit : mm

コードNo. Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
◆ 08-00239-30404	3	R0.05	4	2.5	2.85	15°	6	45	4.42	4.57	4.73	4.91	5.30
◆ 08-00239-30406			6	2.5	2.85	15°	6	45	6.48	6.71	6.95	7.21	7.79
◆ 08-00239-30408			8	2.5	2.85	15°	6	45	8.55	8.85	9.17	9.51	10.28
◆ 08-00239-30410			10	2.5	2.85	15°	6	50	10.62	10.99	11.38	11.81	12.76
◆ 08-00239-30412			12	2.5	2.85	15°	6	50	12.69	13.13	13.60	14.11	15.25
◆ 08-00239-30415			15	2.5	2.85	15°	6	55	15.79	16.34	16.92	17.56	18.98
◆ 08-00239-30504		R0.1	4	2.5	2.85	15°	6	45	4.42	4.57	4.73	4.90	5.29
◆ 08-00239-30506			6	2.5	2.85	15°	6	45	6.48	6.71	6.94	7.20	7.78
◆ 08-00239-30508			8	2.5	2.85	15°	6	45	8.55	8.84	9.16	9.50	10.26
◆ 08-00239-30510			10	2.5	2.85	15°	6	50	10.62	10.98	11.38	11.80	12.75
◆ 08-00239-30512			12	2.5	2.85	15°	6	50	12.68	13.12	13.59	14.10	15.24
◆ 08-00239-30515			15	2.5	2.85	15°	6	55	15.79	16.33	16.92	17.55	18.97
◆ 08-00239-30604		R0.2	4	2.5	2.85	15°	6	45	4.41	4.56	4.72	4.89	5.27
◆ 08-00239-30606			6	2.5	2.85	15°	6	45	6.48	6.70	6.93	7.19	7.75
◆ 08-00239-30608			8	2.5	2.85	15°	6	45	8.55	8.84	9.15	9.49	10.24
◆ 08-00239-30610			10	2.5	2.85	15°	6	50	10.61	10.98	11.37	11.79	12.73
◆ 08-00239-30612			12	2.5	2.85	15°	6	50	12.68	13.12	13.58	14.09	15.21
◆ 08-00239-30615			15	2.5	2.85	15°	6	55	15.78	16.33	16.91	17.54	18.94
◆ 08-00239-30704		R0.3	4	2.5	2.85	15°	6	45	4.41	4.55	4.71	4.87	5.24
◆ 08-00239-30706			6	2.5	2.85	15°	6	45	6.48	6.69	6.92	7.17	7.73
◆ 08-00239-30708			8	2.5	2.85	15°	6	45	8.54	8.83	9.14	9.47	10.22
◆ 08-00239-30710			10	2.5	2.85	15°	6	50	10.61	10.97	11.36	11.77	12.70
◆ 08-00239-30712			12	2.5	2.85	15°	6	50	12.68	13.11	13.57	14.07	15.19
◆ 08-00239-30715			15	2.5	2.85	15°	6	55	15.78	16.32	16.90	17.52	18.92
◆ 08-00239-30804		R0.5	4	2.5	2.85	15°	6	45	4.40	4.54	4.69	4.84	5.20
◆ 08-00239-30806			6	2.5	2.85	15°	6	45	6.47	6.68	6.90	7.14	7.68
◆ 08-00239-30808			8	2.5	2.85	15°	6	45	8.54	8.82	9.12	9.44	10.17
◆ 08-00239-30810			10	2.5	2.85	15°	6	50	10.60	10.96	11.33	11.74	12.66
◆ 08-00239-30812			12	2.5	2.85	15°	6	50	12.67	13.10	13.55	14.04	15.14
◆ 08-00239-30815			15	2.5	2.85	15°	6	55	15.77	16.31	16.88	17.49	18.87
◆ 08-00239-40508	4	R0.1	8	3.2	3.8	15°	6	45	8.65	8.94	9.26	9.61	10.38
◆ 08-00239-40512			12	3.2	3.8	15°	6	50	12.78	13.22	13.70	14.21	15.35
◆ 08-00239-40516			16	3.2	3.8	15°	6	55	16.92	17.50	18.13	18.81	Free
◆ 08-00239-40520			20	3.2	3.8	15°	6	55	21.05	21.78	22.56	23.41	Free
◆ 08-00239-40608		R0.2	8	3.2	3.8	15°	6	45	8.64	8.94	9.25	9.59	10.36
◆ 08-00239-40612			12	3.2	3.8	15°	6	50	12.78	13.22	13.69	14.19	15.33
◆ 08-00239-40616			16	3.2	3.8	15°	6	55	16.91	17.50	18.12	18.79	Free
◆ 08-00239-40620			20	3.2	3.8	15°	6	55	21.05	21.77	22.55	23.39	Free
◆ 08-00239-40708		R0.3	8	3.2	3.8	15°	6	45	8.64	8.93	9.24	9.58	10.33
◆ 08-00239-40712			12	3.2	3.8	15°	6	50	12.77	13.21	13.68	14.18	15.31
◆ 08-00239-40716			16	3.2	3.8	15°	6	55	16.91	17.49	18.11	18.78	Free
◆ 08-00239-40720			20	3.2	3.8	15°	6	55	21.04	21.77	22.54	23.38	Free
◆ 08-00239-40808		R0.5	8	3.2	3.8	15°	6	45	8.63	8.92	9.22	9.55	10.29
◆ 08-00239-40812			12	3.2	3.8	15°	6	50	12.77	13.20	13.65	14.15	15.26
◆ 08-00239-40816			16	3.2	3.8	15°	6	55	16.90	17.47	18.09	18.75	Free
◆ 08-00239-40820			20	3.2	3.8	15°	6	55	21.04	21.75	22.52	23.35	Free
◆ 08-00239-50515	5	R0.1	15	4	4.75	15°	6	50	15.98	16.53	17.13	Free	Free
◆ 08-00239-50520			20	4	4.75	15°	6	55	21.15	21.88	Free	Free	Free
◆ 08-00239-50615		R0.2	15	4	4.75	15°	6	50	15.98	16.53	17.12	Free	Free
◆ 08-00239-50620			20	4	4.75	15°	6	55	21.14	21.87	Free	Free	Free
◆ 08-00239-50715		R0.3	15	4	4.75	15°	6	50	15.97	16.52	17.10	Free	Free
◆ 08-00239-50720			20	4	4.75	15°	6	55	21.14	21.87	Free	Free	Free
◆ 08-00239-50815		R0.5	15	4	4.75	15°	6	50	15.97	16.50	17.08	Free	Free
◆ 08-00239-50820			20	4	4.75	15°	6	55	21.13	21.85	Free	Free	Free

MUGEN COATING PREMIUM Plus 4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Unit : mm

コードNo. Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
◆ 08-00239-60512	6	R0.1	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
◆ 08-00239-60518			18	5	5.7	-	6	50	Free	Free	Free	Free	Free
◆ 08-00239-60524			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
◆ 08-00239-60530			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
◆ 08-00239-60612		R0.2	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
◆ 08-00239-60618			18	5	5.7	-	6	50	Free	Free	Free	Free	Free
◆ 08-00239-60624			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
◆ 08-00239-60630			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
◆ 08-00239-60712		R0.3	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
◆ 08-00239-60718			18	5	5.7	-	6	50	Free	Free	Free	Free	Free
◆ 08-00239-60724			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
◆ 08-00239-60730			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
◆ 08-00239-60812		R0.5	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
◆ 08-00239-60818			18	5	5.7	-	6	50	Free	Free	Free	Free	Free
◆ 08-00239-60824			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
◆ 08-00239-60830			30	5	5.7	-	6	65	Free	Free	Free	Free	Free
◆ 08-00239-60912		R1	12	5	5.7	-	6	45	Free	Free	Free	Free	Free
◆ 08-00239-60918			18	5	5.7	-	6	50	Free	Free	Free	Free	Free
◆ 08-00239-60924			24	5	5.7	-	6	60	Free	Free	Free	Free	Free
◆ 08-00239-60930			30	5	5.7	-	6	65	Free	Free	Free	Free	Free

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
0.1	0.01	0.2	2	40,000	200	0.002	0.01	40,000	150	0.002	0.01	40,000	120	0.002	0.01
		0.3	3	40,000	160	0.002	0.01	40,000	120	0.002	0.01	40,000	90	0.002	0.01
0.15	0.01	0.3	2	40,000	240	0.002	0.015	40,000	180	0.002	0.01	40,000	140	0.002	0.01
		0.5	3.3	40,000	160	0.002	0.015	40,000	120	0.002	0.01	40,000	90	0.002	0.01
	0.02	0.3	2	40,000	240	0.002	0.015	40,000	180	0.002	0.01	40,000	140	0.002	0.01
		0.5	3.3	40,000	160	0.002	0.015	40,000	120	0.002	0.01	40,000	90	0.002	0.01
0.2	0.02	0.3	1.5	30,000	360	0.003	0.02	30,000	280	0.003	0.01	30,000	220	0.003	0.01
		0.5	2.5	30,000	320	0.003	0.02	30,000	240	0.003	0.01	30,000	180	0.003	0.01
		0.75	3.8	30,000	270	0.003	0.02	30,000	190	0.003	0.01	30,000	150	0.003	0.01
		1	5	30,000	240	0.002	0.02	30,000	160	0.002	0.01	30,000	120	0.002	0.01
	0.05	0.3	1.5	30,000	360	0.003	0.02	30,000	280	0.003	0.01	30,000	220	0.003	0.01
		0.5	2.5	30,000	320	0.003	0.02	30,000	240	0.003	0.01	30,000	180	0.003	0.01
		0.75	3.8	30,000	270	0.003	0.02	30,000	190	0.003	0.01	30,000	150	0.003	0.01
		1	5	30,000	240	0.003	0.02	30,000	160	0.003	0.01	30,000	120	0.003	0.01
0.3	0.02	0.5	1.7	30,000	600	0.003	0.04	30,000	500	0.003	0.03	30,000	400	0.003	0.03
		0.75	2.5	30,000	560	0.003	0.04	30,000	460	0.003	0.03	30,000	360	0.003	0.03
		1	3.3	30,000	500	0.003	0.04	30,000	400	0.003	0.03	30,000	300	0.003	0.03
		1.5	5	30,000	320	0.003	0.04	30,000	240	0.003	0.03	30,000	180	0.003	0.03
	0.05	0.5	1.7	30,000	600	0.003	0.04	30,000	500	0.003	0.03	30,000	400	0.003	0.03
		0.75	2.5	30,000	560	0.003	0.04	30,000	460	0.003	0.03	30,000	360	0.003	0.03
		1	3.3	30,000	500	0.003	0.04	30,000	400	0.003	0.03	30,000	300	0.003	0.03
		1.5	5	30,000	320	0.003	0.04	30,000	240	0.003	0.03	30,000	180	0.003	0.03
0.4	0.02	0.5	1.3	28,000	760	0.005	0.05	25,000	650	0.004	0.04	22,000	480	0.004	0.04
		1	2.5	28,000	700	0.005	0.05	25,000	600	0.004	0.04	22,000	450	0.004	0.04
		1.5	3.8	28,000	600	0.005	0.05	25,000	520	0.004	0.04	22,000	390	0.004	0.04
		2	5	25,000	500	0.005	0.05	25,000	440	0.003	0.04	22,000	330	0.003	0.04
	0.05	0.5	1.3	28,000	760	0.005	0.05	25,000	650	0.005	0.04	22,000	480	0.005	0.04
		1	2.5	28,000	700	0.005	0.05	25,000	600	0.005	0.04	22,000	450	0.005	0.04
		1.5	3.8	28,000	600	0.005	0.05	25,000	520	0.005	0.04	22,000	390	0.005	0.04
		2	5	25,000	500	0.005	0.05	25,000	440	0.005	0.04	22,000	330	0.005	0.04
0.5	0.02	1	2	23,000	900	0.006	0.1	20,000	800	0.004	0.08	18,000	600	0.004	0.08
		1.5	3	23,000	800	0.006	0.1	20,000	640	0.004	0.08	18,000	480	0.004	0.08
		2	4	23,000	720	0.005	0.1	20,000	600	0.003	0.08	18,000	450	0.003	0.08
		2.5	5	23,000	680	0.005	0.1	20,000	580	0.003	0.08	18,000	420	0.003	0.08
	0.05	1	2	23,000	900	0.007	0.1	20,000	800	0.005	0.08	18,000	600	0.005	0.08
		1.5	3	23,000	800	0.007	0.1	20,000	640	0.005	0.08	18,000	480	0.005	0.08
		2	4	23,000	720	0.007	0.1	20,000	600	0.005	0.08	18,000	450	0.005	0.08
		2.5	5	23,000	680	0.006	0.1	20,000	580	0.004	0.08	18,000	420	0.004	0.08
	0.1	1	2	23,000	900	0.007	0.1	20,000	800	0.005	0.08	18,000	600	0.005	0.08
		1.5	3	23,000	800	0.007	0.1	20,000	640	0.005	0.08	18,000	480	0.005	0.08
		2	4	23,000	720	0.007	0.1	20,000	600	0.005	0.08	18,000	450	0.005	0.08
		2.5	5	23,000	680	0.006	0.1	20,000	580	0.004	0.08	18,000	420	0.004	0.08

MHRSH430RSF

Size expansion

MHRSH430RSF

Recommended Milling Conditions

Recommended Milling Conditions

Work Material				High Speed Steels / Hardened Steels SKH51･SKD11 (~62HRC)				High Speed Steels SKH55･HAP40 (~66HRC)				High Speed Steels SKH57･HAP72 (~70HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min-1	mm/min	ap mm	ae mm	min-1	mm/min	ap mm	ae mm	min-1	mm/min	ap mm	ae mm
0.6	0.02	1	1.7	23,000	1,000	0.006	0.15	20,000	850	0.004	0.1	17,000	640	0.004	0.1
		2	3.3	23,000	800	0.006	0.15	20,000	640	0.004	0.1	17,000	480	0.004	0.1
		3	5	23,000	700	0.005	0.15	20,000	600	0.003	0.1	17,000	450	0.003	0.1
	0.05	1	1.7	23,000	1,000	0.01	0.15	20,000	850	0.01	0.1	17,000	640	0.008	0.1
		2	3.3	23,000	800	0.01	0.15	20,000	640	0.007	0.1	17,000	480	0.006	0.1
		3	5	23,000	700	0.008	0.15	20,000	600	0.006	0.1	17,000	450	0.005	0.1
	0.1	1	1.7	23,000	1,000	0.01	0.15	20,000	850	0.01	0.1	17,000	640	0.008	0.1
		2	3.3	23,000	800	0.01	0.15	20,000	640	0.007	0.1	17,000	480	0.006	0.1
		3	5	23,000	700	0.008	0.15	20,000	600	0.006	0.1	17,000	450	0.005	0.1
0.8	0.02	2	2.5	23,000	1,400	0.006	0.16	20,000	1,000	0.005	0.14	17,000	700	0.005	0.14
		3	3.8	23,000	1,300	0.005	0.16	20,000	900	0.003	0.14	17,000	650	0.003	0.14
		4	5	23,000	1,200	0.005	0.16	20,000	800	0.003	0.14	17,000	600	0.003	0.14
	0.05	2	2.5	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14	17,000	700	0.012	0.14
		3	3.8	23,000	1,300	0.015	0.16	20,000	900	0.01	0.14	17,000	650	0.008	0.14
		4	5	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14	17,000	600	0.006	0.14
	0.1	2	2.5	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14	17,000	700	0.012	0.14
		3	3.8	23,000	1,300	0.015	0.16	20,000	900	0.01	0.14	17,000	650	0.008	0.14
		4	5	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14	17,000	600	0.006	0.14
	0.2	2	2.5	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14	17,000	700	0.012	0.14
		3	3.8	23,000	1,300	0.015	0.16	20,000	900	0.01	0.14	17,000	650	0.008	0.14
		4	5	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14	17,000	600	0.006	0.14
1	0.02	2	2	21,000	2,000	0.01	0.25	17,000	1,400	0.008	0.2	15,000	1,000	0.005	0.2
		3	3	20,000	1,800	0.01	0.25	16,000	1,300	0.008	0.2	14,000	900	0.005	0.2
		4	4	18,000	1,500	0.008	0.25	14,000	1,100	0.005	0.2	12,000	750	0.003	0.2
		5	5	16,000	1,400	0.005	0.25	13,000	1,000	0.003	0.2	11,000	650	0.003	0.2
	0.05	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2
	0.1	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2
	0.2	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2
	0.3	2	2	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2	15,000	1,000	0.018	0.2
		3	3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2	14,000	900	0.018	0.2
		4	4	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2	12,000	750	0.012	0.2
		5	5	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2	11,000	650	0.006	0.2
1.5	0.02	3	2	20,000	2,000	0.01	0.4	16,000	1,400	0.008	0.3	14,000	1,000	0.006	0.3
		4	2.7	18,000	1,700	0.01	0.4	14,000	1,200	0.008	0.3	12,000	800	0.006	0.3
		6	4	16,000	1,500	0.008	0.4	13,000	1,100	0.005	0.3	11,000	750	0.004	0.3
		8	5.3	14,000	1,300	0.008	0.4	11,000	900	0.003	0.3	10,000	600	0.003	0.3

Work Material				High Speed Steels / Hardened Steels SKH51･SKD11 (~62HRC)				High Speed Steels SKH55･HAP40 (~66HRC)				High Speed Steels SKH57･HAP72 (~70HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min-1	mm/min	ap mm	ae mm	min-1	mm/min	ap mm	ae mm	min-1	mm/min	ap mm	ae mm
1.5	0.05	3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3
	0.1	3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3
	0.2	3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3
	0.3	3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3
	0.5	3	2	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3	14,000	1,000	0.018	0.3
		4	2.7	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3	12,000	800	0.018	0.3
		6	4	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3	11,000	750	0.012	0.3
		8	5.3	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3	10,000	600	0.006	0.3
2	0.02	4	2	17,000	2,000	0.012	0.5	14,000	1,400	0.008	0.35	12,000	1,000	0.006	0.35
		6	3	15,000	1,800	0.012	0.5	12,000	1,200	0.008	0.35	11,000	900	0.006	0.35
		8	4	14,000	1,500	0.01	0.5	11,000	1,100	0.005	0.35	10,000	750	0.004	0.35
		10	5	12,000	1,300	0.01	0.5	10,000	1,000	0.003	0.35	9,000	650	0.003	0.35
	0.05	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.1	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.2	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.3	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35
	0.5	4	2	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35	12,000	1,000	0.018	0.35
		6	3	15,000	1,800	0.05	0.5	12,000	1,200	0.03	0.35	11,000	900	0.018	0.35
		8	4	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35	10,000	750	0.012	0.35
		10	5	12,000	1,300	0.04	0.5	10,000	1,000	0.02	0.35	9,000	650	0.012	0.35

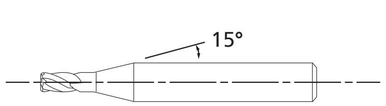
Work Material				High Speed Steels / Hardened Steels SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
3	0.05	4	1.3	13,000	2,000	0.05	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.05	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.05	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.05	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.04	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.03	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.1	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.2	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.3	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
	0.5	4	1.3	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6	8,000	1,100	0.03	0.6
		6	2	11,500	1,700	0.07	0.7	9,500	1,300	0.05	0.6	7,500	1,000	0.03	0.6
		8	2.7	10,500	1,500	0.07	0.7	8,000	1,100	0.05	0.6	6,000	800	0.03	0.6
		10	3.3	10,000	1,350	0.07	0.7	7,500	1,000	0.05	0.6	6,000	750	0.03	0.6
		12	4	10,000	1,350	0.06	0.7	7,500	1,000	0.04	0.6	6,000	750	0.024	0.6
		15	5	9,000	1,200	0.05	0.7	7,000	900	0.03	0.6	5,500	650	0.018	0.6
4	0.1	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
	0.2	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
	0.3	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8
	0.5	8	2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8	5,500	1,000	0.036	0.8
		12	3	8,500	1,800	0.07	1	7,000	1,300	0.05	0.8	5,500	1,000	0.03	0.8
		16	4	7,500	1,500	0.06	1	5,500	1,000	0.05	0.8	5,200	900	0.03	0.8
		20	5	6,000	1,200	0.06	1	4,500	800	0.05	0.8	4,000	650	0.03	0.8

Work Material				High Speed Steels / Hardened Steels SKH51・SKD11 (~62HRC)				High Speed Steels SKH55・HAP40 (~66HRC)				High Speed Steels SKH57・HAP72 (~70HRC)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
5	0.1	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
	0.2	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
	0.3	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
	0.5	15	3	7,000	1,700	0.08	1.6	5,500	1,300	0.06	1.2	4,400	900	0.036	1.2
		20	4	6,000	1,400	0.07	1.6	5,000	1,100	0.05	1.2	4,000	750	0.03	1.2
6	0.1	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	0.2	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	0.3	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	0.5	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5
	1	12	2	5,500	1,800	0.08	2	4,500	1,400	0.06	1.5	3,600	1,000	0.036	1.5
		18	3	5,000	1,500	0.08	2	4,000	1,100	0.06	1.5	3,000	800	0.036	1.5
		24	4	4,500	1,300	0.07	2	3,500	900	0.05	1.5	2,700	700	0.036	1.5
		30	5	3,000	800	0.07	2	3,000	650	0.05	1.5	2,300	500	0.03	1.5

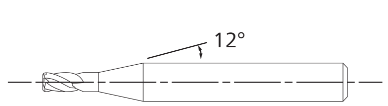
Notes

※1 Depth of Cut：ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※2 Adjust milling condition according to machine rigidity and clamp condition of work material.
※3 In case of chattering etc., please adjust cutting conditions if necessary.
※4 At point where cutting load is high such as at corners, pay attention to setting cutting conditions and tool paths particularly.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Adjust both spindle speed and feed at the same rate.
※8 A shrink fit type is recommended for tool holder. When using collet type or others, strictly adhere to minimum gripping length.
※9 We recommend using oil mist coolant.

Neck taper angle (γ) of MHRSH430RSF is 15°. Our other products have a neck taper angle (γ) of 12°.



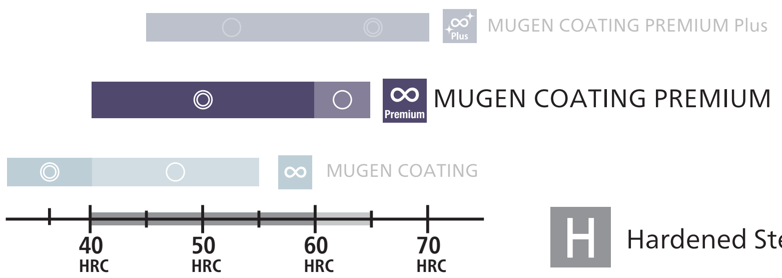
MHRSH430RSF



Our other products have a neck taper angle (γ) of 12°

Wide range lineup for stainless steel, titanium alloy and hardened steel

Range of NS TOOL original coating by work material hardness



P Prehardened Steel
M Stainless Steel
H Hardened Steel
S Heat Resistant Alloy

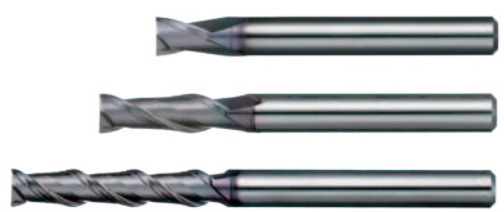
MUGEN COATING PREMIUM, improved from MUGEN COATING, supports the extended tool life for direct milling on high hardened steels. Suitable for machining on high hard materials up to 65HRC.

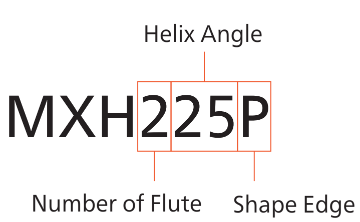
Square　MXH type

For hardened steel (up to 55HRC), stainless steel and tough material
L/D=1/5 Total 222 size

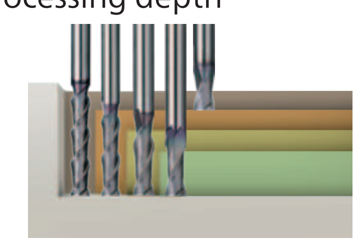
Work Material

MXH225 ～ 245	MXH225P ～ 235P
P Prehardened Steel	P Prehardened Steel
M Stainless Steel	M Stainless Steel
S Heat Resistant Alloy	S Heat Resistant Alloy
H Hardened Steel	





Various sizes available according to processing depth

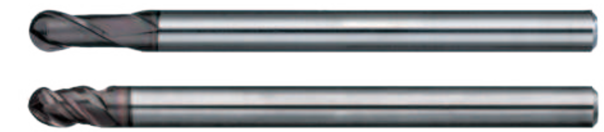


Ball　MSBH type

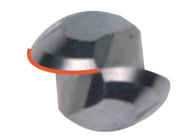
Ball end mill for prehardened steel / hardened steel (up to 65HRC)

Work Material

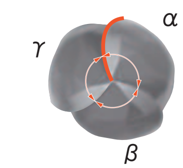
P Prehardened Steel
H Hardened Steel
M Stainless Steel
S Heat Resistant Alloy



MSBH230
Adoption optimal spiral shape for hardened steel



MSBH345
Adoption optimal spiral shape and unequal flute spacing of end teeth



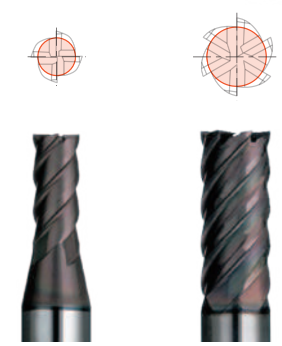
Square　MHDH type

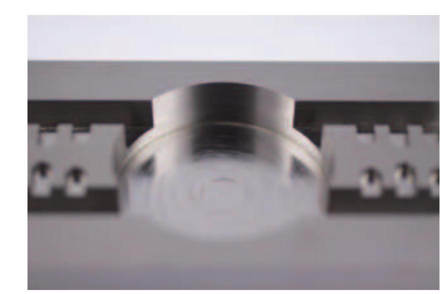
Ideal for finishing on hardened steel(up to 65HRC) with 4/6-flute with strong helix angle

Work Material

P Prehardened Steel
H Hardened Steel

High accuracy and less deflection on hardened steel with high rigid tool design





Corner Radius　MHDH・R type

Corner radius end mill for hardened steel (up to 65HRC)

Work Material

P Prehardened Steel
H Hardened Steel

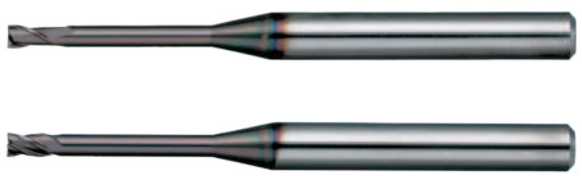
Wide variations for machining Stainless steel, Titanium alloy, hardened steel or so

Square MHRH type

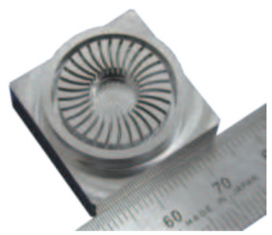
Work Material

- **P** Prehardened Steel
- **H** Hardened Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy

Long Neck Square End Mills suitable for deep milling of tempered steel and hardened steel (up to 65HRC)



MHRH230 ϕ0.5 × 3
MHRH430 ϕ1 × 6
Work Material : PD613 (60HRC)
Work Size : 80×80 mm



Ball MRBH230

Work Material

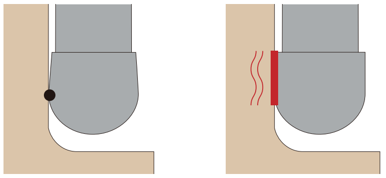
- **P** Prehardened Steel
- **H** Hardened Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy

Long Neck Ball End Mill for tempered steel and hardened steel (up to 65HRC). L/D up to 22 times

MRBH230 R1×4
R1×8
Work Material : HAP40 (65HRC)
Work Size : 30×20 mm

Suppression of chattering even when machining thin profiles

Back tapered design to reduce cutting loads



MUGEN COATING PREMIUM Long Neck Type

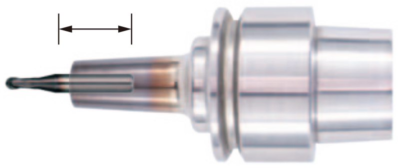
Ball MACH type

Work Material

- **P** Prehardened Steel
- **H** Hardened Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy

Sharp cutting edges reduce cutting load and are suitable for tough materials

Short length shank compatible with shrink fit holder are also available

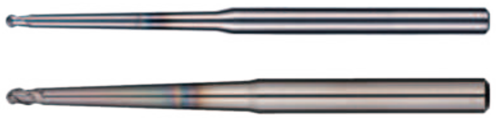


Ball MRBTNH type

Work Material

- **P** Prehardened Steel
- **H** Hardened Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy

High precision machining available for deep milling of hardened steel



MRBTNH345 R1×1°×30
R1×1°×20
Work Material : DAC-S (44HRC)
Work Size : 80×80 mm

Corner Radius MHRH・R type

Work Material

- **P** Prehardened Steel
- **H** Hardened Steel
- **M** Stainless Steel
- **S** Heat Resistant Alloy

Long Neck Corner Radius End Mills suitable for deep milling of tempered steel and hardened steel (up to 65HRC)

Highly efficient machining with 4-flute even for extremely small diameter of ϕ0.1

Suitable for machining on 50~65HRC hardened steels, stainless steels and heat resistant alloys

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																								
MXH	MXH225	ϕ0.1 ~ ϕ6	1D	∞ Premium	2	25°	Side	Slot	Face	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	25	F-010
	Applicable to stainless steels and titanium alloy. L/D=1. High rigidity with short length of cut. Suitable for slotting process																							
MXH	MXH230	ϕ0.1 ~ ϕ6	2D	∞ Premium	2	30°	Side	Slot	Face	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	36	F-012
	Applicable to stainless steels and titanium alloy. L/D=2. Applicable to both slotting and side milling																							
MXH	MXH235	ϕ0.1 ~ ϕ6	3D	∞ Premium	2	35°	Side	Slot	Face	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	36	F-014
	Applicable to stainless steels and titanium alloy. L/D=3. Applicable both slotting and side milling																							
MXH	MXH240	ϕ0.3 ~ ϕ6	4D	∞ Premium	2	40°	Side	-	Face	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	14	F-016
	Applicable to stainless steels and titanium alloy. L/D=4																							
MXH	MXH245	ϕ0.3 ~ ϕ6	5D	∞ Premium	2	45°	Side	-	Face	-	-	◎	○	-	-	◎	◎	-	-	-	-	-	14	F-018
	Applicable to stainless steels and titanium alloy. L/D=5																							
MXH	MXH225P	ϕ0.1 ~ ϕ6	1D	∞ Premium	2	25°	Side	-	Face	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	25	F-020
	Applicable to stainless steels and titanium alloy. L/D=1. Sharp edge type																							
MXH	MXH230P	ϕ0.1 ~ ϕ6	2D	∞ Premium	2	30°	Side	-	Face	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	36	F-022
	Applicable to stainless steels and titanium alloy. L/D=2. Sharp edge type																							
MXH	MXH235P	ϕ0.1 ~ ϕ6	3D	∞ Premium	2	35°	Side	-	Face	-	-	◎	-	-	-	◎	◎	-	-	-	-	-	36	F-024
	Applicable to stainless steels and titanium alloy. L/D=3. Sharp edge type																							

MUGEN COATING PREMIUM Full Cutting Length Type

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																									
MHDH	MHDH445	ϕ1 ~ ϕ4	2D	∞ Premium	4	45°	Side	Slot	Face	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	5	F-026
	4-flute with high helix angle. For finishing of hardened steels (~ 65HRC)																								
MHDH	MHDH645	ϕ5 ~ ϕ12	2D 3D	∞ Premium	6	45°	Side	Slot	Face	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	10	F-028
	6-flute with high helix angle. For finishing of hardened steels (~ 65HRC)																								
Ball																									
MSBH	MSBH230	R0.05 ~ R6	≒ 1.5D	∞ Premium	2	30°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	20	F-030
	Ball end mill for prehardened steels and hardened steels up to 65HRC. For multi-purpose from roughing to finishing																								
MSBH	MSBH345	R0.5 ~ R3	≒ 1.5D	∞ Premium	3	45°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	26	F-032
	3-flute high helix angle ball end mill for prehardened steels and hardened steels up to 65HRC																								
Corner Radius																									
MHDH・R	MHDH445R	ϕ3 × R0.2 ~ ϕ4 × R0.5	2D	∞ Premium	4	45°	Side	Slot	Face	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	6	F-034
	4-flute high helix angle corner radius end mill for hardened steels up to 65HRC																								
MHDH・R	MHDH645R	ϕ5 × R0.2 ~ ϕ12 × R2	2D	∞ Premium	6	45°	Side	Slot	Face	-	-	-	○	◎	◎	-	-	-	-	-	-	-	-	21	F-036
	6-flute high helix angle corner radius end mill for hardened steels up to 65HRC																								

Suitable for machining on 50~65HRC hardened steels, stainless steels and heat resistant alloys

MUGEN COATING PREMIUM Long Neck Type

Long Neck Square

Series	Model	Size	Maximum Cutting Depth	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
MHRH	MHRH230 	φ0.1～φ3	25D	∞ Premium	2	30°	Side	Slot	Face	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	134	F-038
	Long neck square end mill for hardened steels up to 65HRC. Maximum L/D=25																								
MHRH	MHRH430 	φ1～φ6	≒10D	∞ Premium	4	30°	Side	Slot	Face	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	55	F-044
	4-flute long neck square end mill for prehardened steels and hardened steels up to 65HRC. Maximum L/D=10																								

Long Neck Ball

Series	Model	Size	Maximum Cutting Depth	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
MRBH	MRBH230 	R0.05～R3	22D	∞ Premium	2	30°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	224	F-048
	Long neck ball end mill for prehardened steels and hardened steels(～65HRC). Maximum L/D=22																								
MACH	MACH225SF 	R0.1～R3	2D	∞ Premium	2	25°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	12	F-058
	Sharp cutting edge reduces cutting load for tough materials. Suitable for shrink fit holder																								
MACH	MACH225 	R0.1～R3	6D	∞ Premium	2	25°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	26	F-060
	Sharp cutting edge reduces cutting load for tough materials																								

Long Neck Tapered Ball

Series	Model	Size	Maximum Cutting Depth	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
MRBTNH	MRBTNH230 	R0.05×neck taper angle3° ～R2×neck taper angle1°	30D	∞ Premium	2	30°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	209	F-062
	Taper neck to improve tool rigidity. Opition of same taper angle as inclined working angle																								
MRBTNH	MRBTNH345 	R0.5×neck taper angle30' ～R2×neck taper angle1°	30D	∞ Premium	3	45°	-	-	-	3D	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	69	F-070
	3-flute with high helix angle and taper neck design for deep area milling with high efficiency																								

Long Neck Corner Radius

Series	Model	Size	Maximum Cutting Depth	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
MHRH・R	MHRH230R 	φ0.2 × R0.02 ～φ0.9 × R0.1	≒16D	∞ Premium	2	30°	Side	Slot	Face	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	97	F-074
	Long neck corner radius end mill for prehardened steels and hardened steels(～65HRC). Maximum L/D=16																								
MHRH・R	MHRH430R 	φ0.1 × R0.01 ～φ6 × R1	16D	∞ Premium	4	30°	Side	Slot	Face	-	-	-	◎	◎	◎	-	○	○	-	-	-	-	-	336	F-078
	4-flute long neck corner radius end mill for prehardened steels and hardened steels(～65HRC). Maximum L/D=16																								

MXH225

Size ϕ 0.1～ϕ 6

Premium ≦55 HRC

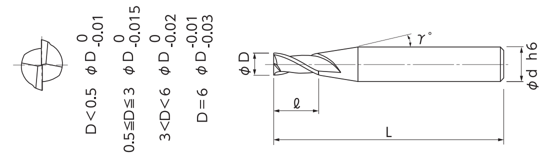
MUGEN COATING PREMIUM 2-Flute LEAD25 End Mill

Total 25 sizes

Recommended Milling Conditions

Applicable to stainless steels and titanium alloy. L/D=1. High rigidity with short length of cut. Suitable for slotting process

MG 2 25° Side Slot Face



- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM.
- L/D=1 and helix 25° to increase rigidity and realize high efficient machining.
- Suppress chattering and deflection in slotting process.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00005-00010	0.1	0.1	12°	4	45
08-00005-00020	0.2	0.2	12°	4	45
08-00005-00030	0.3	0.3	12°	4	45
08-00005-00040	0.4	0.4	12°	4	45
08-00005-00050	0.5	0.5	12°	4	45
08-00005-00060	0.6	0.6	12°	4	45
08-00005-00070	0.7	0.7	12°	4	45
08-00005-00080	0.8	0.8	12°	4	45
08-00005-00090	0.9	0.9	12°	4	45
08-00005-00100	1	1	12°	4	45
08-00005-00110	1.1	1.1	12°	4	45
08-00005-00120	1.2	1.2	12°	4	45
08-00005-00130	1.3	1.3	12°	4	45
08-00005-00140	1.4	1.4	12°	4	45
08-00005-00150	1.5	1.5	12°	4	45
08-00005-00160	1.6	1.6	12°	4	45
08-00005-00170	1.7	1.7	12°	4	45
08-00005-00180	1.8	1.8	12°	4	45
08-00005-00190	1.9	1.9	12°	4	45
08-00005-00200	2	2	12°	4	45
08-00005-00250	2.5	2.5	12°	4	45
08-00005-00300	3	3	12°	6	45
08-00005-00400	4	4	12°	6	45
08-00005-00500	5	5	12°	6	50
08-00005-00600	6	6	–	6	50

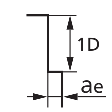
How to Order　When you order, indicate MXH225 (D).　※(γ) is reference value.

Work Material	Stainless Steels SUS304			Titanium Alloy Ti-6Al-4V			Heat Resistance Alloy Inconel®718			Hardened Steels SKD61 (～52HRC)		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min⁻¹	mm/min Side Milling	Slotting	min⁻¹	mm/min Side Milling	Slotting	min⁻¹	mm/min Side Milling	Slotting	min⁻¹	mm/min Side Milling	Slotting
0.1	50,000	30	15	48,000	30	15	25,000	10	10	50,000	–	15
0.2	50,000	50	25	48,000	50	25	25,000	15	10	47,700	–	20
0.3	50,000	90	35	48,000	90	35	25,000	30	15	31,800	–	20
0.4	47,700	130	50	45,000	130	50	23,000	40	20	23,900	50	25
0.5	38,200	130	50	37,000	130	50	19,000	40	20	19,100	60	30
0.6	34,000	130	50	33,000	130	50	17,000	40	20	16,000	60	30
0.7	30,000	130	50	29,000	130	50	15,000	40	20	13,700	60	30
0.8	26,000	140	50	25,000	140	50	13,000	45	20	12,000	60	30
0.9	22,000	140	55	21,000	140	55	11,000	45	25	10,700	60	30
1	19,100	150	55	18,000	150	55	9,500	50	25	9,500	75	40
1.1	17,500	150	55	16,000	150	55	8,500	50	25	8,700	75	40
1.2	16,000	150	55	15,000	150	55	8,000	50	25	8,000	75	40
1.3	14,500	150	55	13,500	150	55	7,200	50	25	7,400	75	40
1.4	13,000	150	55	12,500	150	55	6,500	50	25	6,900	75	40
1.5	12,700	150	55	12,000	150	55	6,200	50	25	6,400	75	40
1.6	11,900	150	55	11,500	150	55	6,000	50	25	6,000	75	40
1.7	11,300	160	55	10,900	160	55	5,500	50	25	5,700	75	40
1.8	10,700	160	55	10,300	160	55	5,200	50	25	5,300	75	40
1.9	10,100	170	60	9,700	170	60	5,000	55	30	5,000	75	40
2	9,500	170	60	9,100	170	60	4,800	55	30	4,800	75	40
2.5	7,600	180	65	7,200	180	65	3,800	60	30	3,800	75	40
3	6,400	190	70	6,000	190	70	3,200	65	35	3,200	80	40
4	4,800	190	70	4,400	190	70	2,400	65	35	2,400	95	50
5	3,800	230	75	3,400	230	75	1,900	75	40	1,900	95	50
6	3,200	260	85	2,800	260	85	1,600	80	40	1,600	100	50

Depth of Cut (D : Dia.)

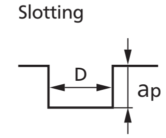
Stainless Steels / Titanium Alloy:

Side Milling



ae
ϕ0.1～0.9=0.05D
ϕ1～2.5=0.1D
ϕ3～6=0.2D

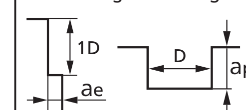
Slotting



ap
ϕ0.1～0.4=0.05D
ϕ0.5～1.4=0.2D
ϕ1.5～3=0.7D
ϕ4～6=1D

Heat Resistance Alloy:

Side Milling　Slotting

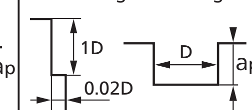


ae
ϕ0.1～0.9=0.01D
ϕ1～2.5=0.02D
ϕ3～6=0.04D

ap
ϕ0.1～0.4=0.01D
ϕ0.5～1.4=0.1D
ϕ1.5～3=0.3D
ϕ4～6=0.5D

Hardened Steels:

Side Milling　Slotting



ap
ϕ0.1～0.4=0.05D
ϕ0.5～6=0.2D

Notes

※1 Adjust milling condition conforming to machine rigidity and clamping condition.
※2 Use cutting fluid with smoke retardant.
※3 Use rigid and precise machine and chuck holder.
※4 Adjust milling condition with caution for chip evacuation and smoke generation when milling with water-insoluble fluid.

MXH230

Size ϕ 0.1～ϕ 6

Premium ≦55 HRC

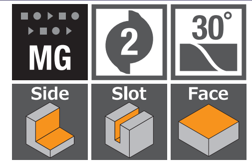
Regular Line
MUGEN PREMIUM
Full Cutting Length Type

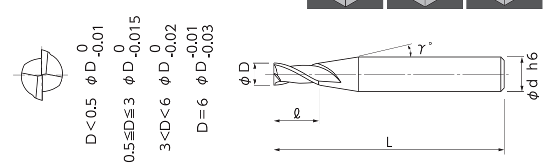
MUGEN COATING PREMIUM 2-Flute LEAD30 End Mill

Total 36 sizes

Recommended Milling Conditions

Applicable to stainless steels and titanium alloy. L/D=2.
Applicable to both slotting and side milling





Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Square Coating

- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM.
- L/D=2 and helix 30°standard type, applicable for both slotting and side milling.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00006-00010	0.1	0.2	12°	4	45
08-00006-00020	0.2	0.4	12°	4	45
08-00006-00030	0.3	0.6	12°	4	45
08-00006-00040	0.4	0.8	12°	4	45
08-00006-00050	0.5	1	12°	4	45
08-00006-00060	0.6	1.2	12°	4	45
08-00006-00070	0.7	1.4	12°	4	45
08-00006-00080	0.8	1.6	12°	4	45
08-00006-00090	0.9	1.8	12°	4	45
08-00006-00100	1	2	12°	4	45
08-00006-00110	1.1	2.2	12°	4	45
08-00006-00120	1.2	2.4	12°	4	45
08-00006-00130	1.3	2.6	12°	4	45
08-00006-00140	1.4	2.8	12°	4	45
08-00006-00150	1.5	3	12°	4	45
08-00006-00160	1.6	3.2	12°	4	45
08-00006-00170	1.7	3.4	12°	4	45
08-00006-00180	1.8	3.6	12°	4	45
08-00006-00190	1.9	3.8	12°	4	45
08-00006-00200	2	4	12°	4	45
08-00006-00210	2.1	4.2	12°	4	45
08-00006-00220	2.2	4.4	12°	4	45
08-00006-00230	2.3	4.6	12°	4	45
08-00006-00240	2.4	4.8	12°	4	45
08-00006-00250	2.5	5	12°	4	45
08-00006-00260	2.6	5.2	12°	4	45
08-00006-00270	2.7	5.4	12°	4	45
08-00006-00280	2.8	5.6	12°	4	45
08-00006-00290	2.9	5.8	12°	4	45
08-00006-00300	3	6	12°	6	45
08-00006-00350	3.5	7	12°	6	45
08-00006-00400	4	8	12°	6	45
08-00006-00450	4.5	9	12°	6	50
08-00006-00500	5	10	12°	6	50
08-00006-00550	5.5	11	12°	6	50
08-00006-00600	6	12	–	6	50

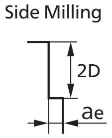
How to Order When you order, indicate MXH230 (D). ※(γ) is reference value.

Work Material	Stainless Steels SUS304			Titanium Alloy Ti-6Al-4V			Heat Resistance Alloy Inconel®718			Hardened Steels SKD61 (～52HRC)		
Dia.	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting
0.1	50,000	30	15	48,000	30	15	25,000	10	10	50,000	–	15
0.2	50,000	50	25	48,000	50	25	25,000	15	10	47,700	–	20
0.3	50,000	90	35	48,000	90	35	25,000	30	15	31,800	–	20
0.4	47,700	130	50	45,000	130	50	23,000	40	20	23,900	50	25
0.5	38,200	130	50	37,000	130	50	19,000	40	20	19,100	60	30
0.6	34,500	130	50	32,000	130	50	17,000	40	20	16,000	60	30
0.7	30,500	130	50	28,000	130	50	15,000	40	20	13,700	60	30
0.8	26,000	140	50	24,000	140	50	13,000	45	20	12,000	60	30
0.9	22,000	140	55	20,000	140	55	11,000	45	25	10,700	60	30
1	19,100	150	55	18,000	150	55	9,500	50	25	9,500	75	40
1.1	17,500	150	55	16,000	150	55	8,700	50	25	8,700	75	40
1.2	16,300	150	55	15,000	150	55	8,100	50	25	8,000	75	40
1.3	15,100	150	55	14,000	150	55	7,500	50	25	7,400	75	40
1.4	13,900	150	55	13,000	150	55	7,000	50	25	6,900	75	40
1.5	12,700	150	55	12,000	150	55	6,200	50	25	6,400	75	40
1.6	12,000	150	55	11,500	150	55	6,000	50	25	6,000	75	40
1.7	11,300	160	55	10,900	160	55	5,500	50	25	5,700	75	40
1.8	10,600	160	55	10,200	160	55	5,300	50	25	5,300	75	40
1.9	9,900	170	60	9,500	170	60	5,000	55	30	5,000	75	40
2	9,500	170	60	9,100	170	60	4,800	55	30	4,800	75	40
2.1	9,100	170	60	8,700	170	60	4,500	55	30	4,600	75	40
2.2	8,700	170	60	8,300	170	60	4,300	55	30	4,400	75	40
2.3	8,300	170	60	7,900	170	60	4,100	55	30	4,200	75	40
2.4	7,900	180	65	7,500	180	65	4,000	60	30	4,000	75	40
2.5	7,600	180	65	7,200	180	65	3,800	60	30	3,800	75	40
2.6	7,400	180	65	7,000	180	65	3,700	60	30	3,700	75	40
2.7	7,200	180	65	6,800	180	65	3,600	60	30	3,600	75	40
2.8	7,000	180	65	6,500	180	65	3,500	60	30	3,500	75	40
2.9	6,700	190	70	6,200	190	70	3,300	60	30	3,300	75	40
3	6,400	190	70	6,000	190	70	3,200	65	35	3,200	80	40
3.5	5,500	190	70	5,100	190	70	2,700	65	35	2,700	85	45
4	4,800	190	70	4,400	190	70	2,400	65	35	2,400	95	50
4.5	4,200	210	75	3,800	210	75	2,100	70	35	2,100	95	50
5	3,800	230	75	3,400	230	75	1,900	75	40	1,900	95	50
5.5	3,500	240	80	3,100	240	80	1,700	75	40	1,700	95	50
6	3,200	260	85	2,800	260	85	1,600	80	40	1,600	100	50

Depth of Cut (D：Dia.)

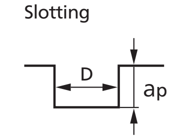
Stainless Steels / Titanium Alloy:

Side Milling



ae
ϕ0.1～0.9=0.05D
ϕ1～2.9=0.07D
ϕ3～6=0.15D

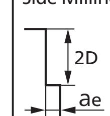
Slotting

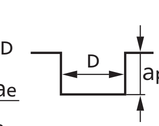


ap
ϕ0.1～0.4=0.05D
ϕ0.5～1.4=0.15D
ϕ1.5～3.5=0.5D
ϕ4～6=0.75D

Heat Resistance Alloy:

Side Milling Slotting



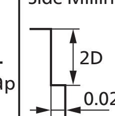


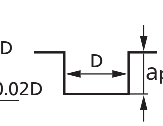
ae
ϕ0.1～0.9=0.01D
ϕ1～2.9=0.015D
ϕ3～6=0.03D

ap
ϕ0.1～0.4=0.02D
ϕ0.5～1.4=0.07D
ϕ1.5～3.5=0.2D
ϕ4～6=0.3D

Hardened Steels:

Side Milling Slotting





ap
ϕ0.1～0.4=0.05D
ϕ0.5～6=0.15D

Notes

※1 Adjust milling condition conforming to machine rigidity and clamping condition.
※2 Use cutting fluid with smoke retardant.
※3 Use rigid and precise machine and chuck holder.
※4 Adjust milling condition with caution for chip evacuation and smoke generation when milling with water-insoluble fluid.

MXH235

Size ϕ 0.1～ϕ 6

Premium ≦55 HRC

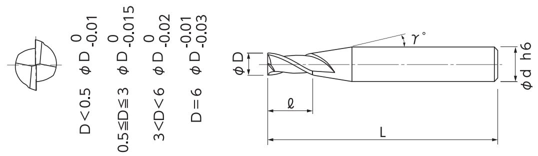
MXH235

MUGEN COATING PREMIUM 2-Flute LEAD35 End Mill

Total 36 sizes

MG 2 35° Side Slot Face

Applicable to stainless steels and titanium alloy. L/D=3.
Applicable to both slotting and side milling



- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM.
- L/D=3 and helix 35°for appropriate length of cut to avoid the inconveniences in size selection.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00007-00010	0.1	0.3	12°	4	45
08-00007-00020	0.2	0.6	12°	4	45
08-00007-00030	0.3	0.9	12°	4	45
08-00007-00040	0.4	1.2	12°	4	45
08-00007-00050	0.5	1.5	12°	4	45
08-00007-00060	0.6	1.8	12°	4	45
08-00007-00070	0.7	2.1	12°	4	45
08-00007-00080	0.8	2.4	12°	4	45
08-00007-00090	0.9	2.7	12°	4	45
08-00007-00100	1	3	12°	4	45
08-00007-00110	1.1	3.3	12°	4	45
08-00007-00120	1.2	3.6	12°	4	45
08-00007-00130	1.3	3.9	12°	4	45
08-00007-00140	1.4	4.2	12°	4	45
08-00007-00150	1.5	4.5	12°	4	45
08-00007-00160	1.6	4.8	12°	4	45
08-00007-00170	1.7	5.1	12°	4	45
08-00007-00180	1.8	5.4	12°	4	45
08-00007-00190	1.9	5.7	12°	4	45
08-00007-00200	2	6	12°	4	45
08-00007-00210	2.1	6.3	12°	4	45
08-00007-00220	2.2	6.6	12°	4	45
08-00007-00230	2.3	6.9	12°	4	45
08-00007-00240	2.4	7.2	12°	4	45
08-00007-00250	2.5	7.5	12°	4	45
08-00007-00260	2.6	7.8	12°	4	45
08-00007-00270	2.7	8.1	12°	4	45

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00007-00280	2.8	8.4	12°	4	45
08-00007-00290	2.9	8.7	12°	4	45
08-00007-00300	3	9	12°	6	45
08-00007-00350	3.5	10.5	12°	6	45
08-00007-00400	4	12	12°	6	50
08-00007-00450	4.5	13.5	12°	6	50
08-00007-00500	5	15	12°	6	55
08-00007-00550	5.5	16.5	12°	6	60
08-00007-00600	6	18	–	6	60

How to Order When you order, indicate MXH235 (D). ※(γ) is reference value.

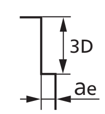
Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Titanium Alloy Ti-6Al-4V			Heat Resistance Alloy Inconel®718			Hardened Steels SKD61 (～52HRC)		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min⁻¹	mm/min		min⁻¹	mm/min		min⁻¹	mm/min		min⁻¹	mm/min	
		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting
0.1	50,000	30	15	40,000	30	15	25,000	10	10	50,000	–	15
0.2	50,000	50	25	40,000	50	25	25,000	15	10	39,800	–	20
0.3	50,000	90	35	40,000	90	35	25,000	30	15	26,500	–	20
0.4	43,800	120	50	35,000	120	50	22,000	40	20	19,900	–	20
0.5	35,000	120	50	28,000	120	50	17,000	40	20	15,900	50	25
0.6	31,500	120	50	25,000	120	50	15,000	40	20	13,300	50	25
0.7	28,000	120	50	22,500	120	50	14,000	40	20	11,400	50	25
0.8	24,500	130	50	19,600	130	50	12,000	45	20	10,000	50	25
0.9	21,000	130	50	17,000	130	50	10,500	45	20	8,900	50	25
1	17,500	140	50	14,000	140	50	8,700	45	20	8,000	65	30
1.1	16,400	140	50	13,000	140	50	8,200	45	20	7,300	65	30
1.2	15,300	140	50	12,000	140	50	7,500	45	20	6,700	65	30
1.3	14,100	140	50	11,000	140	50	7,000	45	20	6,200	65	30
1.4	12,900	140	50	10,000	140	50	6,400	45	20	5,700	65	30
1.5	11,700	140	50	9,400	140	50	5,800	45	20	5,300	65	30
1.6	11,200	140	50	8,900	140	50	5,500	45	20	5,000	65	30
1.7	10,600	140	50	8,500	140	50	5,300	45	20	4,700	65	30
1.8	10,000	150	50	8,000	150	50	5,000	50	20	4,500	65	30
1.9	9,400	160	55	7,500	160	55	4,700	50	25	4,200	65	30
2	8,800	160	55	7,000	160	55	4,400	50	25	4,000	65	30
2.1	8,500	160	55	6,800	160	55	4,200	50	25	3,800	65	30
2.2	8,100	160	55	6,500	160	55	4,000	50	25	3,700	65	30
2.3	7,800	160	55	6,200	160	55	3,900	50	25	3,500	65	30
2.4	7,400	160	55	5,900	160	55	3,700	50	25	3,300	65	30
2.5	7,000	170	60	5,600	170	60	3,500	55	30	3,200	70	35
2.6	6,700	170	60	5,400	170	60	3,300	55	30	3,100	70	35
2.7	6,400	170	60	5,100	170	60	3,200	55	30	3,000	70	35
2.8	6,200	170	60	4,900	170	60	3,100	55	30	2,900	70	35
2.9	6,000	170	60	4,800	170	60	3,000	55	30	2,800	70	35
3	5,800	170	60	4,600	170	60	2,900	55	30	2,700	70	35
3.5	5,000	180	60	4,000	180	60	2,500	60	30	2,300	75	35
4	4,400	180	60	3,500	180	60	2,200	60	30	2,000	80	40
4.5	3,900	200	65	3,100	200	65	1,900	65	30	1,800	80	40
5	3,500	210	70	2,800	210	70	1,700	70	35	1,600	80	40
5.5	3,200	220	70	2,500	220	70	1,600	75	35	1,400	80	40
6	2,900	230	75	2,300	230	75	1,400	75	35	1,300	80	40

Depth of Cut (D:Dia.)

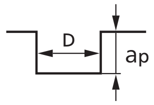
Stainless Steels / Titanium Alloy:

Side Milling



ae
ϕ0.1～0.9=0.04D
ϕ1～2.9=0.05D
ϕ3～6=0.1D

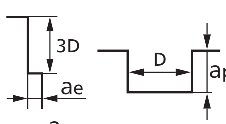
Slotting



ap
ϕ0.1～0.4=0.05D
ϕ0.5～1.4=0.08D
ϕ1.5～3.5=0.25D
ϕ4～6=0.4D

Heat Resistance Alloy:

Side Milling Slotting

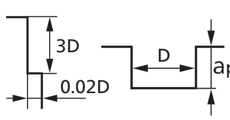


ae
ϕ0.1～0.9=0.01D
ϕ1～2.9=0.02D
ϕ3～6=0.05D

ap
ϕ0.1～0.4=0.02D
ϕ0.5～1.4=0.04D
ϕ1.5～3.5=0.1D
ϕ4～6=0.2D

Hardened Steels:

Side Milling Slotting



ap
ϕ0.1～0.4=0.05D
ϕ0.5～6=0.1D

Notes

※1 Adjust milling condition conforming to machine rigidity and clamping condition.
※2 Use cutting fluid with smoke retardant.
※3 Use rigid and precise machine and chuck holder.
※4 Adjust milling condition with caution for chip evacuation and smoke generation when milling with water-insoluble fluid.

MXH240

Size ϕ 0.3～ϕ 6

Premium ≦55 HRC

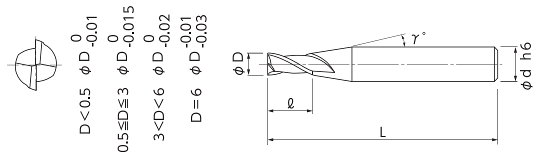
MUGEN COATING PREMIUM 2-Flute LEAD40 End Mill

Total 14 sizes

MG 2 40° Side Face

Applicable to stainless steels and titanium alloy. L/D=4

Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Square Coating



- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM.
- L/D=4 and helix 40° is suitable for deep machining with minimum deflection of cutting up-right surface.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00008-00030	0.3	1.2	12°	4	45
08-00008-00040	0.4	1.6	12°	4	45
08-00008-00050	0.5	2	12°	4	45
08-00008-00080	0.8	3.2	12°	4	45
08-00008-00100	1	4	12°	4	45
08-00008-00120	1.2	4.8	12°	4	45
08-00008-00150	1.5	6	12°	4	45
08-00008-00180	1.8	7.2	12°	4	45
08-00008-00200	2	8	12°	4	45
08-00008-00250	2.5	10	12°	4	45
08-00008-00300	3	12	12°	6	50
08-00008-00400	4	16	12°	6	55
08-00008-00500	5	20	12°	6	60
08-00008-00600	6	24	–	6	65

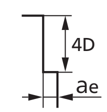
How to Order When you order, indicate MXH240 (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304		Titanium Alloy Ti-6Al-4V		Heat Resistance Alloy Inconel®718	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.3	21,200	40	20,000	40	10,500	20
0.4	15,900	45	14,000	40	8,000	20
0.5	12,700	45	11,000	40	6,300	20
0.8	9,600	45	8,000	40	4,800	20
1	6,400	50	4,400	50	3,200	25
1.2	4,800	50	3,300	50	2,400	25
1.5	4,200	50	2,900	50	2,100	25
1.8	3,700	55	2,600	50	1,800	25
2	3,200	60	2,200	55	1,600	30
2.5	2,500	60	1,700	55	1,200	30
3	2,100	60	1,600	60	1,000	30
4	1,600	65	1,100	65	800	35
5	1,300	80	900	80	750	40
6	1,100	90	700	90	600	45

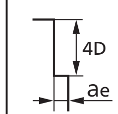
Depth of Cut (D：Dia.)

Side Milling (Stainless Steels, Titanium Alloy)



ae
ϕ0.3～0.8＝0.03D
ϕ1～2.5＝0.04D
ϕ3～6＝0.08D

Side Milling (Heat Resistance Alloy)



ae
ϕ0.3～0.8＝0.01D
ϕ1～2.5＝0.015D
ϕ3～6＝0.02D

Notes

※1 Adjust milling condition conforming to machine rigidity and clamping condition.
※2 Use cutting fluid with smoke retardant.
※3 Use a rigid and precise machine and chuck holder.

MXH245

Size ϕ 0.3～ϕ 6

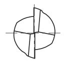
Premium ≦55 HRC

MUGEN COATING PREMIUM 2-Flute LEAD45 End Mill

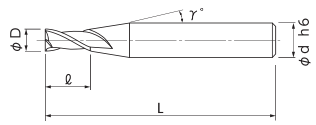
Total 14 sizes

MG 2 45° Side Face

Applicable to stainless steels and titanium alloy. L/D=5



D<0.5 $\phi D^{0}_{-0.01}$
0.5≦D≦3 $\phi D^{0}_{-0.015}$
3<D<6 $\phi D^{0}_{-0.02}$
D=6 $\phi D^{-0.01}_{-0.03}$



- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM.
- L/D=5 and helix 45°to minimize the milling deflection even though the long cutting length design.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00009-00030	0.3	1.5	12°	4	45
08-00009-00040	0.4	2	12°	4	45
08-00009-00050	0.5	2.5	12°	4	45
08-00009-00080	0.8	4	12°	4	45
08-00009-00100	1	5	12°	4	45
08-00009-00120	1.2	6	12°	4	45
08-00009-00150	1.5	7.5	12°	4	45
08-00009-00180	1.8	9	12°	4	50
08-00009-00200	2	10	12°	4	50
08-00009-00250	2.5	12.5	12°	4	50
08-00009-00300	3	15	12°	6	55
08-00009-00400	4	20	12°	6	60
08-00009-00500	5	25	12°	6	65
08-00009-00600	6	30	–	6	75

How to Order　When you order, indicate MXH245 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304		Titanium Alloy Ti-6Al-4V		Heat Resistance Alloy Inconel®718	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.3	15,900	30	14,000	30	8,000	15
0.4	11,900	35	10,000	35	6,000	15
0.5	9,500	35	8,000	35	4,700	15
0.8	7,100	35	6,000	35	3,500	15
1	4,800	40	3,400	40	2,400	20
1.2	4,000	40	2,800	40	2,000	20
1.5	3,200	40	2,200	40	1,600	20
1.8	2,800	40	1,900	40	1,400	20
2	2,400	45	1,700	45	1,200	20
2.5	1,900	45	1,300	45	950	20
3	1,600	50	1,100	50	800	25
4	1,200	50	840	50	600	25
5	1,000	60	700	60	500	30
6	800	65	550	65	400	30
Depth of Cut (D：Dia.)	Side Milling 5D ae — ae ϕ0.3～0.8＝0.02D, ϕ1～2.5＝0.03D, ϕ3～6＝0.06D				Side Milling 5D ae — ae ϕ0.3～0.8＝0.005D, ϕ1～2.5＝0.007D, ϕ3～6＝0.015D	
Notes	※1 Adjust milling condition conforming to machine rigidity and clamping condition. ※2 Use cutting fluid with smoke retardant. ※3 Use a rigid and precise machine and chuck holder.					

MXH225P

Size ϕ 0.1～ϕ 6

Premium

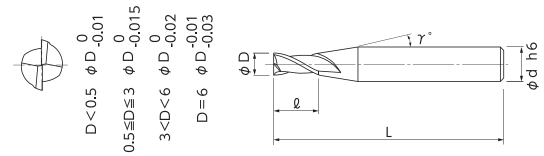
MUGEN COATING PREMIUM 2-Flute Sharp Edge LEAD25 End Mill

Total 25 sizes

Applicable to stainless steels and titanium alloy. L/D=1. Sharp edge type

MG | 2 | 25° | 90° | Side | Face

Prehardened Steel P



Stainless Steel M

Titanium Alloy Heat Resistant Alloy S

- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM with sharp edge type.
- L/D=1 and helix 25°.

Square Coating

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00015-00010	0.1	0.1	12°	4	45
08-00015-00020	0.2	0.2	12°	4	45
08-00015-00030	0.3	0.3	12°	4	45
08-00015-00040	0.4	0.4	12°	4	45
08-00015-00050	0.5	0.5	12°	4	45
08-00015-00060	0.6	0.6	12°	4	45
08-00015-00070	0.7	0.7	12°	4	45
08-00015-00080	0.8	0.8	12°	4	45
08-00015-00090	0.9	0.9	12°	4	45
08-00015-00100	1	1	12°	4	45
08-00015-00110	1.1	1.1	12°	4	45
08-00015-00120	1.2	1.2	12°	4	45
08-00015-00130	1.3	1.3	12°	4	45
08-00015-00140	1.4	1.4	12°	4	45
08-00015-00150	1.5	1.5	12°	4	45
08-00015-00160	1.6	1.6	12°	4	45
08-00015-00170	1.7	1.7	12°	4	45
08-00015-00180	1.8	1.8	12°	4	45
08-00015-00190	1.9	1.9	12°	4	45
08-00015-00200	2	2	12°	4	45
08-00015-00250	2.5	2.5	12°	4	45
08-00015-00300	3	3	12°	6	45
08-00015-00400	4	4	12°	6	45
08-00015-00500	5	5	12°	6	50
08-00015-00600	6	6	–	6	50

How to Order　When you order, indicate MXH225P (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304		Titanium Alloy Ti-6Al-4V		Heat Resistance Alloy Inconel®718	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.1	50,000	30	48,000	30	25,000	10
0.2	50,000	50	48,000	50	25,000	15
0.3	50,000	90	48,000	90	25,000	30
0.4	47,700	130	45,000	130	23,000	40
0.5	38,200	130	37,000	130	19,000	40
0.6	34,000	130	33,000	130	17,000	40
0.7	30,000	130	29,000	130	15,000	40
0.8	26,000	140	25,000	140	13,000	45
0.9	22,000	140	21,000	140	11,000	45
1	19,100	150	18,000	150	9,500	50
1.1	17,500	150	16,000	150	8,500	50
1.2	16,000	150	15,000	150	8,000	50
1.3	14,500	150	13,500	150	7,200	50
1.4	13,000	150	12,500	150	6,500	50
1.5	12,700	150	12,000	150	6,200	50
1.6	11,900	150	11,500	150	6,000	50
1.7	11,300	160	10,900	160	5,500	50
1.8	10,700	160	10,300	160	5,200	50
1.9	10,100	170	9,700	170	5,000	55
2	9,500	170	9,100	170	4,800	55
2.5	7,600	180	7,200	180	3,800	60
3	6,400	190	6,000	190	3,200	65
4	4,800	190	4,400	190	2,400	65
5	3,800	230	3,400	230	1,900	75
6	3,200	260	2,800	260	1,600	80
Depth of Cut (D : Dia.)	Side Milling 1D / ae ae ϕ0.1～0.9=0.05D ϕ1～2.5=0.1D ϕ3～6=0.2D				Side Milling 1D / ae ae ϕ0.1～0.9=0.01D ϕ1～2.5=0.02D ϕ3～6=0.04D	
Notes	※1 Adjust milling condition conforming to machine rigidity and clamping condition. ※2 Use cutting fluid with smoke retardant. ※3 Use a rigid and precise machine and chuck holder.					

Prehardened Steel P

M Stainless Steel

S Titanium Alloy Heat Resistant Alloy

Square Coating

MXH230P

Size ϕ 0.1～ϕ 6

Premium

MXH230P

MUGEN COATING PREMIUM 2-Flute Sharp Edge LEAD30 End Mill

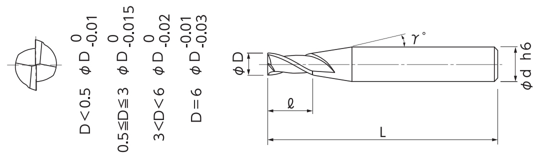
Total 36 sizes

Recommended Milling Conditions

Regular Line
MUGEN PREMIUM
Full Cutting Length Type
Prehardened Steel P
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Square Coating

Applicable to stainless steels and titanium alloy. L/D=2. Sharp edge type

MG 2 30° 90° Side Face



- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM with sharp edge type.
- L/D=2 and helix 30°.

Unit : mm

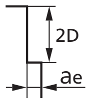
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00016-00010	0.1	0.2	12°	4	45
08-00016-00020	0.2	0.4	12°	4	45
08-00016-00030	0.3	0.6	12°	4	45
08-00016-00040	0.4	0.8	12°	4	45
08-00016-00050	0.5	1	12°	4	45
08-00016-00060	0.6	1.2	12°	4	45
08-00016-00070	0.7	1.4	12°	4	45
08-00016-00080	0.8	1.6	12°	4	45
08-00016-00090	0.9	1.8	12°	4	45
08-00016-00100	1	2	12°	4	45
08-00016-00110	1.1	2.2	12°	4	45
08-00016-00120	1.2	2.4	12°	4	45
08-00016-00130	1.3	2.6	12°	4	45
08-00016-00140	1.4	2.8	12°	4	45
08-00016-00150	1.5	3	12°	4	45
08-00016-00160	1.6	3.2	12°	4	45
08-00016-00170	1.7	3.4	12°	4	45
08-00016-00180	1.8	3.6	12°	4	45
08-00016-00190	1.9	3.8	12°	4	45
08-00016-00200	2	4	12°	4	45
08-00016-00210	2.1	4.2	12°	4	45
08-00016-00220	2.2	4.4	12°	4	45
08-00016-00230	2.3	4.6	12°	4	45
08-00016-00240	2.4	4.8	12°	4	45
08-00016-00250	2.5	5	12°	4	45
08-00016-00260	2.6	5.2	12°	4	45
08-00016-00270	2.7	5.4	12°	4	45
08-00016-00280	2.8	5.6	12°	4	45
08-00016-00290	2.9	5.8	12°	4	45
08-00016-00300	3	6	12°	6	45
08-00016-00350	3.5	7	12°	6	45
08-00016-00400	4	8	12°	6	45
08-00016-00450	4.5	9	12°	6	50
08-00016-00500	5	10	12°	6	50
08-00016-00550	5.5	11	12°	6	50
08-00016-00600	6	12	–	6	50

How to Order When you order, indicate MXH230P (D). ※(γ) is reference value.

Work Material	Stainless Steels SUS304		Titanium Alloy Ti-6Al-4V		Heat Resistance Alloy Inconel®718	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.1	50,000	30	48,000	30	25,000	10
0.2	50,000	50	48,000	50	25,000	15
0.3	50,000	90	48,000	90	25,000	30
0.4	47,700	130	45,000	130	23,000	40
0.5	38,200	130	37,000	130	19,000	40
0.6	34,500	130	32,000	130	17,000	40
0.7	30,500	130	28,000	130	15,000	40
0.8	26,000	140	24,000	140	13,000	45
0.9	22,000	140	20,000	140	11,000	45
1	19,100	150	18,000	150	9,500	50
1.1	17,500	150	16,000	150	8,700	50
1.2	16,300	150	15,000	150	8,100	50
1.3	15,100	150	14,000	150	7,500	50
1.4	13,900	150	13,000	150	7,000	50
1.5	12,700	150	12,000	150	6,200	50
1.6	12,000	150	11,500	150	6,000	50
1.7	11,300	160	10,900	160	5,500	50
1.8	10,600	160	10,200	160	5,300	50
1.9	9,900	170	9,500	170	5,000	55
2	9,500	170	9,100	170	4,800	55
2.1	9,100	170	8,700	170	4,500	55
2.2	8,700	170	8,300	170	4,300	55
2.3	8,300	170	7,900	170	4,100	55
2.4	7,900	180	7,500	180	4,000	60
2.5	7,600	180	7,200	180	3,800	60
2.6	7,400	180	7,000	180	3,700	60
2.7	7,200	180	6,800	180	3,600	60
2.8	7,000	180	6,500	180	3,500	60
2.9	6,700	190	6,200	190	3,300	60
3	6,400	190	6,000	190	3,200	65
3.5	5,500	190	5,100	190	2,700	65
4	4,800	190	4,400	190	2,400	65
4.5	4,200	210	3,800	210	2,100	70
5	3,800	230	3,400	230	1,900	75
5.5	3,500	240	3,100	240	1,700	75
6	3,200	260	2,800	260	1,600	80

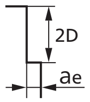
Depth of Cut (D:Dia.)

Side Milling (Stainless Steels, Titanium Alloy)



ae
ϕ0.1～0.9=0.05D
ϕ1～2.9=0.07D
ϕ3～=0.15D

Side Milling (Heat Resistance Alloy)



ae
ϕ0.1～0.9=0.01D
ϕ1～2.9=0.015D
ϕ3～6=0.03D

Notes

※1 Adjust milling condition conforming to machine rigidity and clamping condition.
※2 Use cutting fluid with smoke retardant.
※3 Use a rigid and precise machine and chuck holder.

MXH235P

Size ϕ 0.1 ～ ϕ 6

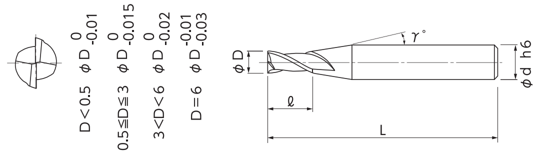
Premium

MUGEN COATING PREMIUM 2-Flute Sharp Edge LEAD35 End Mill

Total 36 sizes

Applicable to stainless steels and titanium alloy. L/D=3. Sharp edge type

MG 2 35° 90° Side Face



- Applicable for heat resistance alloy such as stainless steels and titanium alloy by MUGEN COATING PREMIUM with sharp edge type.
- L/D=3 and helix 35°.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00017-00010	0.1	0.3	12°	4	45
08-00017-00020	0.2	0.6	12°	4	45
08-00017-00030	0.3	0.9	12°	4	45
08-00017-00040	0.4	1.2	12°	4	45
08-00017-00050	0.5	1.5	12°	4	45
08-00017-00060	0.6	1.8	12°	4	45
08-00017-00070	0.7	2.1	12°	4	45
08-00017-00080	0.8	2.4	12°	4	45
08-00017-00090	0.9	2.7	12°	4	45
08-00017-00100	1	3	12°	4	45
08-00017-00110	1.1	3.3	12°	4	45
08-00017-00120	1.2	3.6	12°	4	45
08-00017-00130	1.3	3.9	12°	4	45
08-00017-00140	1.4	4.2	12°	4	45
08-00017-00150	1.5	4.5	12°	4	45
08-00017-00160	1.6	4.8	12°	4	45
08-00017-00170	1.7	5.1	12°	4	45
08-00017-00180	1.8	5.4	12°	4	45
08-00017-00190	1.9	5.7	12°	4	45
08-00017-00200	2	6	12°	4	45
08-00017-00210	2.1	6.3	12°	4	45
08-00017-00220	2.2	6.6	12°	4	45
08-00017-00230	2.3	6.9	12°	4	45
08-00017-00240	2.4	7.2	12°	4	45
08-00017-00250	2.5	7.5	12°	4	45
08-00017-00260	2.6	7.8	12°	4	45
08-00017-00270	2.7	8.1	12°	4	45
08-00017-00280	2.8	8.4	12°	4	45
08-00017-00290	2.9	8.7	12°	4	45
08-00017-00300	3	9	12°	6	45
08-00017-00350	3.5	10.5	12°	6	45
08-00017-00400	4	12	12°	6	50
08-00017-00450	4.5	13.5	12°	6	50
08-00017-00500	5	15	12°	6	55
08-00017-00550	5.5	16.5	12°	6	60
08-00017-00600	6	18	–	6	60

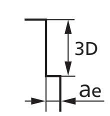
How to Order When you order, indicate MXH235P (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304		Titanium Alloy Ti-6Al-4V		Heat Resistance Alloy Inconel®718	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.1	50,000	30	40,000	30	25,000	10
0.2	50,000	50	40,000	50	25,000	15
0.3	50,000	90	40,000	90	25,000	30
0.4	43,800	120	35,000	120	22,000	40
0.5	35,000	120	28,000	120	17,000	40
0.6	31,500	120	25,000	120	15,000	40
0.7	28,000	120	22,500	120	14,000	40
0.8	24,500	130	19,600	130	12,000	45
0.9	21,000	130	17,000	130	10,500	45
1	17,500	140	14,000	140	8,700	45
1.1	16,400	140	13,000	140	8,200	45
1.2	15,300	140	12,000	140	7,500	45
1.3	14,100	140	11,000	140	7,000	45
1.4	12,900	140	10,000	140	6,400	45
1.5	11,700	140	9,400	140	5,800	45
1.6	11,200	140	8,900	140	5,500	45
1.7	10,600	140	8,500	140	5,300	45
1.8	10,000	150	8,000	150	5,000	50
1.9	9,400	160	7,500	160	4,700	50
2	8,800	160	7,000	160	4,400	50
2.1	8,500	160	6,800	160	4,200	50
2.2	8,100	160	6,500	160	4,000	50
2.3	7,800	160	6,200	160	3,900	50
2.4	7,400	160	5,900	160	3,700	50
2.5	7,000	170	5,600	170	3,500	55
2.6	6,700	170	5,400	170	3,300	55
2.7	6,400	170	5,100	170	3,200	55
2.8	6,200	170	4,900	170	3,100	55
2.9	6,000	170	4,800	170	3,000	55
3	5,800	170	4,600	170	2,900	55
3.5	5,000	180	4,000	180	2,500	60
4	4,400	180	3,500	180	2,200	60
4.5	3,900	200	3,100	200	1,900	65
5	3,500	210	2,800	210	1,700	70
5.5	3,200	220	2,500	220	1,600	75
6	2,900	230	2,300	230	1,400	75

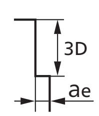
Depth of Cut (D: Dia.)

Side Milling (Stainless Steels, Titanium Alloy)



ae
ϕ0.1～0.9=0.04D
ϕ1～2.9=0.05D
ϕ3～6=0.1D

Side Milling (Heat Resistance Alloy)



ae
ϕ0.1～0.9=0.01D
ϕ1～2.9=0.02D
ϕ3～6=0.05D

Notes

※1 Adjust milling condition conforming to machine rigidity and clamping condition.
※2 Use cutting fluid with smoke retardant.
※3 Use a rigid and precise machine and chuck holder.

Regular Line
MUGEN PREMIUM
Full Cutting Length Type

MHDH445

Size φ 1～φ 4

Premium ≦65 HRC

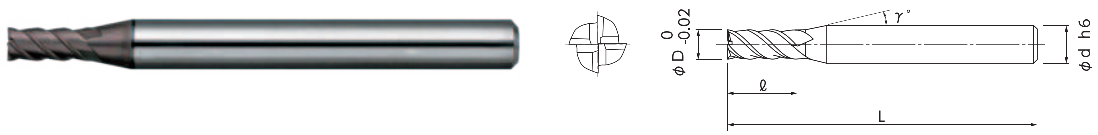
MUGEN COATING PREMIUM 4-Flute Square End Mill For Hardened Steel

Total 5 sizes

MG / 4 / 45° — Side / Slot / Face

Prehardened Steel P
Hardened Steel ~55HRC H
Hardened Steel ~65HRC H

4-flute with high helix angle. For finishing of hardened steels (～ 65HRC)



- Realized stably long tool life against high hardened steels (48～65HRC).
- Improved milling deflection and accuracy by advanced flute design.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00427-00100	1	2	12°	6	60
08-00427-00150	1.5	3	12°	6	60
08-00427-00200	2	4	12°	6	60
08-00427-00300	3	6	12°	6	60
08-00427-00400	4	8	12°	6	60

How to Order   When you order, indicate MHDH445 (D).   ※(γ) is reference value.

Square Coating

MHDH445

Recommended Milling Conditions

Work Material		Hardened Steels HPM38・STAVAX・SKD61 (～55HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Steels SKH (～65HRC)			
Dia.	Length of Cut	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
		Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
		min-1	mm/min	min-1	mm/min	min-1	mm/min	min-1	mm/min	min-1	mm/min	min-1	mm/min
1	2	30,000	800	24,000	400	25,000	500	20,000	300	20,000	240	16,000	120
1.5	3	20,000	860	16,000	460	16,000	560	12,000	380	14,000	330	10,000	160
2	4	15,000	920	12,000	500	12,000	630	10,000	420	10,000	480	8,000	240
3	6	10,000	1,000	8,000	580	8,000	700	7,500	500	7,000	560	6,000	280
4	8	8,500	1,200	7,500	620	7,000	800	6,000	540	6,000	600	5,000	300
Depth of Cut (D:Dia.)		Side Milling: 1.5D, 0.03D		Slotting: D, 0.03D		Side Milling: 1.5D, 0.02D		Slotting: D, 0.02D		Side Milling: 1.5D, 0.02D		Slotting: D, 0.01D	

Notes

※1 Use a rigid and precise machine and chuck holder.
※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use oilmist coolant.

Regular Line
MUGEN PREMIUM
Full Cutting Length Type
P Prehardened Steel
H ~55HRC Hardened Steel
H ~65HRC Hardened Steel
Square Coating

MHDH645

Size ϕ 5～ϕ 12

∞ Premium ≦65 HRC

MHDH645

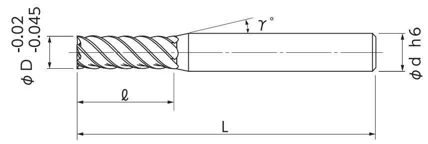
Regular Line
MUGEN PREMIUM
Full Cutting Length Type

MUGEN COATING PREMIUM 6-Flute Square End Mill For Hardened Steel Total 10 sizes

6-flute with high helix angle. For finishing of hardened steels (～ 65HRC)

MG 6 45° Side Slot Face

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H



- L/D=2 and L/D=3 length of cut selection.
- Realized stably long tool life against high hardened steels (48～65HRC).
- Improved milling deflection and accuracy by advanced flute design.

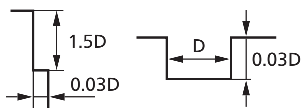
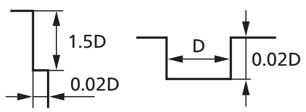
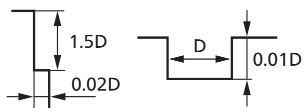
Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00428-00500	5	10	12°	6	60
08-00428-00501		15	12°	6	65
08-00428-00600	6	12	–	6	60
08-00428-00601		18	–	6	65
08-00428-00800	8	16	–	8	65
08-00428-00801		24	–	8	70
08-00428-01000	10	20	–	10	75
08-00428-01001		30	–	10	80
08-00428-01200	12	24	–	12	80
08-00428-01201		36	–	12	90

How to Order When you order, indicate MHDH645 (D)×(ℓ). ※(γ) is reference value.

Square Coating

Recommended Milling Conditions

Work Material		Hardened Steels HPM38・STAVAX・SKD61 (～55HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Steels SKH (～65HRC)			
Dia.	Length of Cut	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
		Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
		min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
5	10	7,600	1,600	6,800	900	6,200	1,200	5,600	600	5,300	800	4,800	350
	15	6,800	1,400	6,000	600	5,600	1,000	5,000	400	4,800	600	4,200	200
6	12	6,400	1,800	5,800	950	5,300	1,200	4,800	600	4,600	800	4,200	350
	18	5,800	1,600	5,000	600	4,800	1,000	4,200	400	4,200	600	3,600	200
8	16	4,800	2,000	4,300	1,000	4,000	1,400	3,600	700	3,400	1,000	3,000	400
	24	4,300	1,800	3,800	700	3,600	1,200	3,200	500	3,000	800	2,700	250
10	20	3,800	2,000	3,400	1,000	3,200	1,600	2,800	800	2,600	1,000	2,300	500
	30	3,400	1,800	3,000	800	2,800	1,400	2,500	600	2,300	800	2,000	300
12	24	3,200	2,000	2,800	1,000	2,600	1,600	2,300	800	2,200	1,000	2,000	500
	36	2,800	1,800	2,500	800	2,300	1,400	2,000	600	2,000	800	1,800	300
Depth of Cut (D：Dia.)		 Side Milling 1.5D 0.03D		Slotting D 0.03D		 Side Milling 1.5D 0.02D		Slotting D 0.02D		 Side Milling 1.5D 0.02D		Slotting D 0.01D	
Notes		※1 Use a rigid and precise machine and chuck holder. ※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine. ※3 Adjust both spindle speed and feed at the same rate. ※4 Use oil mist coolant.											

P Prehardened Steel
H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel
Square Coating

MSBH230

Size R0.05 ~ R6

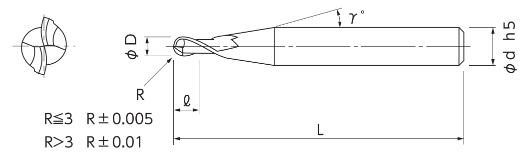
Premium ≤65HRC

MUGEN COATING PREMIUM 2-Flute Ball End Mill for Hardened Steel

Total 20 sizes

Ball end mill for prehardened steels and hardened steels up to 65HRC
For multi-purpose from roughing to finishing

MG 2 30° R ±0.005 (R≦3) φd h5 3D



- Standard ball end mill for hardened steels and suitable for finishing process.
- Applicable for hardened steels up to 65HRC.

Prehardened Steel P
Hardened Steel ~55HRC H
Hardened Steel ~65HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00507-00005	R0.05	0.1	0.1	12°	4	50
08-00507-00007	R0.075	0.15	0.15	12°	4	50
08-00507-00010	R0.1	0.2	0.2	12°	4	50
08-00507-00015	R0.15	0.3	0.3	12°	4	50
08-00507-00020	R0.2	0.6	0.4	12°	4	50
08-00507-00025	R0.25	0.8	0.5	12°	4	50
08-00507-00030	R0.3	0.9	0.6	12°	4	50
08-00507-00040	R0.4	1.2	0.8	12°	4	50
08-00507-00050	R0.5	1.5	1	12°	4	50
08-00507-00075	R0.75	2.3	1.5	12°	4	50
08-00507-00100	R1	3	2	12°	4	60
08-00507-00125	R1.25	3.8	2.5	12°	6	60
08-00507-00150	R1.5	5	3	12°	6	60
08-00507-00201	R2	6	4	–	4	70
08-00507-00200	R2	6	4	12°	6	70
08-00507-00250	R2.5	8	5	12°	6	70
08-00507-00300	R3	10	6	–	6	80
08-00507-00400	R4	12	8	–	8	90
08-00507-00500	R5	15	10	–	10	100
08-00507-00600	R6	20	12	–	12	100

How to Order When you order, indicate MSBH230 (R)×(d). ※(γ) is reference value.

Ball Coating

Machining Case 1

3D Shape Model

Work Size : 100 x 100mm (Machining depth 20mm)

- Work material: STAVAX 52HRC
- Total machining time : 9hr 23min
- Coolant : Oil mist

Process	Roughing	Semi-finishing	Finishing
Tool	MSBH230 R3	MSBH230 R2	MSBH230 R2
Spindle speed [min⁻¹]	14,000	15,000	
Feed [mm/min]	3,000	2,000	1,800
Depth of cut ap×ae [mm]	0.3×2	0.2×0.3	0.08×0.05
Machining time	2hr 30min	2hr 23min	4hr 30min

Recommended Milling Conditions

Work Material	Hardened Steels SKD61·STAVAX·HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.05	0.005	0.005	150	40,000	0.003	0.005	100	40,000	0.002	0.005	60	40,000
0.075	0.005	0.005	180	40,000	0.003	0.005	150	40,000	0.002	0.005	100	40,000
0.1	0.01	0.02	360	40,000	0.01	0.01	320	40,000	0.003	0.005	240	40,000
0.15	0.01	0.03	420	40,000	0.01	0.02	360	40,000	0.005	0.01	300	40,000
0.2	0.02	0.06	1,000	40,000	0.02	0.05	820	40,000	0.01	0.02	480	40,000
0.25	0.03	0.07	1,200	40,000	0.025	0.05	1,000	40,000	0.015	0.03	600	40,000
0.3	0.05	0.1	1,600	40,000	0.03	0.06	1,200	40,000	0.02	0.05	720	30,000
0.4	0.1	0.15	2,200	40,000	0.07	0.1	1,800	40,000	0.05	0.1	1,200	30,000
0.5	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
0.75	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
1	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
1.25	0.2	0.6	3,000	25,000	0.2	0.5	2,500	20,000	0.15	0.3	2,000	16,000
1.5	0.2	0.8	3,000	20,000	0.2	0.6	2,500	18,000	0.2	0.5	2,000	14,000
2	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
2.5	0.3	1.5	3,000	18,000	0.2	1.2	2,500	12,000	0.2	0.7	2,000	9,200
3	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
4	0.5	2	2,500	10,000	0.4	1.2	1,800	7,000	0.3	1	1,200	5,000
5	0.7	2.5	2,000	7,000	0.5	1.5	1,500	5,000	0.4	1.2	1,000	4,000
6	1	3	1,500	5,000	0.6	2	1,200	4,000	0.5	1.5	800	3,000

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 We recommend using oil mist coolant.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.
※5 Length of tool overhang must be as short as possible.

P Prehardened Steel
H ~55HRC Hardened Steel
H ~65HRC Hardened Steel
M Stainless Steel
S Titanium Alloy Heat Resistant Alloy

Ball Coating

MSBH345

Size R0.5 ~ R3

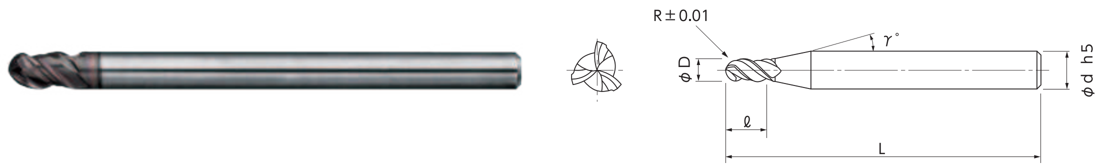
Premium ≦65 HRC

MUGEN COATING PREMIUM 3-Flute Ball End Mill for Hardened Steel

Total 26 sizes

MG 3 45° φd h5 3D

3-flute high helix angle ball end mill
for prehardened steels and hardened steels up to 65HRC



- MUGEN COATING PREMIUM realizes long tool life for machining on high-hardened steel.
- Original 3-flute design and unequal flute spacing to suppress chattering realize high efficient machining.

Unit : mm

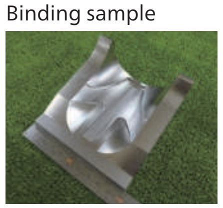
Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00607-00050	R0.5	1.5	1	12°	6	60
▌08-00607-00060	R0.6	2	1.2	12°	6	60
▌08-00607-00070	R0.7	3	1.4	12°	6	60
▌08-00607-00080	R0.8	3	1.6	12°	6	60
▌08-00607-00090	R0.9	3	1.8	12°	6	60
08-00607-00100	R1	3	2	12°	6	60
▌08-00607-00110	R1.1	3.5	2.2	12°	6	60
▌08-00607-00120	R1.2	4	2.4	12°	6	60
▌08-00607-00130	R1.3	4	2.6	12°	6	60
▌08-00607-00140	R1.4	5	2.8	12°	6	60
08-00607-00150	R1.5	5	3	12°	6	60
▌08-00607-00160	R1.6	5	3.2	12°	6	60
▌08-00607-00170	R1.7	6	3.4	12°	6	60
▌08-00607-00180	R1.8	6	3.6	12°	6	60
▌08-00607-00190	R1.9	6	3.8	12°	6	60
08-00607-00200	R2	6	4	12°	6	70
▌08-00607-00210	R2.1	7	4.2	12°	6	70
▌08-00607-00220	R2.2	7	4.4	12°	6	70
▌08-00607-00230	R2.3	7	4.6	12°	6	70
▌08-00607-00240	R2.4	8	4.8	12°	6	70
08-00607-00250	R2.5	8	5	12°	6	70
▌08-00607-00260	R2.6	8	5.2	12°	6	70
▌08-00607-00270	R2.7	9	5.4	12°	6	70
▌08-00607-00280	R2.8	9	5.6	12°	6	70
▌08-00607-00290	R2.9	9	5.8	12°	6	70
08-00607-00300	R3	10	6	–	6	80

How to Order　When you order, indicate MSBH345 (R).　※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Machining Case 1

Binding sample



- Work material : DC53 60HRC
- Total machining time : 15hr 16min
- Coolant : Oil mist
- Work Size : 100 x 100mm (Machining depth 50mm)

Process	Roughing	Semi-finishing	Finishing	Stock removal
Tool	MSBH345 R3	MSBH345 R3	MSBH345 R3	MSBH345 R2
Spindle speed [min⁻¹]	7,200			12,000
Feed [mm/min]	3,000	3,000	2,200	2,200
Depth of cut apxae [mm]	0.3×1.5	0.3×0.5	0.1×0.1	0.1×0.1
Machining time	6hr 40min	49min	7hr20min	27min

Recommended Milling Conditions

Work Material	Hardened Steels SKD61·STAVAX (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	0.1	0.3	2,500	30,000	0.1	0.2	2,500	30,000	0.08	0.1	2,000	30,000
1	0.2	0.6	3,000	20,000	0.2	0.6	3,000	20,000	0.15	0.3	2,500	20,000
1.5	0.2	1	3,000	18,000	0.2	0.8	3,000	16,000	0.2	0.5	2,000	14,000
2	0.3	1.5	3,000	15,000	0.2	1	3,000	12,000	0.2	0.6	2,000	10,000
2.5	0.3	2	3,000	12,000	0.2	1.2	3,000	10,000	0.2	0.7	2,000	8,000
3	0.4	2	3,000	9,000	0.3	1.2	3,000	7,200	0.2	1	2,000	6,800

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 We recommend using oil mist coolant.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.
※5 Length of overhang is 4 to 5 times Dia. When it is longer than 4 to 5 times Dia., adjust the conditions listed above.

MHDH445R

Size $\phi 3 \times R0.2 \sim \phi 4 \times R0.5$

Premium ≦65 HRC

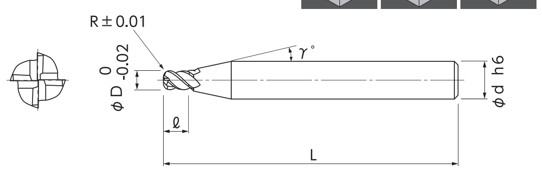
MUGEN COATING PREMIUM 4-Flute Corner Radius End Mill for Hardened Steel Total 6 sizes

Recommended Milling Conditions

4-flute high helix angle corner radius end mill for hardened steels up to 65HRC

MG 4 45°
Side Slot Face

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H



- Realized stably long tool life against high hardened steels (48～65HRC).
- Corner radius to prevent flute chipping, and high helix angle for cutting sharpness.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00437-03002	3	R0.2	6	12°	6	60
08-00437-03003		R0.3	6	12°	6	60
08-00437-03005		R0.5	6	12°	6	60
08-00437-04002	4	R0.2	8	12°	6	60
08-00437-04003		R0.3	8	12°	6	60
08-00437-04005		R0.5	8	12°	6	60

How to Order When you order, indicate MHDH445R (D)×(R). ※(γ) is reference value.

Work Material	Hardened Steels HPM38･STAVAX･SKD61 (～55HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Steels SKH (～65HRC)			
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
3	10,000	1,000	8,000	580	8,000	700	7,500	500	7,000	560	6,000	280
4	8,500	1,200	7,500	620	7,000	800	6,000	540	6,000	600	5,000	300
Depth of Cut (D：Dia.)	Side Milling 1.5D 0.03D		Slotting D 0.02D		Side Milling 1.5D 0.02D		Slotting D 0.01D		Side Milling 1.5D 0.02D		Slotting D 0.01D	
Notes	※1 Use a rigid and precise machine and chuck holder. ※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine. ※3 Adjust both spindle speed and feed at the same rate. ※4 Use oilmist coolant.											

P Prehardened Steel
H ~55 HRC Hardened Steel
H ~65 HRC Hardened Steel

Corner Radius Coating

Corner Radius Coating

MHDH645R

Size φ5 × R0.2 ～ φ12 × R2

Premium ≦65 HRC

MHDH645R

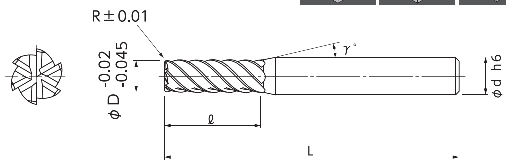
Regular Line
MUGEN PREMIUM
Full Cutting Length Type

MUGEN COATING PREMIUM 6-Flute Corner Radius End Mill for Hardened Steel Total 21 sizes

MG 6 45°
Side Slot Face

6-flute high helix angle corner radius end mill for hardened steels up to 65HRC

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H



- Realized stably long tool life against high hardened steels (48～65HRC).
- Corner radius to prevent flute chipping, and high helix angle for cutting sharpness.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00438-05002	5	R0.2	10	12°	6	60
08-00438-05003		R0.3	10	12°	6	60
08-00438-05005		R0.5	10	12°	6	60
08-00438-05010		R1	10	12°	6	60
08-00438-06002	6	R0.2	12	–	6	60
08-00438-06003		R0.3	12	–	6	60
08-00438-06005		R0.5	12	–	6	60
08-00438-06010		R1	12	–	6	60
08-00438-08003	8	R0.3	16	–	8	65
08-00438-08005		R0.5	16	–	8	65
08-00438-08010		R1	16	–	8	65
08-00438-08015		R1.5	16	–	8	65
08-00438-10003	10	R0.3	20	–	10	75
08-00438-10005		R0.5	20	–	10	75
08-00438-10010		R1	20	–	10	75
08-00438-10015		R1.5	20	–	10	75
08-00438-10020		R2	20	–	10	75
08-00438-12005	12	R0.5	24	–	12	80
08-00438-12010		R1	24	–	12	80
08-00438-12015		R1.5	24	–	12	80
08-00438-12020		R2	24	–	12	80

How to Order When you order, indicate MHDH645R (D)×(R). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Hardened Steels HPM38・STAVAX・SKD61 (～55HRC)				Hardened Steels SKD11 (～62HRC)				High Speed Tool Steels SKH (～65HRC)			
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
5	7,600	1,600	6,800	900	6,200	1,200	5,600	600	5,300	800	4,800	350
6	6,400	1,800	5,800	950	5,300	1,200	4,800	600	4,600	800	4,200	350
8	4,800	2,000	4,300	1,000	4,000	1,400	3,600	700	3,400	1,000	3,000	400
10	3,800	2,000	3,400	1,000	3,200	1,600	2,800	800	2,600	1,000	2,300	500
12	3,200	2,000	2,800	1,000	2,600	1,600	2,300	800	2,200	1,000	2,000	500
Depth of Cut (D:Dia.)	Side Milling 1.5D 0.03D		Slotting D 0.02D		Side Milling 1.5D 0.02D		Slotting D 0.01D		Side Milling 1.5D 0.02D		Slotting D 0.01D	
Notes	※1 Use a rigid and precise machine and chuck holder. ※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine. ※3 Adjust both spindle speed and feed at the same rate. ※4 Use oil mist coolant.											

Corner Radius Coating

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Corner Radius Coating

MHRH230

Size ϕ0.1 ～ ϕ3

Premium ≦65 HRC

MHRH230

MUGEN COATING PREMIUM 2-Flute Long Neck End Mill for Hardened Steel

Total 134 sizes

MUGEN COATING PREMIUM 2-Flute Long Neck End Mill for Hardened Steel

MG　2　30°

Side　Slot　Face

P Prehardened Steel

H ~55 HRC Hardened Steel

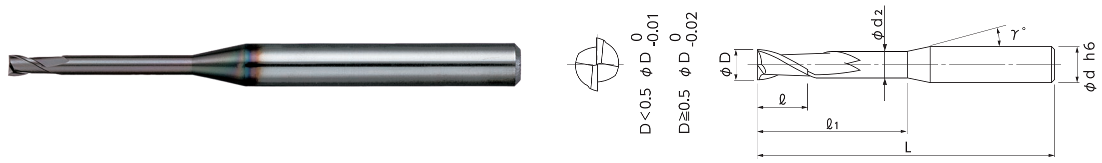
H ~65 HRC Hardened Steel

M Stainless Steel

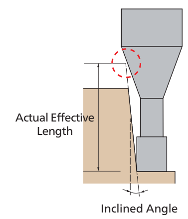
S Titanium Alloy Heat Resistant Alloy

Long Neck Square Coating

Long neck square end mill for hardened steels up to 65HRC.
Maximum L/D=25



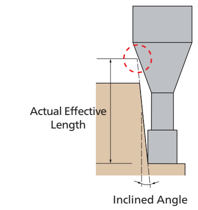
- MUGEN COATING PREMIUM to improve accuracy and tool life on machining hardened steels!
- Total 134 sizes!



Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00207-01003	0.1	0.3	0.08	0.085	12°	4	45	0.34	0.36	0.38	0.40	0.44
08-00207-01005		0.5					45	0.55	0.58	0.61	0.64	0.71
08-00207-01007		0.75					45	0.81	0.85	0.89	0.93	1.04
08-00207-01010		1					45	1.07	1.12	1.18	1.23	1.37
08-00207-01503	0.15	0.3	0.12	0.13	12°	4	45	0.36	0.37	0.39	0.41	0.46
08-00207-01505		0.5					45	0.57	0.59	0.62	0.65	0.72
08-00207-01507		0.75					45	0.83	0.86	0.90	0.95	1.05
08-00207-01510		1					45	1.09	1.14	1.19	1.25	1.38
08-00207-01515		1.5					45	1.61	1.68	1.76	1.85	2.05
08-00207-02005	0.2	0.5	0.15	0.18	12°	4	45	0.57	0.59	0.62	0.65	0.72
08-00207-02007		0.75					45	0.83	0.86	0.90	0.95	1.05
08-00207-02010		1					45	1.09	1.14	1.19	1.25	1.38
08-00207-02015		1.5					45	1.61	1.68	1.76	1.85	2.05
08-00207-02020		2					45	2.13	2.23	2.33	2.44	2.71
08-00207-02025		2.5					45	2.65	2.77	2.90	3.04	3.38
08-00207-02030		3					45	3.17	3.31	3.47	3.64	4.04
08-00207-03010	0.3	1	0.25	0.28	12°	4	45	1.09	1.14	1.19	1.25	1.38
08-00207-03015		1.5					45	1.61	1.68	1.76	1.85	2.05
08-00207-03020		2					45	2.13	2.23	2.33	2.44	2.71
08-00207-03025		2.5					45	2.65	2.77	2.90	3.04	3.38
08-00207-03030		3					45	3.17	3.31	3.47	3.64	4.04
08-00207-04010	0.4	1	0.3	0.37	12°	4	45	1.11	1.16	1.22	1.28	1.42
08-00207-04015		1.5					45	1.63	1.71	1.79	1.87	2.08
08-00207-04020		2					45	2.15	2.25	2.36	2.47	2.74
08-00207-04025		2.5					45	2.68	2.80	2.93	3.07	3.41
08-00207-04030		3					45	3.20	3.34	3.50	3.67	4.07
08-00207-04035		3.5					45	3.72	3.89	4.07	4.27	4.73
08-00207-04040		4					45	4.24	4.43	4.64	4.87	5.40
08-00207-04050		5					45	5.28	5.52	5.78	6.06	6.72
08-00207-04060		6					45	6.33	6.61	6.92	7.26	8.05
08-00207-04080		8					45	8.41	8.79	9.20	9.65	10.71
08-00207-04100		10					45	10.50	10.97	11.48	12.05	13.36
08-00207-05010	0.5	1	0.4	0.46	12°	4	45	1.14	1.19	1.24	1.30	1.45
08-00207-05015		1.5					45	1.66	1.73	1.81	1.90	2.11
08-00207-05020		2					45	2.18	2.28	2.38	2.50	2.77
08-00207-05025		2.5					45	2.70	2.82	2.95	3.10	3.44

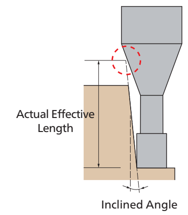
How to Order　When you order, indicate MHRH230 (D)×(ℓ1).　※(γ) is reference value.



Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00207-05030	0.5	3	0.4	0.46	12°	4	45	3.22	3.37	3.52	3.70	4.10
08-00207-05035		3.5					45	3.74	3.91	4.09	4.30	4.77
08-00207-05040		4					45	4.26	4.46	4.66	4.89	5.43
08-00207-05045		4.5					45	4.79	5.00	5.23	5.49	6.09
08-00207-05050		5					45	5.31	5.54	5.80	6.09	6.76
08-00207-05060		6					45	6.35	6.63	6.95	7.29	8.08
08-00207-05070		7					45	7.39	7.72	8.09	8.48	9.41
08-00207-05080		8					50	8.44	8.81	9.23	9.68	10.74
08-00207-05090		9					50	9.48	9.90	10.37	10.88	12.07
08-00207-05100		10					50	10.52	10.99	11.51	12.07	13.39
08-00207-06015	0.6	1.5	0.5	0.56	12°	4	45	1.66	1.73	1.81	1.90	2.11
08-00207-06020		2					45	2.18	2.28	2.38	2.50	2.77
08-00207-06030		3					45	3.22	3.37	3.52	3.70	4.10
08-00207-06040		4					45	4.26	4.46	4.66	4.89	5.43
08-00207-06050		5					45	5.31	5.54	5.80	6.09	6.76
08-00207-06060		6					45	6.35	6.63	6.95	7.29	8.08
08-00207-07020	0.7	2	0.55	0.66	12°	4	45	2.18	2.28	2.38	2.50	2.77
08-00207-07040		4					45	4.26	4.46	4.66	4.89	5.43
08-00207-07060		6					45	6.35	6.63	6.95	7.29	8.08
08-00207-07080		8					50	8.44	8.81	9.23	9.68	10.74
08-00207-07100		10					50	10.52	10.99	11.51	12.07	13.39
08-00207-08030	0.8	3	0.65	0.76	12°	4	45	3.22	3.37	3.52	3.70	4.10
08-00207-08040		4					45	4.26	4.46	4.66	4.89	5.43
08-00207-08050		5					45	5.31	5.54	5.80	6.09	6.76
08-00207-08060		6					45	6.35	6.63	6.95	7.29	8.08
08-00207-08080		8					50	8.44	8.81	9.23	9.68	10.74
08-00207-08100		10					50	10.52	10.99	11.51	12.07	13.39
08-00207-08120		12					50	12.61	13.17	13.79	14.47	16.05
08-00207-10020	1	2	0.8	0.95	12°	4	50	2.20	2.30	2.41	2.53	2.81
08-00207-10030		3					50	3.25	3.39	3.55	3.73	4.13
08-00207-10040		4					50	4.29	4.48	4.69	4.92	5.46
08-00207-10050		5					50	5.33	5.57	5.83	6.12	6.79
08-00207-10060		6					50	6.37	6.66	6.97	7.32	8.11
08-00207-10070		7					50	7.42	7.75	8.11	8.51	9.44
08-00207-10080		8					50	8.46	8.84	9.25	9.71	10.77
08-00207-10090		9					50	9.50	9.93	10.39	10.91	12.10
08-00207-10100		10					50	10.55	11.02	11.53	12.10	13.42
08-00207-10120		12					50	12.63	13.20	13.82	14.49	16.08
08-00207-10140		14					50	14.72	15.38	16.10	16.89	18.73
08-00207-10160		16					60	16.80	17.55	18.38	19.28	21.39
08-00207-10180		18					60	18.89	19.73	20.66	21.67	24.04
08-00207-10200		20					60	20.97	21.91	22.94	24.07	26.70
08-00207-10220		22					60	23.06	24.09	25.22	26.46	Free
08-00207-12060	1.2	6	1	1.15	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00207-12080		8					50	8.46	8.84	9.25	9.71	10.77
08-00207-12100		10					50	10.55	11.02	11.53	12.10	13.42
08-00207-12120		12					50	12.63	13.20	13.82	14.49	16.08
08-00207-12160		16					60	16.80	17.55	18.38	19.28	21.39
08-00207-14060	1.4	6	1.1	1.35	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00207-14120		12					50	12.63	13.20	13.82	14.49	16.08

MUGEN COATING PREMIUM 2-Flute Long Neck End Mill for Hardened Steel



Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00207-15040	1.5	4	1.2	1.45	12°	4	50	4.29	4.48	4.69	4.92	5.46
08-00207-15060		6					50	6.37	6.66	6.97	7.32	8.11
08-00207-15080		8					50	8.46	8.84	9.25	9.71	10.77
08-00207-15100		10					50	10.55	11.02	11.53	12.10	13.42
08-00207-15120		12					50	12.63	13.20	13.82	14.49	16.08
08-00207-15140		14					60	14.72	15.38	16.10	16.89	18.73
08-00207-15160		16					60	16.80	17.55	18.38	19.28	21.39
08-00207-15180		18					60	18.89	19.73	20.66	21.67	Free
08-00207-15200		20					60	20.97	21.91	22.94	24.07	Free
08-00207-15250		25					70	26.19	27.36	28.64	30.05	Free
08-00207-15300		30					70	31.40	32.81	34.34	Free	Free
08-00207-15350		35					80	36.62	38.25	40.05	Free	Free
08-00207-16060	1.6	6	1.3	1.55	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00207-16080		8					50	8.46	8.84	9.25	9.71	10.77
08-00207-18060	1.8	6	1.4	1.75	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00207-18080		8					50	8.46	8.84	9.25	9.71	10.77
08-00207-18100		10					50	10.55	11.02	11.53	12.10	13.42
08-00207-18120		12					50	12.63	13.20	13.82	14.49	16.08
08-00207-18140		14					50	14.72	15.38	16.10	16.89	18.73
08-00207-18160		16					60	16.80	17.55	18.38	19.28	Free
08-00207-18180		18					60	18.89	19.73	20.66	21.67	Free
08-00207-20040	2	4	1.6	1.94	12°	4	50	4.31	4.51	4.72	4.95	5.49
08-00207-20060		6					50	6.40	6.69	7.00	7.34	8.15
08-00207-20080		8					50	8.48	8.86	9.28	9.74	10.80
08-00207-20100		10					50	10.57	11.04	11.56	12.13	13.45
08-00207-20120		12					50	12.66	13.22	13.84	14.52	16.11
08-00207-20140		14					60	14.74	15.40	16.12	16.92	18.76
08-00207-20160		16					60	16.83	17.58	18.40	19.31	Free
08-00207-20180		18					60	18.91	19.76	20.69	21.70	Free
08-00207-20200		20					60	21.00	21.94	22.97	24.10	Free
08-00207-20250		25					70	26.21	27.39	28.67	Free	Free
08-00207-20300		30					70	31.43	32.83	34.37	Free	Free
08-00207-20350		35					80	36.64	38.28	Free	Free	Free
08-00207-20400		40					90	41.85	43.73	Free	Free	Free
08-00207-20500		50					100	52.28	54.62	Free	Free	Free
08-00207-25080	2.5	8	2	2.4	12°	4	50	8.58	8.97	9.39	9.85	10.93
08-00207-25120		12					50	12.75	13.32	13.95	14.64	Free
08-00207-25160		16					60	16.93	17.68	18.51	19.42	Free
08-00207-25200		20					60	21.10	22.04	23.07	Free	Free
08-00207-25300		30					70	31.52	32.94	Free	Free	Free
08-00207-25400		40					90	41.95	Free	Free	Free	Free
08-00207-25500		50					100	52.38	Free	Free	Free	Free
08-00207-30080	3	8	4.5	2.85	12°	6	50	8.71	9.10	9.52	9.99	11.08
08-00207-30120		12					50	12.88	13.45	14.08	14.78	16.39
08-00207-30160		16					60	17.05	17.81	18.65	19.56	21.70
08-00207-30200		20					60	21.22	22.17	23.21	24.35	27.01
08-00207-30250		25					70	26.43	27.62	28.91	30.33	Free
08-00207-30300		30					70	31.65	33.06	34.61	36.31	Free

How to Order When you order, indicate MHRH230 (D)×(ℓ1). ※(γ) is reference value.

Recommended Milling Conditions

Work Material		Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Under Neck Length	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	ae mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	ae mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	ae mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	ae mm
0.1	0.3	40,000	150	0.005	0.06	40,000	120	0.003	0.05	40,000	100	0.002	0.04	40,000	70	0.002	0.03
	0.5	40,000	100	0.005	0.06	40,000	80	0.003	0.05	40,000	60	0.002	0.04	40,000	50	0.002	0.03
	0.75	40,000	80	0.003	0.06	40,000	70	0.002	0.05	40,000	50	0.001	0.04	40,000	30	0.001	0.03
	1	40,000	60	0.002	0.06	40,000	50	0.001	0.05	40,000	40	0.001	0.04	40,000	20	0.001	0.03
0.15	0.3	40,000	180	0.005	0.09	40,000	150	0.003	0.07	40,000	120	0.002	0.06	40,000	100	0.002	0.04
	0.5	40,000	150	0.005	0.09	40,000	120	0.003	0.07	40,000	100	0.002	0.06	40,000	80	0.002	0.04
	0.75	40,000	120	0.003	0.09	40,000	100	0.002	0.07	40,000	80	0.001	0.06	40,000	60	0.001	0.04
	1	40,000	100	0.002	0.09	40,000	80	0.001	0.07	40,000	60	0.001	0.06	40,000	40	0.001	0.04
	1.5	40,000	80	0.002	0.09	40,000	60	0.001	0.07	40,000	40	0.001	0.06	40,000	20	0.001	0.04
0.2	0.5	30,000	240	0.005	0.12	30,000	200	0.003	0.1	30,000	160	0.003	0.08	30,000	120	0.003	0.06
	0.75	30,000	200	0.005	0.12	30,000	180	0.003	0.1	30,000	140	0.003	0.08	30,000	100	0.003	0.06
	1	30,000	180	0.005	0.12	30,000	150	0.003	0.1	30,000	120	0.003	0.08	30,000	80	0.003	0.06
	1.5	30,000	120	0.003	0.12	30,000	100	0.002	0.1	30,000	80	0.002	0.08	30,000	60	0.002	0.06
	2	30,000	80	0.003	0.12	30,000	50	0.002	0.1	30,000	40	0.002	0.08	30,000	30	0.002	0.06
	2.5	30,000	60	0.002	0.12	30,000	50	0.001	0.1	25,000	40	0.001	0.08	25,000	30	0.001	0.06
	3	30,000	40	0.002	0.12	25,000	40	0.001	0.1	25,000	30	0.001	0.08	22,000	20	0.001	0.06
0.3	1	30,000	350	0.007	0.18	30,000	300	0.003	0.15	30,000	250	0.003	0.12	30,000	200	0.003	0.09
	1.5	30,000	260	0.007	0.18	30,000	200	0.003	0.15	30,000	160	0.003	0.12	30,000	120	0.003	0.09
	2	30,000	180	0.005	0.18	30,000	150	0.003	0.15	30,000	120	0.003	0.12	25,000	100	0.003	0.09
	2.5	30,000	150	0.004	0.18	25,000	100	0.002	0.15	25,000	80	0.002	0.12	20,000	60	0.002	0.09
	3	30,000	70	0.004	0.18	25,000	50	0.002	0.15	25,000	40	0.002	0.12	20,000	30	0.002	0.09
0.4	1	30,000	450	0.01	0.24	30,000	400	0.005	0.2	30,000	350	0.005	0.16	25,000	300	0.005	0.12
	1.5	30,000	400	0.01	0.24	30,000	360	0.005	0.2	30,000	330	0.005	0.16	25,000	250	0.005	0.12
	2	30,000	360	0.01	0.24	30,000	320	0.005	0.2	25,000	280	0.005	0.16	25,000	220	0.005	0.12
	2.5	30,000	340	0.008	0.24	25,000	280	0.005	0.2	25,000	250	0.004	0.16	20,000	200	0.004	0.12
	3	30,000	320	0.008	0.24	25,000	260	0.004	0.2	20,000	220	0.003	0.16	18,000	180	0.003	0.12
	3.5	30,000	280	0.007	0.24	25,000	220	0.004	0.2	20,000	180	0.003	0.16	18,000	150	0.002	0.12
	4	30,000	250	0.006	0.24	25,000	200	0.003	0.2	20,000	160	0.002	0.16	18,000	120	0.002	0.12
	5	25,000	250	0.005	0.24	22,000	180	0.003	0.2	20,000	150	0.002	0.16	18,000	90	0.002	0.12
	6	25,000	200	0.004	0.24	22,000	150	0.002	0.2	18,000	130	0.002	0.16	16,000	70	0.001	0.12
	8	20,000	150	0.002	0.24	16,000	120	0.001	0.2	14,000	90	0.001	0.16	12,000	40	0.001	0.12
	10	16,000	100	0.002	0.24	13,000	80	0.001	0.2	12,000	50	0.001	0.16	10,000	20	0.001	0.12
0.5	1	30,000	550	0.02	0.3	25,000	500	0.01	0.25	23,000	450	0.007	0.2	20,000	400	0.005	0.15
	1.5	30,000	520	0.02	0.3	25,000	450	0.01	0.25	23,000	400	0.007	0.2	20,000	360	0.005	0.15
	2	30,000	500	0.02	0.3	25,000	420	0.01	0.25	23,000	380	0.007	0.2	20,000	320	0.005	0.15
	2.5	30,000	480	0.015	0.3	25,000	400	0.008	0.25	23,000	360	0.006	0.2	20,000	300	0.004	0.15
	3	30,000	420	0.015	0.3	25,000	350	0.007	0.25	23,000	320	0.005	0.2	20,000	280	0.003	0.15
	3.5	25,000	400	0.012	0.3	25,000	320	0.006	0.25	23,000	280	0.003	0.2	20,000	240	0.003	0.15
	4	25,000	380	0.01	0.3	25,000	280	0.005	0.25	23,000	240	0.003	0.2	20,000	200	0.002	0.15
	4.5	25,000	350	0.008	0.3	25,000	230	0.004	0.25	20,000	200	0.003	0.2	18,000	160	0.002	0.15
	5	25,000	320	0.007	0.3	20,000	200	0.003	0.25	18,000	150	0.003	0.2	16,000	100	0.002	0.15
	6	25,000	300	0.005	0.3	20,000	200	0.003	0.25	18,000	150	0.002	0.2	16,000	100	0.002	0.15
	7	20,000	250	0.005	0.3	16,000	180	0.003	0.25	14,000	140	0.002	0.2	14,000	80	0.002	0.15
	8	20,000	200	0.005	0.3	16,000	160	0.002	0.25	14,000	130	0.002	0.2	12,000	60	0.001	0.15
	9	20,000	200	0.003	0.3	16,000	150	0.002	0.25	14,000	120	0.001	0.2	12,000	50	0.001	0.15
	10	16,000	170	0.003	0.3	13,000	130	0.002	0.25	12,000	110	0.001	0.2	10,000	40	0.001	0.15
0.6	1.5	30,000	650	0.02	0.35	25,000	550	0.01	0.3	23,000	450	0.007	0.25	20,000	400	0.005	0.18
	2	30,000	550	0.02	0.35	25,000	500	0.01	0.3	23,000	400	0.007	0.25	20,000	350	0.005	0.18
	3	30,000	500	0.015	0.35	25,000	450	0.007	0.3	23,000	350	0.005	0.25	20,000	300	0.003	0.18
	4	25,000	450	0.01	0.35	25,000	400	0.005	0.3	23,000	300	0.003	0.25	20,000	250	0.002	0.18

MHRH230

Recommended Milling Conditions

Work Material		Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
0.6	5	25,000	400	0.007	0.35	20,000	350	0.003	0.3	18,000	250	0.003	0.25	16,000	200	0.002	0.18
	6	25,000	350	0.005	0.35	20,000	300	0.002	0.3	18,000	200	0.002	0.25	16,000	150	0.001	0.18
0.7	2	30,000	750	0.04	0.4	25,000	600	0.03	0.35	23,000	450	0.02	0.28	20,000	400	0.012	0.21
	4	25,000	690	0.03	0.4	25,000	560	0.02	0.35	23,000	400	0.015	0.28	20,000	320	0.007	0.21
	6	25,000	550	0.02	0.4	20,000	410	0.015	0.35	18,000	300	0.012	0.28	16,000	240	0.007	0.21
	8	20,000	430	0.012	0.4	16,000	330	0.01	0.35	14,000	230	0.007	0.28	12,000	180	0.005	0.21
	10	16,000	300	0.008	0.4	13,000	200	0.005	0.35	12,000	180	0.003	0.28	10,000	120	0.002	0.21
0.8	3	25,000	850	0.04	0.45	25,000	780	0.03	0.4	23,000	650	0.02	0.32	20,000	550	0.012	0.24
	4	25,000	800	0.03	0.45	25,000	700	0.025	0.4	23,000	600	0.015	0.32	20,000	500	0.007	0.24
	5	25,000	700	0.03	0.45	23,000	630	0.02	0.4	20,000	530	0.012	0.32	18,000	450	0.006	0.24
	6	20,000	620	0.025	0.45	20,000	550	0.02	0.4	18,000	450	0.01	0.32	16,000	350	0.005	0.24
	8	16,000	500	0.015	0.45	16,000	400	0.007	0.4	14,000	300	0.005	0.32	12,000	200	0.003	0.24
	10	16,000	400	0.012	0.45	16,000	350	0.007	0.4	12,000	180	0.005	0.32	10,000	150	0.003	0.24
	12	16,000	300	0.007	0.45	13,000	220	0.005	0.4	12,000	120	0.003	0.32	10,000	120	0.002	0.24
1	2	25,000	1,200	0.07	0.6	23,000	1,000	0.06	0.5	18,000	900	0.05	0.4	14,000	600	0.035	0.3
	3	25,000	1,200	0.06	0.6	23,000	1,000	0.05	0.5	18,000	900	0.04	0.4	14,000	600	0.03	0.3
	4	25,000	1,000	0.05	0.6	23,000	900	0.04	0.5	18,000	800	0.03	0.4	14,000	500	0.02	0.3
	5	22,000	1,000	0.04	0.6	20,000	800	0.03	0.5	16,000	700	0.02	0.4	12,000	450	0.012	0.3
	6	20,000	900	0.03	0.6	18,000	700	0.02	0.5	14,000	600	0.01	0.4	10,000	400	0.007	0.3
	7	20,000	900	0.03	0.6	18,000	650	0.02	0.5	14,000	550	0.01	0.4	10,000	370	0.006	0.3
	8	18,000	800	0.03	0.6	16,000	600	0.02	0.5	12,000	500	0.01	0.4	8,000	340	0.005	0.3
	9	18,000	700	0.02	0.6	16,000	550	0.015	0.5	12,000	450	0.007	0.4	8,000	300	0.005	0.3
	10	16,000	600	0.02	0.6	14,000	500	0.01	0.5	10,000	400	0.007	0.4	6,000	250	0.005	0.3
	12	16,000	500	0.02	0.6	13,000	400	0.01	0.5	10,000	300	0.005	0.4	6,000	180	0.004	0.3
	14	16,000	450	0.015	0.6	13,000	360	0.008	0.5	10,000	280	0.005	0.4	5,500	160	0.004	0.3
	16	14,000	400	0.012	0.6	12,000	320	0.006	0.5	9,000	250	0.004	0.4	5,500	150	0.003	0.3
	18	14,000	300	0.01	0.6	12,000	240	0.006	0.5	8,000	200	0.004	0.4	5,000	120	0.002	0.3
	20	12,000	200	0.007	0.6	10,000	160	0.005	0.5	7,000	130	0.003	0.4	4,500	90	0.001	0.3
	22	12,000	180	0.005	0.6	10,000	150	0.003	0.5	6,000	100	0.002	0.4	4,200	60	0.001	0.3
1.2	6	20,000	900	0.04	0.7	18,000	700	0.03	0.6	14,000	600	0.02	0.5	10,000	400	0.01	0.4
	8	18,000	800	0.04	0.7	16,000	600	0.02	0.6	12,000	500	0.01	0.5	8,000	340	0.007	0.4
	10	16,000	600	0.03	0.7	12,000	500	0.02	0.6	10,000	430	0.01	0.5	8,000	300	0.005	0.4
	12	14,000	600	0.02	0.7	10,000	500	0.01	0.6	9,000	400	0.007	0.5	7,000	250	0.005	0.4
	16	12,000	400	0.018	0.7	9,000	300	0.01	0.6	8,000	260	0.005	0.5	6,000	180	0.003	0.4
1.4	6	22,000	1,000	0.06	0.8	20,000	800	0.04	0.7	18,000	700	0.03	0.56	12,000	450	0.02	0.42
	12	16,000	700	0.03	0.8	13,000	500	0.01	0.7	11,000	400	0.007	0.56	8,000	280	0.005	0.42
1.5	4	23,000	1,200	0.07	0.9	20,000	900	0.05	0.75	18,000	800	0.04	0.6	14,000	600	0.03	0.45
	6	23,000	1,000	0.06	0.9	20,000	800	0.04	0.75	18,000	700	0.03	0.6	14,000	500	0.02	0.45
	8	20,000	900	0.06	0.9	18,000	600	0.03	0.75	14,000	600	0.03	0.6	10,000	380	0.01	0.45
	10	20,000	800	0.04	0.9	16,000	500	0.03	0.75	14,000	500	0.02	0.6	10,000	350	0.01	0.45
	12	16,000	700	0.04	0.9	14,000	500	0.02	0.75	12,000	430	0.02	0.6	8,000	310	0.007	0.45
	14	14,000	600	0.03	0.9	12,000	400	0.02	0.75	10,000	380	0.01	0.6	7,500	250	0.007	0.45
	16	12,000	500	0.02	0.9	10,000	360	0.01	0.75	9,000	300	0.007	0.6	6,800	200	0.005	0.45
	18	10,000	400	0.02	0.9	9,000	330	0.008	0.75	8,000	260	0.005	0.6	6,000	170	0.004	0.45
	20	9,000	320	0.014	0.9	8,000	280	0.005	0.75	7,000	200	0.004	0.6	5,500	150	0.003	0.45
	25	8,000	250	0.01	0.9	7,000	200	0.004	0.75	6,000	150	0.003	0.6	4,500	100	0.002	0.45
	30	7,000	200	0.005	0.9	6,000	150	0.003	0.75	5,000	110	0.002	0.6	4,000	80	0.002	0.45
	35	6,000	150	0.003	0.9	5,000	110	0.002	0.75	4,500	90	0.002	0.6	3,500	60	0.002	0.45
1.6	6	22,000	1,000	0.06	0.96	19,000	850	0.04	0.8	17,000	750	0.03	0.64	13,000	600	0.025	0.48
	8	20,000	900	0.06	0.96	17,000	750	0.03	0.8	14,000	600	0.03	0.64	10,000	430	0.015	0.48

Work Material		Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
1.8	6	20,000	1,000	0.07	1	18,000	900	0.05	0.9	15,000	750	0.04	0.7	12,000	600	0.03	0.5
	8	18,000	900	0.06	1	16,000	800	0.04	0.9	12,000	600	0.03	0.7	9,500	500	0.02	0.5
	10	16,000	800	0.06	1	14,000	700	0.04	0.9	12,000	500	0.03	0.7	9,500	450	0.02	0.5
	12	14,000	700	0.05	1	12,000	600	0.03	0.9	10,000	500	0.02	0.7	8,200	400	0.01	0.5
	14	14,000	700	0.05	1	12,000	600	0.03	0.9	10,000	430	0.02	0.7	8,200	360	0.01	0.5
	16	12,000	600	0.04	1	10,000	500	0.02	0.9	9,200	400	0.01	0.7	7,500	340	0.007	0.5
	18	10,000	500	0.04	1	9,200	410	0.02	0.9	8,500	370	0.01	0.7	6,000	320	0.007	0.5
2	4	20,000	1,200	0.1	1.2	18,000	1,000	0.08	1	15,000	800	0.06	0.8	12,000	600	0.04	0.6
	6	20,000	1,000	0.08	1.2	18,000	900	0.06	1	15,000	750	0.05	0.8	12,000	600	0.03	0.6
	8	18,000	900	0.07	1.2	16,000	800	0.05	1	12,000	600	0.04	0.8	9,500	500	0.02	0.6
	10	16,000	800	0.06	1.2	14,000	700	0.05	1	12,000	500	0.04	0.8	9,500	450	0.02	0.6
	12	14,000	700	0.05	1.2	12,000	600	0.04	1	10,000	500	0.03	0.8	8,200	400	0.01	0.6
	14	14,000	700	0.04	1.2	12,000	600	0.03	1	10,000	430	0.02	0.8	8,200	360	0.007	0.6
	16	12,000	600	0.04	1.2	10,000	500	0.03	1	9,200	400	0.02	0.8	7,500	340	0.007	0.6
	18	10,000	500	0.03	1.2	9,200	410	0.02	1	8,500	370	0.01	0.8	6,000	320	0.005	0.6
	20	10,000	400	0.03	1.2	9,200	380	0.02	1	8,500	340	0.01	0.8	6,000	260	0.005	0.6
	25	9,000	350	0.02	1.2	8,500	330	0.015	1	8,000	300	0.008	0.8	5,000	180	0.004	0.6
	30	8,000	300	0.015	1.2	7,500	280	0.01	1	7,000	250	0.006	0.8	4,500	150	0.004	0.6
	35	7,000	250	0.012	1.2	6,500	230	0.008	1	6,000	200	0.005	0.8	4,000	120	0.003	0.6
	40	6,000	200	0.008	1.2	5,500	180	0.005	1	5,000	150	0.004	0.8	3,500	100	0.003	0.6
	50	5,000	120	0.005	1.2	4,500	100	0.004	1	4,000	80	0.003	0.8	3,000	55	0.002	0.6
2.5	8	16,000	1,000	0.08	1.5	14,000	800	0.07	1.25	10,000	700	0.05	1	8,000	500	0.03	0.75
	12	14,000	800	0.07	1.5	12,000	700	0.06	1.25	9,600	600	0.04	1	7,500	480	0.02	0.75
	16	12,000	700	0.06	1.5	10,000	600	0.05	1.25	8,500	500	0.02	1	7,000	400	0.01	0.75
	20	10,000	600	0.06	1.5	8,200	500	0.05	1.25	7,500	500	0.02	1	5,000	400	0.01	0.75
	30	8,000	400	0.03	1.5	7,000	300	0.025	1.25	6,000	250	0.015	1	4,000	150	0.008	0.75
	40	6,000	250	0.015	1.5	5,500	200	0.012	1.25	5,000	180	0.01	1	3,500	110	0.005	0.75
	50	5,000	150	0.01	1.5	4,500	120	0.008	1.25	4,000	100	0.005	1	3,000	70	0.004	0.75
3	8	16,000	1,000	0.15	1.8	14,000	900	0.1	1.5	10,000	800	0.07	1.2	8,000	600	0.05	0.9
	12	14,000	900	0.1	1.8	12,000	800	0.08	1.5	9,200	700	0.06	1.2	7,200	500	0.04	0.9
	16	12,000	800	0.08	1.8	10,000	700	0.07	1.5	8,500	600	0.05	1.2	6,500	400	0.03	0.9
	20	10,000	800	0.08	1.8	9,000	700	0.07	1.5	7,800	600	0.04	1.2	5,800	400	0.02	0.9
	25	9,000	700	0.07	1.8	8,200	600	0.06	1.5	7,000	500	0.03	1.2	5,000	360	0.01	0.9
	30	8,000	700	0.05	1.8	7,000	600	0.03	1.5	6,500	500	0.02	1.2	4,500	330	0.007	0.9

Notes

※1 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
※2 ap:Axial Depth of Cut, ae:Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steel.
※4 Recommend to apply herical or ramping for approaching into axial direction.
※5 Adjust feed rate 50% lower and cutting depth(ae) 30% lower for milling deep wall area. When L/D exceeds 8 for stable milling.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※8 Recommend guide slotting process with short neck tool before milling with L/D 5 time or longer neck tool.
※9 Major adjustment of milling conditions appropriately on milling profile, machine tool and etc. required for the tools smaller than Dia. 0.5mm, or L/D 15 times longer.

MHRH430

Size φ1～φ6

Premium ≦65 HRC

MHRH430

MUGEN COATING PREMIUM 4 -Flute Long Neck End Mill for Hardened Steel

Total 55 sizes

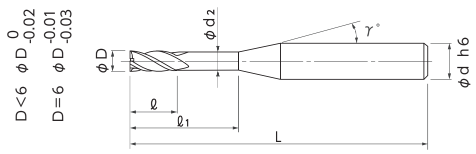
MUGEN COATING PREMIUM 4 -Flute Long Neck End Mill for Hardened Steel

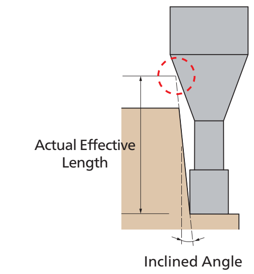
Regular Line
MUGEN PREMIUM
Long Neck Type

4-flute long neck square end mill for prehardened steels and hardened steels up to 65HRC
Maximum L/D=10

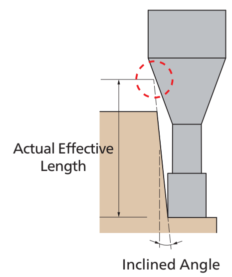
MG 4 30°
Side Slot Face

Prehardened Steel P
Hardened Steel ~55HRC H
Hardened Steel ~65HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S





- MUGEN COATING PREMIUM to improve accuracy and tool life on machining hardened steels!
- Improve tool rigidity for precision machining!
- Total 55 sizes!



Long Neck Square Coating

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00217-01004	1	4	0.8	0.95	12°	4	50	4.29	4.48	4.69	4.92	5.46
08-00217-01006		6					50	6.37	6.66	6.97	7.32	8.11
08-00217-01008		8					50	8.46	8.84	9.25	9.71	10.77
08-00217-01010		10					50	10.55	11.02	11.53	12.10	13.42
08-00217-01206	1.2	6	1	1.15	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00217-01208		8					50	8.46	8.84	9.25	9.71	10.77
08-00217-01210		10					50	10.55	11.02	11.53	12.10	13.42
08-00217-01212		12					50	12.63	13.20	13.82	14.49	16.08
08-00217-01506	1.5	6	1.2	1.45	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00217-01508		8					50	8.46	8.84	9.25	9.71	10.77
08-00217-01510		10					50	10.55	11.02	11.53	12.10	13.42
08-00217-01512		12					50	12.63	13.20	13.82	14.49	16.08
08-00217-01514		14					60	14.72	15.38	16.10	16.89	18.73
08-00217-01516		16					60	16.80	17.55	18.38	19.28	21.39
08-00217-01806	1.8	6	1.4	1.74	12°	4	50	6.40	6.69	7.00	7.34	8.15
08-00217-01808		8					50	8.48	8.86	9.28	9.74	10.80
08-00217-01810		10					50	10.57	11.04	11.56	12.13	13.45
08-00217-01812		12					50	12.66	13.22	13.84	14.52	16.11
08-00217-01814		14					60	14.74	15.40	16.12	16.92	18.76
08-00217-01816		16					60	16.83	17.58	18.40	19.31	Free
08-00217-01818		18					60	18.91	19.76	20.69	21.70	Free

How to Order When you order, indicate MHRH430 (D)×(ℓ1). ※(γ) is reference value.

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00217-02006	2	6	1.6	1.94	12°	4	50	6.40	6.69	7.00	7.34	8.15
08-00217-02008		8					50	8.48	8.86	9.28	9.74	10.80
08-00217-02010		10					50	10.57	11.04	11.56	12.13	13.45
08-00217-02012		12					50	12.66	13.22	13.84	14.52	16.11
08-00217-02014		14					60	14.74	15.40	16.12	16.92	18.76
08-00217-02016		16					60	16.83	17.58	18.40	19.31	Free
08-00217-02018		18					60	18.91	19.76	20.69	21.70	Free
08-00217-02020		20					60	21.00	21.94	22.97	24.10	Free
08-00217-02508	2.5	8	2	2.4	12°	4	50	8.58	8.97	9.39	9.85	10.93
08-00217-02512		12					50	12.75	13.32	13.95	14.64	Free
08-00217-02516		16					60	16.93	17.68	18.51	19.42	Free
08-00217-02520		20					60	21.10	22.04	23.07	Free	Free
08-00217-02525		25					70	26.31	27.49	Free	Free	Free
08-00217-03008	3	8	4.5	2.85	12°	6	50	8.71	9.10	9.52	9.99	11.08
08-00217-03012		12					50	12.88	13.45	14.08	14.78	16.39
08-00217-03016		16					60	17.05	17.81	18.65	19.56	21.70
08-00217-03020		20					60	21.22	22.17	23.21	24.35	27.01
08-00217-03025		25					70	26.43	27.62	28.91	30.33	Free
08-00217-03030		30					70	31.65	33.06	34.61	36.31	Free
08-00217-04012	4	12	6	3.8	12°	6	50	13.00	13.58	14.22	14.92	16.55
08-00217-04016		16					60	17.17	17.94	18.78	19.70	Free
08-00217-04020		20					60	21.34	22.30	23.34	24.49	Free
08-00217-04025		25					70	26.56	27.74	29.04	Free	Free
08-00217-04030		30					70	31.77	33.19	34.75	Free	Free
08-00217-04035		35					80	36.98	38.64	Free	Free	Free
08-00217-04040		40					90	42.20	44.09	Free	Free	Free
08-00217-05016	5	16	7.5	4.8	12°	6	60	17.17	17.94	18.78	Free	Free
08-00217-05025		25					70	26.56	27.74	Free	Free	Free
08-00217-05035		35					80	36.98	Free	Free	Free	Free
08-00217-05050		50					110	52.63	Free	Free	Free	Free
08-00217-06020	6	20	9	5.8	–	6	80	Free	Free	Free	Free	Free
08-00217-06030		30					90	Free	Free	Free	Free	Free
08-00217-06040		40					100	Free	Free	Free	Free	Free
08-00217-06050		50					110	Free	Free	Free	Free	Free

MHRH430

Recommended Milling Conditions

Work Material		Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
1	4	25,000	2,000	0.05	0.6	23,000	1,800	0.04	0.5	18,000	1,600	0.03	0.4	14,000	1,000	0.02	0.3
	6	20,000	1,800	0.03	0.6	18,000	1,400	0.02	0.5	14,000	1,200	0.01	0.4	10,000	800	0.007	0.3
	8	18,000	1,600	0.03	0.6	16,000	1,200	0.02	0.5	12,000	1,000	0.01	0.4	8,000	680	0.005	0.3
	10	16,000	1,200	0.02	0.6	14,000	1,000	0.01	0.5	10,000	800	0.007	0.4	6,000	500	0.005	0.3
1.2	6	20,000	1,800	0.04	0.7	18,000	1,400	0.03	0.6	14,000	1,200	0.02	0.5	10,000	800	0.01	0.4
	8	18,000	1,600	0.04	0.7	16,000	1,200	0.02	0.6	12,000	1,000	0.01	0.5	8,000	680	0.007	0.4
	10	16,000	1,200	0.03	0.7	12,000	1,000	0.02	0.6	10,000	850	0.01	0.5	8,000	600	0.005	0.4
	12	14,000	1,200	0.02	0.7	10,000	1,000	0.01	0.6	9,000	800	0.007	0.5	7,000	500	0.005	0.4
1.5	6	23,000	2,000	0.06	0.9	20,000	1,600	0.04	0.75	18,000	1,400	0.03	0.6	14,000	1,000	0.02	0.45
	8	20,000	1,800	0.06	0.9	18,000	1,200	0.03	0.75	14,000	1,200	0.03	0.6	10,000	750	0.01	0.45
	10	20,000	1,600	0.04	0.9	16,000	1,000	0.03	0.75	14,000	1,000	0.02	0.6	10,000	700	0.01	0.45
	12	16,000	1,400	0.04	0.9	14,000	1,000	0.02	0.75	12,000	850	0.02	0.6	8,000	620	0.007	0.45
	14	14,000	1,200	0.03	0.9	12,000	800	0.02	0.75	10,000	750	0.01	0.6	7,500	500	0.007	0.45
	16	12,000	1,000	0.02	0.9	10,000	720	0.01	0.75	9,000	600	0.007	0.6	6,800	400	0.005	0.45
1.8	6	20,000	2,000	0.07	1	18,000	1,800	0.05	0.9	15,000	1,500	0.04	0.7	12,000	1,200	0.03	0.5
	8	18,000	1,800	0.06	1	16,000	1,600	0.04	0.9	12,000	1,200	0.03	0.7	9,500	1,000	0.02	0.5
	10	16,000	1,600	0.06	1	14,000	1,400	0.04	0.9	12,000	1,000	0.03	0.7	9,500	900	0.02	0.5
	12	14,000	1,400	0.05	1	12,000	1,200	0.03	0.9	10,000	1,000	0.02	0.7	8,200	800	0.01	0.5
	14	14,000	1,400	0.05	1	12,000	1,200	0.03	0.9	10,000	860	0.02	0.7	8,200	720	0.01	0.5
	16	12,000	1,200	0.04	1	10,000	1,000	0.02	0.9	9,200	800	0.01	0.7	7,500	680	0.007	0.5
	18	10,000	1,000	0.04	1	9,200	820	0.02	0.9	8,500	740	0.01	0.7	6,000	640	0.007	0.5
2	6	20,000	2,000	0.08	1.2	18,000	1,800	0.06	1	15,000	1,500	0.05	0.8	12,000	1,200	0.03	0.6
	8	18,000	1,800	0.07	1.2	16,000	1,600	0.05	1	12,000	1,200	0.04	0.8	9,500	1,000	0.02	0.6
	10	16,000	1,600	0.06	1.2	14,000	1,400	0.05	1	12,000	1,000	0.04	0.8	9,500	900	0.02	0.6
	12	14,000	1,400	0.05	1.2	12,000	1,200	0.04	1	10,000	1,000	0.03	0.8	8,200	800	0.01	0.6
	14	14,000	1,400	0.04	1.2	12,000	1,200	0.03	1	10,000	860	0.02	0.8	8,200	720	0.007	0.6
	16	12,000	1,200	0.04	1.2	10,000	1,000	0.03	1	9,200	800	0.02	0.8	7,500	680	0.007	0.6
	18	10,000	1,000	0.03	1.2	9,200	820	0.02	1	8,500	740	0.01	0.8	6,000	640	0.005	0.6
	20	10,000	800	0.03	1.2	9,200	760	0.02	1	8,500	680	0.01	0.8	6,000	520	0.005	0.6
2.5	8	16,000	2,000	0.08	1.5	14,000	1,600	0.07	1.25	10,000	1,400	0.05	1	8,000	1,000	0.03	0.75
	12	14,000	1,600	0.07	1.5	12,000	1,400	0.06	1.25	9,600	1,200	0.04	1	7,500	960	0.02	0.75
	16	12,000	1,400	0.06	1.5	10,000	1,200	0.05	1.25	8,500	1,000	0.02	1	7,000	800	0.01	0.75
	20	10,000	1,200	0.06	1.5	8,200	1,000	0.05	1.25	7,500	1,000	0.02	1	5,000	800	0.01	0.75
	25	8,000	1,000	0.05	1.5	7,000	800	0.03	1.25	6,500	680	0.01	1	4,500	550	0.005	0.75

Regular Line
MUGEN PREMIUM
Long Neck Type

MHRH430

Recommended Milling Conditions

Work Material		Carbon Steels・Prehardened Steels S50C・NAK55・NAK80 HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
3	8	16,000	2,000	0.15	1.8	14,000	1,800	0.1	1.5	10,000	1,600	0.07	1.2	8,000	1.200	0.05	0.9
	12	14,000	1,800	0.1	1.8	12,000	1,600	0.08	1.5	9,200	1,400	0.06	1.2	7,200	1,000	0.04	0.9
	16	12,000	1,600	0.08	1.8	10,000	1,400	0.07	1.5	8,500	1,200	0.05	1.2	6,500	800	0.03	0.9
	20	10,000	1,600	0.08	1.8	9,000	1,400	0.07	1.5	7,800	1,200	0.04	1.2	5,800	800	0.02	0.9
	25	9,000	1,400	0.07	1.8	8,200	1,200	0.06	1.5	7,000	1,000	0.03	1.2	5,000	720	0.01	0.9
	30	8,000	1,400	0.05	1.8	7,000	1,200	0.03	1.5	6,500	1,000	0.02	1.2	4,500	650	0.007	0.9
4	12	12,000	2,000	0.2	2.5	9,500	2,000	0.15	2	8,000	1,600	0.08	1.6	7,000	1,000	0.06	1.2
	16	10,000	2,000	0.15	2.5	8,000	1,800	0.1	2	7,000	1,400	0.06	1.6	6,000	1,200	0.05	1.2
	20	8,500	1,800	0.12	2.5	7,000	1,600	0.08	2	6,500	1,200	0.05	1.6	5,500	1,000	0.04	1.2
	25	8,000	1,600	0.1	2.5	6,000	1,400	0.07	2	5,200	1,200	0.04	1.6	4,500	1,000	0.03	1.2
	30	6,800	1,400	0.08	2.5	4,800	1,000	0.05	2	4,200	850	0.03	1.6	3,500	620	0.02	1.2
	35	5,500	1,000	0.07	2.5	4,200	880	0.04	2	3,800	720	0.02	1.6	3,000	550	0.01	1.2
	40	4,000	860	0.05	2.5	3,600	720	0.03	2	3,000	600	0.01	1.6	2,500	400	0.007	1.2
5	16	10,000	2,000	0.2	3	7,000	1,800	0.12	2.5	5,500	1,600	0.08	2	4,500	1,000	0.06	1.5
	25	8,000	1,600	0.15	3	5,800	1,400	0.07	2.5	4,200	1,200	0.05	2	3,000	800	0.03	1.5
	35	6,000	1,200	0.1	3	4,200	900	0.05	2.5	3,500	800	0.03	2	2,500	600	0.02	1.5
	50	3,500	750	0.07	3	2,800	620	0.03	2.5	2,500	500	0.02	2	1,500	350	0.01	1.5
6	20	8,000	2,000	0.25	4	6,500	1,600	0.18	3	4,500	1,400	0.08	2.4	3,500	920	0.06	1.8
	30	7,000	1,600	0.2	4	4,500	1,200	0.12	3	3,500	1,000	0.06	2.4	2,500	660	0.04	1.8
	40	4,500	1,200	0.15	4	3,000	1,000	0.08	3	2,500	800	0.03	2.4	2,000	550	0.02	1.8
	50	3,000	850	0.1	4	2,500	700	0.05	3	2,000	500	0.02	2.4	1,500	380	0.01	1.8

Notes

※1 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
※2 ap:Axial Depth of Cut, ae:Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steel.
※4 Recommend to apply herical or ramping for approaching into axial direction.
※5 Adjust feed rate 50% lower and cutting depth (ae) 30% lower for milling deep wall area. When L/D exceeds 8 for stable milling.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

MRBH230

Size R0.05～R3

Premium ≦65 HRC

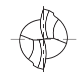
MRBH230

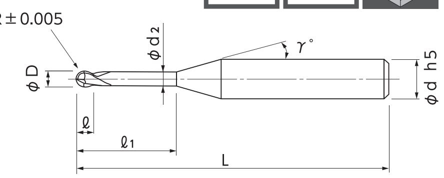
MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel   Total 224 sizes

MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel

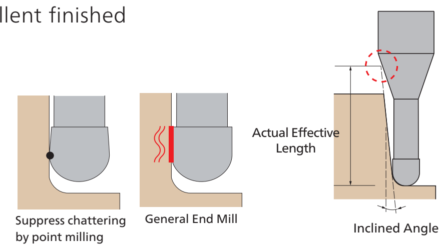
Long neck ball end mill for prehardened steels and hardened steels(～65HRC). Maximum L/D=22

MG　2　30°　R ±0.005　φd h5　3D





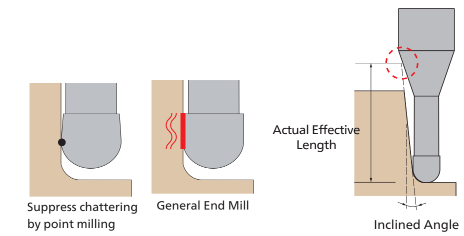
- MUGEN COATING PREMIUM for hardened steels and unique new design excel in chipping prevention and resolves chattering to realize excellent finished surface.
- Applicable for hardened steels up to 65HRC.
- Total 224 sizes!



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00527-00050		0.2	0.07	0.1	0.085	12°	4	45	0.24	0.25	0.26	0.27	0.29
08-00527-00051	R0.05	0.3	0.07	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
08-00527-00053		0.5	0.07	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
08-00527-00071		0.3	0.1	0.15	0.13	12°	4	45	0.36	0.37	0.39	0.40	0.44
08-00527-00073	R0.075	0.5	0.1	0.15	0.13	12°	4	45	0.57	0.59	0.61	0.64	0.70
08-00527-00075		1	0.1	0.15	0.13	12°	4	45	1.09	1.13	1.18	1.24	1.37
08-00527-00100		0.3	0.15	0.2	0.18	12°	4	45	0.35	0.36	0.38	0.39	0.42
08-00527-00101		0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
08-00527-00102		0.75	0.15	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
08-00527-00103		1	0.15	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
08-00528-00103		1	0.15	0.2	0.18	12°	6	50	1.08	1.13	1.18	1.23	1.35
08-00527-00104	R0.1	1.25	0.15	0.2	0.18	12°	4	45	1.34	1.40	1.46	1.53	1.68
08-00527-00105		1.5	0.15	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
08-00527-00106		1.75	0.15	0.2	0.18	12°	4	45	1.86	1.94	2.03	2.13	2.35
08-00527-00107		2	0.15	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68
08-00527-00108		2.5	0.15	0.2	0.18	12°	4	45	2.65	2.76	2.89	3.02	3.34
08-00527-00109		3	0.15	0.2	0.18	12°	4	45	3.17	3.31	3.46	3.62	4.01
08-00527-00162		0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.63	0.68
08-00527-00150		0.6	0.2	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81
08-00527-00163		0.75	0.2	0.3	0.28	12°	4	45	0.82	0.86	0.89	0.93	1.01
08-00527-00151		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
08-00527-00152		1.25	0.2	0.3	0.28	12°	4	45	1.34	1.39	1.45	1.52	1.67
08-00527-00153		1.5	0.2	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00
08-00528-00153	R0.15	1.5	0.2	0.3	0.28	12°	6	50	1.60	1.67	1.74	1.82	2.00
08-00527-00154		1.75	0.2	0.3	0.28	12°	4	45	1.86	1.94	2.02	2.12	2.33
08-00527-00155		2	0.2	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66
08-00527-00156		2.25	0.2	0.3	0.28	12°	4	45	2.38	2.48	2.59	2.71	3.00
08-00527-00157		2.5	0.2	0.3	0.28	12°	4	45	2.64	2.76	2.88	3.01	3.33
08-00527-00159		3	0.2	0.3	0.28	12°	4	45	3.17	3.30	3.45	3.61	3.99
08-00527-00160		3.5	0.2	0.3	0.28	12°	4	45	3.69	3.85	4.02	4.21	4.65
08-00527-00161		4	0.2	0.3	0.28	12°	4	45	4.21	4.39	4.59	4.81	5.32

How to Order　When you order, indicate MRBH230 (R)×(ℓ1)×(d).　※(γ) is reference value.

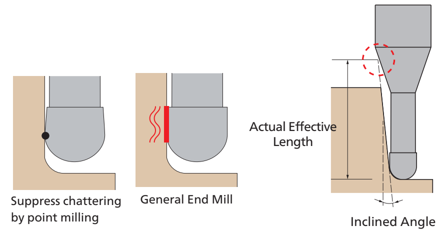


Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00527-00211		0.5	0.3	0.4	0.37	12°	4	45	0.59	0.60	0.62	0.64	0.69
08-00527-00201		0.8	0.3	0.4	0.37	12°	4	45	0.89	0.93	0.96	1.00	1.09
08-00527-00202		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35
08-00528-00202		1	0.3	0.4	0.37	12°	6	50	1.10	1.14	1.19	1.24	1.35
08-00527-00203		1.5	0.3	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02
08-00527-00204		2	0.3	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68
08-00528-00204	R0.2	2	0.3	0.4	0.37	12°	6	50	2.15	2.23	2.33	2.43	2.68
08-00527-00205		2.5	0.3	0.4	0.37	12°	4	45	2.67	2.78	2.90	3.03	3.34
08-00527-00206		3	0.3	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01
08-00527-00207		3.5	0.3	0.4	0.37	12°	4	45	3.71	3.87	4.04	4.23	4.67
08-00527-00208		4	0.3	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33
08-00527-00209		4.5	0.3	0.4	0.37	12°	4	45	4.75	4.96	5.18	5.43	6.00
08-00527-00210		5	0.3	0.4	0.37	12°	4	45	5.27	5.50	5.75	6.02	6.66
08-00527-00212		6	0.3	0.4	0.37	12°	4	45	6.33	6.60	6.90	7.23	8.00
08-00527-00250		1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
08-00527-00251		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
08-00527-00252		2	0.35	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69
08-00527-00253		2.5	0.35	0.5	0.46	12°	4	45	2.69	2.80	2.92	3.05	3.36
08-00527-00254		3	0.35	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02
08-00527-00255		3.5	0.35	0.5	0.46	12°	4	45	3.73	3.89	4.06	4.25	4.69
08-00527-00256	R0.25	4	0.35	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35
08-00527-00257		4.5	0.35	0.5	0.46	12°	4	45	4.78	4.98	5.20	5.44	6.01
08-00527-00258		5	0.35	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68
08-00527-00259		5.5	0.35	0.5	0.46	12°	4	45	5.82	6.07	6.34	6.64	7.34
08-00527-00260		6	0.35	0.5	0.46	12°	4	45	6.34	6.61	6.91	7.24	8.00
08-00527-00262		8	0.35	0.5	0.46	12°	4	45	8.42	8.79	9.19	9.63	10.66
08-00527-00264		10	0.35	0.5	0.46	12°	4	45	10.52	10.98	11.49	12.04	13.35
08-00527-00300		1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
08-00527-00301		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
08-00527-00302		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
08-00528-00302		2	0.45	0.6	0.56	12°	6	50	2.17	2.25	2.34	2.44	2.68
08-00527-00303		2.5	0.45	0.6	0.56	12°	4	45	2.69	2.79	2.91	3.04	3.34
08-00527-00304		3	0.45	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01
08-00528-00304	R0.3	3	0.45	0.6	0.56	12°	6	50	3.21	3.34	3.48	3.64	4.01
08-00527-00305		3.5	0.45	0.6	0.56	12°	4	45	3.73	3.88	4.05	4.24	4.67
08-00527-00306		4	0.45	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33
08-00528-00306		4	0.45	0.6	0.56	12°	6	50	4.25	4.43	4.62	4.84	5.33
08-00527-00321		4.5	0.45	0.6	0.56	12°	4	45	4.78	4.98	5.20	5.45	6.02
08-00527-00308		5	0.45	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66
08-00527-00322		5.5	0.45	0.6	0.56	12°	4	45	5.82	6.07	6.34	6.64	7.35
08-00527-00310		6	0.45	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99

MRBH230

MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel



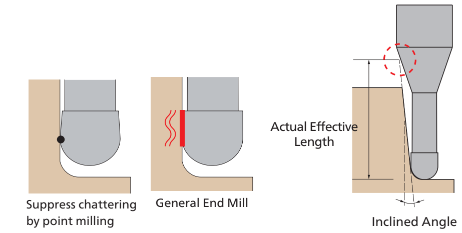
Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00527-00312		7	0.45	0.6	0.56	12°	4	45	7.38	7.70	8.04	8.43	9.31
08-00527-00314		8	0.45	0.6	0.56	12°	4	45	8.42	8.79	9.18	9.62	10.64
08-00527-00316	R0.3	9	0.45	0.6	0.56	12°	4	45	9.47	9.88	10.33	10.82	11.97
08-00527-00318		10	0.45	0.6	0.56	12°	4	45	10.51	10.97	11.47	12.02	13.30
08-00527-00320		12	0.45	0.6	0.56	12°	4	45	12.59	13.14	13.75	14.41	15.95
08-00527-00350		2	0.5	0.7	0.66	12°	4	45	2.17	2.25	2.34	2.44	2.67
08-00527-00351	R0.35	4	0.5	0.7	0.66	12°	4	45	4.25	4.43	4.62	4.84	5.33
08-00527-00352		6	0.5	0.7	0.66	12°	4	45	6.34	6.61	6.91	7.23	8.00
08-00527-00353		8	0.5	0.7	0.66	12°	4	45	8.43	8.79	9.19	9.63	10.66
08-00527-00401		2	0.6	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65
08-00528-00401		2	0.6	0.8	0.76	12°	6	50	2.16	2.24	2.33	2.42	2.65
08-00527-00402		3	0.6	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97
08-00527-00403		4	0.6	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30
08-00527-00404	R0.4	5	0.6	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63
08-00527-00405		6	0.6	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96
08-00527-00406		7	0.6	0.8	0.76	12°	4	45	7.38	7.69	8.03	8.41	9.28
08-00527-00407		8	0.6	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61
08-00527-00409		10	0.6	0.8	0.76	12°	4	45	10.50	10.96	11.45	12.00	13.26
08-00527-00410		12	0.6	0.8	0.76	12°	4	45	12.59	13.14	13.73	14.39	15.92
08-00527-00450		2	0.65	0.9	0.86	12°	4	45	2.16	2.24	2.33	2.42	2.64
08-00527-00451	R0.45	4	0.65	0.9	0.86	12°	4	45	4.25	4.42	4.61	4.82	5.30
08-00527-00452		6	0.65	0.9	0.86	12°	4	45	6.34	6.60	6.89	7.21	7.96
08-00527-00453		8	0.65	0.9	0.86	12°	4	45	8.42	8.78	9.17	9.61	10.62
08-00527-00500		2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
08-00527-00514		2.5	0.75	1	0.95	12°	4	45	2.71	2.81	2.92	3.04	3.32
08-00527-00501		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
08-00528-00501		3	0.75	1	0.95	12°	6	50	3.22	3.35	3.48	3.63	3.97
08-00527-00502		4	0.75	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30
08-00528-00502		4	0.75	1	0.95	12°	6	50	4.27	4.44	4.62	4.83	5.30
08-00527-00503		5	0.75	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63
08-00528-00503	R0.5	5	0.75	1	0.95	12°	6	50	5.31	5.53	5.76	6.02	6.63
08-00527-00504		6	0.75	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96
08-00528-00504		6	0.75	1	0.95	12°	6	50	6.35	6.62	6.90	7.22	7.96
08-00527-00505		7	0.75	1	0.95	12°	4	45	7.40	7.71	8.04	8.42	9.28
08-00528-00505		7	0.75	1	0.95	12°	6	50	7.40	7.71	8.04	8.42	9.28
08-00527-00506		8	0.75	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61
08-00528-00506		8	0.75	1	0.95	12°	6	50	8.44	8.79	9.18	9.61	10.61
08-00527-00507		9	0.75	1	0.95	12°	4	45	9.48	9.88	10.32	10.81	11.94

How to Order When you order, indicate MRBH230 (R)×(ℓ1)×(d). ※(γ) is reference value.

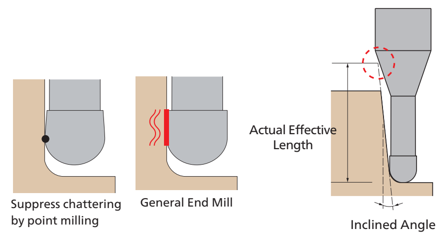
MRBH230

MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00527-00508		10	0.75	1	0.95	12°	4	45	10.52	10.97	11.46	12.01	13.26
08-00528-00508		10	0.75	1	0.95	12°	6	50	10.52	10.97	11.46	12.01	13.26
08-00527-00509		12	0.75	1	0.95	12°	4	45	12.61	13.15	13.75	14.40	15.92
08-00527-00515		13	0.75	1	0.95	12°	4	45	13.66	14.25	14.90	15.62	17.29
08-00527-00510	R0.5	14	0.75	1	0.95	12°	4	50	14.70	15.33	16.03	16.79	18.57
08-00527-00511		16	0.75	1	0.95	12°	4	50	16.78	17.51	18.31	19.18	21.23
08-00527-00512		18	0.75	1	0.95	12°	4	55	18.87	19.69	20.59	21.58	23.88
08-00527-00513		20	0.75	1	0.95	12°	4	55	20.95	21.87	22.87	23.97	26.54
08-00528-00516		22	0.75	1	0.95	12°	6	60	22.82	23.59	24.43	25.33	27.34
08-00527-00600		2.4	0.9	1.2	1.15	12°	4	45	2.59	2.68	2.78	2.89	3.15
08-00527-00601		4	0.9	1.2	1.15	12°	4	45	4.26	4.43	4.61	4.81	5.27
08-00527-00602		6	0.9	1.2	1.15	12°	4	45	6.35	6.61	6.89	7.20	7.92
08-00527-00603	R0.6	8	0.9	1.2	1.15	12°	4	45	8.43	8.79	9.17	9.59	10.58
08-00527-00604		10	0.9	1.2	1.15	12°	4	45	10.52	10.96	11.45	11.99	13.23
08-00527-00605		12	0.9	1.2	1.15	12°	4	45	12.61	13.14	13.73	14.38	15.89
08-00527-00606		14	0.9	1.2	1.15	12°	4	50	14.69	15.32	16.01	16.77	18.54
08-00527-00607		16	0.9	1.2	1.15	12°	4	50	16.78	17.50	18.29	19.17	21.20
08-00527-00700		8	1	1.4	1.35	12°	4	45	8.44	8.78	9.17	9.59	10.57
08-00527-00701	R0.7	12	1	1.4	1.35	12°	4	50	12.61	13.14	13.73	14.38	15.90
08-00527-00702		16	1	1.4	1.35	12°	4	50	16.78	17.50	18.30	19.17	21.22
08-00527-00750		3	1.1	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
08-00527-00751		4	1.1	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
08-00527-00753		6	1.1	1.5	1.45	12°	4	45	6.34	6.59	6.87	7.17	7.88
08-00528-00753		6	1.1	1.5	1.45	12°	6	50	6.34	6.59	6.87	7.17	7.88
08-00527-00755		8	1.1	1.5	1.45	12°	4	45	8.43	8.77	9.15	9.56	10.53
08-00528-00755		8	1.1	1.5	1.45	12°	6	50	8.43	8.77	9.15	9.56	10.53
08-00527-00757	R0.75	10	1.1	1.5	1.45	12°	4	45	10.51	10.95	11.43	11.96	13.18
08-00527-00758		12	1.1	1.5	1.45	12°	4	45	12.60	13.13	13.71	14.35	15.84
08-00527-00759		14	1.1	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
08-00527-00760		16	1.1	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15
08-00527-00761		18	1.1	1.5	1.45	12°	4	55	18.86	19.68	20.57	21.56	23.87
08-00527-00762		20	1.1	1.5	1.45	12°	4	55	20.94	21.85	22.84	23.92	Free
08-00527-00763		22	1.1	1.5	1.45	12°	4	60	23.03	24.02	25.12	26.32	Free
08-00527-00764		30	1.1	1.5	1.45	12°	4	70	31.37	32.74	34.24	35.89	Free
08-00527-00803		8	1.2	1.6	1.55	12°	4	45	8.43	8.77	9.14	9.55	10.51
08-00527-00805	R0.8	12	1.2	1.6	1.55	12°	4	45	12.60	13.13	13.70	14.34	15.82
08-00527-00807		16	1.2	1.6	1.55	12°	4	50	16.77	17.48	18.27	19.13	21.13
08-00527-00809		20	1.2	1.6	1.55	12°	4	55	20.94	21.84	22.83	23.91	Free



Unit : mm

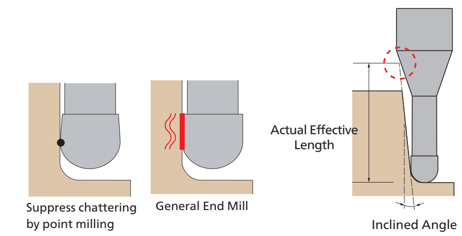
Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00527-01001	R1	3	1.5	2	1.94	12°	4	45	3.23	3.33	3.44	3.56	3.85
08-00527-01002		4	1.5	2	1.94	12°	4	45	4.27	4.42	4.58	4.76	5.17
08-00528-01002		4	1.5	2	1.94	12°	6	50	4.27	4.42	4.58	4.76	5.17
08-00527-01004		6	1.5	2	1.94	12°	4	45	6.36	6.60	6.86	7.15	7.83
08-00528-01004		6	1.5	2	1.94	12°	6	50	6.36	6.60	6.86	7.15	7.83
08-00527-01006		8	1.5	2	1.94	12°	4	45	8.44	8.78	9.14	9.54	10.48
08-00528-01006		8	1.5	2	1.94	12°	6	50	8.44	8.78	9.14	9.54	10.48
08-00527-01008		10	1.5	2	1.94	12°	4	45	10.53	10.95	11.42	11.94	13.14
08-00528-01008		10	1.5	2	1.94	12°	6	50	10.53	10.95	11.42	11.94	13.14
08-00527-01010		12	1.5	2	1.94	12°	4	45	12.61	13.13	13.70	14.33	15.79
08-00527-01020		13	1.5	2	1.94	12°	4	45	13.66	14.23	14.86	15.55	17.16
08-00527-01011		14	1.5	2	1.94	12°	4	50	14.70	15.31	15.98	16.72	18.45
08-00527-01012		16	1.5	2	1.94	12°	4	50	16.78	17.49	18.27	19.12	Free
08-00528-01012		16	1.5	2	1.94	12°	6	60	16.78	17.49	18.27	19.12	Free
08-00527-01013		18	1.5	2	1.94	12°	4	55	18.87	19.67	20.55	21.51	Free
08-00527-01014		20	1.5	2	1.94	12°	4	55	20.96	21.85	22.83	23.90	Free
08-00527-01015		22	1.5	2	1.94	12°	4	60	23.04	24.03	25.11	26.30	Free
08-00527-01016		25	1.5	2	1.94	12°	4	65	26.17	27.30	28.53	29.89	Free
08-00528-01016		25	1.5	2	1.94	12°	6	65	26.17	27.30	28.53	29.89	Free
08-00527-01017		30	1.5	2	1.94	12°	4	70	31.38	32.74	34.23	Free	Free
08-00527-01018		35	1.5	2	1.94	12°	4	80	36.60	38.19	39.93	Free	Free
08-00527-01019		40	1.5	2	1.94	12°	4	90	41.81	43.64	Free	Free	Free
08-00527-01250	R1.25	6	2.3	2.5	2.4	12°	4	45	6.45	6.68	6.94	7.22	7.89
08-00527-01251		8	2.3	2.5	2.4	12°	4	45	8.54	8.86	9.22	9.62	10.55
08-00527-01252		10	2.3	2.5	2.4	12°	4	45	10.62	11.04	11.49	12.00	13.18
08-00527-01253		15	2.3	2.5	2.4	12°	4	50	15.83	16.48	17.20	17.98	Free
08-00527-01254		20	2.3	2.5	2.4	12°	4	55	21.04	21.93	22.90	Free	Free
08-00527-01255		25	2.3	2.5	2.4	12°	4	65	26.26	27.38	28.60	Free	Free
08-00527-01256		30	2.3	2.5	2.4	12°	4	70	31.47	32.82	Free	Free	Free
08-00527-01257		35	2.3	2.5	2.4	12°	4	70	36.69	38.27	Free	Free	Free
08-00527-01501	R1.5	6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
08-00527-01502		8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
08-00527-01503		10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
08-00527-01504		12	2.5	3	2.85	12°	6	60	12.81	13.32	13.88	14.49	15.91
08-00527-01505		14	2.5	3	2.85	12°	6	60	14.90	15.50	16.16	16.88	18.57
08-00527-01506		16	2.5	3	2.85	12°	6	60	16.98	17.68	18.44	19.27	21.22
08-00527-01508		20	2.5	3	2.85	12°	6	65	21.16	22.04	23.00	24.06	26.53
08-00527-01509		25	2.5	3	2.85	12°	6	65	26.37	27.48	28.70	30.04	Free
08-00527-01510		30	2.5	3	2.85	12°	6	70	31.58	32.93	34.40	36.03	Free
08-00527-01511		35	2.5	3	2.85	12°	6	80	36.80	38.38	40.11	42.01	Free
08-00527-01512		40	2.5	3	2.85	12°	6	90	42.01	43.83	45.81	Free	Free

How to Order　When you order, indicate MRBH230 (R)×(ℓ1)×(d).　※(γ) is reference value.

Regular Line
MUGEN PREMIUM
Long Neck Type

MRBH230

MUGEN COATING PREMIUM 2-Flute Long Neck Ball End Mill for Hardened Steel



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00527-01750	R1.75	15	2.8	3.5	3.35	12°	6	60	15.94	16.58	17.28	18.05	19.86
08-00527-01754		20	2.8	3.5	3.35	12°	6	65	21.14	22.01	22.96	24.01	Free
08-00527-01751		25	2.8	3.5	3.35	12°	6	65	26.37	27.47	28.69	30.03	Free
08-00527-01755		30	2.8	3.5	3.35	12°	6	70	31.57	32.91	34.37	35.98	Free
08-00527-01752		35	2.8	3.5	3.35	12°	6	80	36.79	38.37	40.10	Free	Free
08-00527-01756		40	2.8	3.5	3.35	12°	6	90	42.00	43.80	45.77	Free	Free
08-00527-01753		45	2.8	3.5	3.35	12°	6	90	47.22	49.27	Free	Free	Free
08-00527-02000	R2	8	3	4	3.8	–	4	65	8.74	9.05	9.38	9.74	10.60
08-00527-02001		8	3	4	3.8	12°	6	65	8.74	9.05	9.38	9.74	10.60
08-00527-02002		10	3	4	3.8	12°	6	65	10.83	11.22	11.66	12.14	13.25
08-00527-02003		12	3	4	3.8	12°	6	65	12.91	13.40	13.94	14.53	15.91
08-00527-02101		14	3	4	3.8	12°	6	65	15.00	15.58	16.22	16.92	18.56
08-00527-02004		15	3	4	3.8	12°	6	65	16.04	16.67	17.36	18.12	19.89
08-00527-02006		20	3	4	3.8	12°	6	65	21.26	22.12	23.06	24.10	Free
08-00527-02008		25	3	4	3.8	12°	6	70	26.47	27.57	28.77	30.09	Free
08-00527-02010		30	3	4	3.8	12°	6	70	31.68	33.01	34.47	Free	Free
08-00527-02011		35	3	4	3.8	12°	6	80	36.90	38.46	40.17	Free	Free
08-00527-02012		40	3	4	3.8	12°	6	85	42.11	43.91	Free	Free	Free
08-00527-02013		45	3	4	3.8	12°	6	90	47.33	49.36	Free	Free	Free
08-00527-02014		50	3	4	3.8	12°	6	100	52.54	54.80	Free	Free	Free
08-00527-02500	R2.5	10	3.5	5	4.8	12°	6	70	10.81	11.18	11.59	12.04	Free
08-00527-02501		15	3.5	5	4.8	12°	6	70	16.02	16.63	17.29	Free	Free
08-00527-02502		20	3.5	5	4.8	12°	6	70	21.24	22.08	Free	Free	Free
08-00527-02503		25	3.5	5	4.8	12°	6	70	26.45	27.52	Free	Free	Free
08-00527-02504		30	3.5	5	4.8	12°	6	80	31.66	Free	Free	Free	Free
08-00527-02506		40	3.5	5	4.8	12°	6	90	42.09	Free	Free	Free	Free
08-00527-03000	R3	10	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
08-00527-03001		15	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
08-00527-03002		20	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
08-00527-03003		25	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
08-00527-03004		30	6	6	5.7	–	6	80	Free	Free	Free	Free	Free
08-00527-03007		35	6	6	5.7	–	6	85	Free	Free	Free	Free	Free
08-00527-03005		40	6	6	5.7	–	6	90	Free	Free	Free	Free	Free
08-00527-03006		50	6	6	5.7	–	6	120	Free	Free	Free	Free	Free
08-00527-03008		60	6	6	5.7	–	6	120	Free	Free	Free	Free	Free

MRBH230

Recommended Milling Conditions

Regular Line
MUGEN PREMIUM
Long Neck Type

Prehardened Steel P
Hardened Steel ~55HRC H
Hardened Steel ~65HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Ball Coating

Work Material			Hardened Steels SKD61・STAVAX・HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.05	0.2	2.0	0.003	0.005	120	40,000	0.002	0.005	100	40,000	0.002	0.003	70	40,000
	0.3	3.0	0.003	0.005	100	40,000	0.002	0.005	70	40,000	0.002	0.003	50	40,000
	0.5	5.0	0.002	0.003	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
0.075	0.3	2.0	0.003	0.005	180	40,000	0.002	0.005	150	40,000	0.002	0.003	100	40,000
	0.5	3.3	0.003	0.005	150	40,000	0.002	0.005	120	40,000	0.002	0.003	70	40,000
	1	6.7	0.002	0.003	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
0.1	0.3	1.5	0.01	0.01	350	40,000	0.006	0.005	300	40,000	0.003	0.003	200	40,000
	0.5	2.5	0.008	0.01	320	40,000	0.005	0.005	280	40,000	0.003	0.003	180	40,000
	0.75	3.8	0.005	0.01	280	40,000	0.003	0.005	200	40,000	0.002	0.003	150	40,000
	1	5.0	0.003	0.005	250	40,000	0.002	0.003	160	40,000	0.001	0.002	120	40,000
	1.25	6.3	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
	1.5	7.5	0.003	0.005	150	40,000	0.002	0.003	120	40,000	0.001	0.002	80	40,000
	1.75	8.8	0.002	0.003	120	40,000	0.001	0.002	100	40,000	0.001	0.002	60	40,000
	2	10.0	0.002	0.003	100	40,000	0.001	0.002	80	40,000	0.001	0.001	50	40,000
	2.5	12.5	0.001	0.002	70	40,000	0.001	0.001	60	40,000	0.001	0.001	40	40,000
	3	15.0	0.001	0.001	50	40,000	0.001	0.001	40	40,000	0.001	0.001	30	40,000
0.15	0.5	1.7	0.01	0.015	350	40,000	0.007	0.01	300	40,000	0.003	0.005	280	40,000
	0.6	2.0	0.007	0.01	350	40,000	0.005	0.007	300	40,000	0.003	0.005	250	40,000
	0.75	2.5	0.007	0.01	330	40,000	0.005	0.007	280	40,000	0.003	0.005	230	40,000
	1	3.3	0.007	0.01	320	40,000	0.005	0.007	250	40,000	0.003	0.005	200	40,000
	1.25	4.2	0.005	0.007	280	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000
	1.5	5.0	0.005	0.007	230	40,000	0.003	0.005	180	40,000	0.002	0.003	120	40,000
	1.75	5.8	0.003	0.005	180	40,000	0.002	0.003	150	40,000	0.002	0.002	100	40,000
	2	6.7	0.003	0.005	150	40,000	0.002	0.003	120	40,000	0.002	0.002	90	40,000
	2.25	7.5	0.002	0.003	120	40,000	0.001	0.002	100	40,000	0.001	0.001	80	40,000
	2.5	8.3	0.002	0.003	100	40,000	0.001	0.002	80	40,000	0.001	0.001	70	40,000
	3	10.0	0.001	0.003	80	40,000	0.001	0.002	70	40,000	0.001	0.001	60	40,000
	3.5	11.7	0.001	0.002	70	40,000	0.001	0.001	60	40,000	0.001	0.001	50	40,000
	4	13.3	0.001	0.002	60	40,000	0.001	0.001	50	40,000	0.001	0.001	40	40,000
0.2	0.5	1.3	0.03	0.05	800	40,000	0.03	0.03	720	40,000	0.009	0.02	580	40,000
	0.8	2.0	0.02	0.05	800	40,000	0.02	0.03	720	40,000	0.008	0.02	580	40,000
	1	2.5	0.02	0.05	800	40,000	0.02	0.03	720	40,000	0.008	0.02	580	40,000
	1.5	3.8	0.01	0.03	620	40,000	0.01	0.02	500	40,000	0.005	0.01	400	40,000
	2	5.0	0.01	0.02	500	40,000	0.01	0.01	380	40,000	0.005	0.007	300	40,000
	2.5	6.3	0.007	0.01	420	40,000	0.005	0.007	300	40,000	0.003	0.005	260	40,000
	3	7.5	0.007	0.01	300	40,000	0.005	0.007	240	40,000	0.003	0.005	200	40,000
	3.5	8.8	0.005	0.007	230	40,000	0.003	0.005	160	40,000	0.002	0.003	120	40,000
	4	10.0	0.005	0.005	160	30,000	0.003	0.003	120	30,000	0.002	0.003	90	30,000
	4.5	11.3	0.003	0.005	100	30,000	0.002	0.003	80	30,000	0.001	0.002	60	30,000
	5	12.5	0.002	0.003	70	30,000	0.001	0.002	50	30,000	0.001	0.002	40	30,000
	6	15.0	0.001	0.002	50	30,000	0.001	0.001	40	30,000	0.001	0.001	30	30,000
0.25	1	2.0	0.03	0.05	1,000	40,000	0.02	0.03	860	40,000	0.01	0.02	650	40,000
	1.5	3.0	0.02	0.05	850	40,000	0.01	0.03	720	40,000	0.007	0.02	520	40,000
	2	4.0	0.02	0.03	720	40,000	0.01	0.02	650	40,000	0.007	0.01	400	40,000
	2.5	5.0	0.01	0.02	600	40,000	0.007	0.01	530	40,000	0.005	0.007	360	40,000
	3	6.0	0.01	0.02	500	40,000	0.007	0.01	420	40,000	0.005	0.007	320	40,000
	3.5	7.0	0.007	0.01	420	40,000	0.005	0.007	360	40,000	0.003	0.005	280	40,000
	4	8.0	0.007	0.01	350	40,000	0.005	0.007	300	40,000	0.003	0.005	260	40,000
	4.5	9.0	0.005	0.005	300	40,000	0.003	0.003	260	40,000	0.002	0.003	220	40,000
	5	10.0	0.005	0.005	240	33,000	0.003	0.003	200	33,000	0.002	0.003	180	33,000
	5.5	11.0	0.003	0.005	200	30,000	0.002	0.003	160	30,000	0.001	0.002	120	30,000
	6	12.0	0.002	0.003	120	30,000	0.001	0.002	80	30,000	0.001	0.002	70	30,000
	8	16.0	0.002	0.002	75	30,000	0.001	0.002	60	30,000	0.001	0.002	50	30,000
	10	20.0	0.001	0.002	40	20,000	0.001	0.002	30	20,000	0.001	0.001	20	20,000

Work Material			Hardened Steels SKD61・STAVAX・HPM38 (~52HRC)				Hardened Steels SKD11 (~62HRC)				High Speed Steels SKH (~65HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.3	1	1.7	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	1.5	2.5	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	2	3.3	0.05	0.1	1,400	40,000	0.03	0.06	1,000	40,000	0.02	0.05	720	30,000
	2.5	4.2	0.03	0.05	1,200	40,000	0.02	0.04	840	40,000	0.02	0.03	640	30,000
	3	5.0	0.03	0.05	1,200	40,000	0.02	0.04	840	40,000	0.02	0.03	640	30,000
	3.5	5.8	0.02	0.03	1,000	40,000	0.01	0.03	620	40,000	0.01	0.02	480	30,000
	4	6.7	0.02	0.03	1,000	40,000	0.01	0.03	620	40,000	0.01	0.02	480	30,000
	4.5	7.5	0.02	0.03	900	35,000	0.01	0.02	580	35,000	0.008	0.015	430	30,000
	5	8.3	0.01	0.02	720	30,000	0.007	0.015	500	30,000	0.007	0.01	400	30,000
	5.5	9.2	0.01	0.015	700	30,000	0.007	0.01	450	30,000	0.005	0.008	360	30,000
	6	10.0	0.007	0.01	500	30,000	0.005	0.007	380	30,000	0.004	0.006	320	30,000
	7	11.7	0.005	0.007	400	25,000	0.003	0.005	300	25,000	0.003	0.003	260	20,000
	8	13.3	0.003	0.005	320	25,000	0.003	0.003	260	25,000	0.002	0.003	220	20,000
	9	15.0	0.003	0.003	280	25,000	0.003	0.002	220	25,000	0.001	0.002	160	20,000
	10	16.7	0.002	0.003	150	20,000	0.002	0.002	120	20,000	0.001	0.002	100	18,000
	12	20.0	0.002	0.002	80	20,000	0.002	0.002	60	20,000	0.001	0.002	50	18,000
0.35	2	2.9	0.07	0.1	1,600	40,000	0.05	0.08	1,300	40,000	0.03	0.07	1,000	30,000
	4	5.7	0.04	0.06	1,300	40,000	0.03	0.04	820	40,000	0.015	0.02	600	30,000
	6	8.6	0.01	0.03	800	30,000	0.01	0.015	500	30,000	0.006	0.01	420	25,000
	8	11.4	0.006	0.01	520	25,000	0.005	0.006	380	20,000	0.004	0.006	250	20,000
0.4	2	2.5	0.1	0.15	2,000	40,000	0.07	0.1	1,600	40,000	0.05	0.1	1,200	30,000
	3	3.8	0.1	0.15	2,000	40,000	0.07	0.1	1,600	40,000	0.05	0.05	1,200	30,000
	4	5.0	0.05	0.1	1,600	40,000	0.05	0.05	1,200	40,000	0.03	0.05	860	30,000
	5	6.3	0.05	0.05	1,600	40,000	0.03	0.05	1,000	40,000	0.02	0.03	620	30,000
	6	7.5	0.03	0.05	1,200	30,000	0.02	0.03	760	30,000	0.01	0.02	560	25,000
	7	8.8	0.02	0.03	1,000	30,000	0.01	0.02	680	30,000	0.007	0.01	520	25,000
	8	10.0	0.01	0.02	820	30,000	0.007	0.01	600	30,000	0.005	0.01	480	25,000
	10	12.5	0.005	0.005	450	25,000	0.003	0.003	380	25,000	0.002	0.003	320	20,000
	12	15.0	0.003	0.005	320	20,000	0.002	0.003	260	20,000	0.002	0.002	200	20,000
0.45	2	2.2	0.1	0.2	2,200	40,000	0.08	0.15	1,800	30,000	0.06	0.1	1,300	30,000
	4	4.4	0.05	0.12	1,800	40,000	0.04	0.08	1,400	30,000	0.03	0.05	900	25,000
	6	6.7	0.035	0.05	1,200	30,000	0.025	0.035	800	25,000	0.015	0.025	600	20,000
	8	8.9	0.025	0.04	1,000	30,000	0.015	0.025	700	23,000	0.008	0.015	500	20,000
0.5	2	2.0	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
	2.5	2.5	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
	3	3.0	0.1	0.3	2,500	40,000	0.1	0.2	2,000	30,000	0.08	0.1	1,400	25,000
	4	4.0	0.1	0.2	2,500	40,000	0.05	0.15	1,800	30,000	0.05	0.1	1,200	25,000
	5	5.0	0.05	0.15	2,000	30,000	0.04	0.1	1,600	25,000	0.03	0.05	920	20,000
	6	6.0	0.05	0.1	1,800	30,000	0.04	0.05	1,200	25,000	0.02	0.05	740	20,000
	7	7.0	0.04	0.06	1,200	30,000	0.03	0.04	950	25,000	0.02	0.03	680	20,000
	8	8.0	0.04	0.06	1,000	30,000	0.03	0.04	860	25,000	0.02	0.03	560	20,000
	9	9.0	0.03	0.05	820	25,000	0.02	0.03	750	20,000	0.01	0.02	500	18,000
	10	10.0	0.03	0.05	750	25,000	0.02	0.03	620	20,000	0.01	0.02	450	18,000
	12	12.0	0.01	0.03	600	20,000	0.007	0.02	520	18,000	0.005	0.01	400	16,000
	13	13.0	0.008	0.02	500	20,000	0.005	0.01	420	18,000	0.003	0.006	350	16,000
	14	14.0	0.005	0.01	420	20,000	0.003	0.007	360	18,000	0.002	0.005	320	16,000
	16	16.0	0.005	0.005	300	18,000	0.003	0.005	250	16,000	0.002	0.003	200	14,000
	18	18.0	0.003	0.005	180	18,000	0.002	0.005	120	16,000	0.002	0.002	85	14,000
	20	20.0	0.003	0.003	100	16,000	0.002	0.003	75	14,000	0.002	0.002	60	12,000
	22	22.0	0.002	0.003	50	14,000	0.002	0.002	40	12,000	0.001	0.002	35	10,000

MRBH230

Recommended Milling Conditions

Regular Line
MUGEN PREMIUM
Long Neck Type

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Ball Coating

Work Material			Hardened Steels SKD61・STAVAX・HPM38(～52HRC)				Hardened Steels SKD11(～62HRC)				High Speed Steels SKH(～65HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.6	2.4	2.0	0.1	0.3	2,500	30,000	0.1	0.2	2,000	30,000	0.05	0.1	1,600	25,000
	4	3.3	0.1	0.2	2,500	30,000	0.07	0.2	2,000	30,000	0.05	0.1	1,600	25,000
	6	5.0	0.07	0.1	2,000	30,000	0.05	0.1	1,600	25,000	0.03	0.07	1,200	20,000
	8	6.7	0.05	0.1	1,600	30,000	0.03	0.07	1,200	25,000	0.02	0.05	920	20,000
	10	8.3	0.03	0.07	1,200	20,000	0.02	0.05	860	20,000	0.01	0.03	680	18,000
	12	10.0	0.02	0.05	860	20,000	0.01	0.03	620	20,000	0.007	0.02	480	18,000
	14	11.7	0.02	0.03	600	18,000	0.01	0.02	400	18,000	0.005	0.01	300	16,000
	16	13.3	0.01	0.02	350	16,000	0.005	0.01	250	16,000	0.003	0.007	130	14,000
0.7	8	5.7	0.12	0.2	2,500	30,000	0.08	0.15	1,800	20,000	0.03	0.08	1,000	20,000
	12	8.6	0.07	0.12	1,400	20,000	0.04	0.08	1,100	18,000	0.015	0.05	700	18,000
	16	11.4	0.02	0.05	700	17,000	0.01	0.03	600	17,000	0.008	0.02	450	16,000
0.75	3	2.0	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
	4	2.7	0.15	0.3	3,000	30,000	0.1	0.3	2,500	30,000	0.1	0.2	2,000	25,000
	6	4.0	0.15	0.2	3,000	30,000	0.1	0.2	2,000	30,000	0.1	0.1	1,600	25,000
	8	5.3	0.1	0.2	2,500	25,000	0.05	0.2	1,600	25,000	0.05	0.1	1,200	20,000
	10	6.7	0.1	0.1	2,500	25,000	0.05	0.1	1,200	25,000	0.05	0.05	860	20,000
	12	8.0	0.05	0.1	1,800	20,000	0.03	0.1	920	20,000	0.02	0.05	780	18,000
	14	9.3	0.05	0.07	1,200	20,000	0.03	0.05	820	20,000	0.02	0.03	650	18,000
	16	10.7	0.03	0.05	720	18,000	0.02	0.03	650	18,000	0.01	0.02	580	16,000
	18	12.0	0.02	0.04	550	16,000	0.012	0.025	400	16,000	0.008	0.015	400	14,000
	20	13.3	0.01	0.03	450	16,000	0.01	0.02	360	16,000	0.007	0.01	300	14,000
	22	14.7	0.01	0.02	330	14,000	0.01	0.01	250	14,000	0.007	0.007	200	12,000
	30	20.0	0.005	0.005	80	10,000	0.003	0.005	60	10,000	0.003	0.003	40	8,000
0.8	8	5.0	0.1	0.2	2,500	25,000	0.07	0.15	2,000	20,000	0.05	0.1	1,600	18,000
	12	7.5	0.07	0.1	1,800	20,000	0.05	0.07	1,500	16,000	0.03	0.05	1,200	14,000
	16	10.0	0.03	0.05	720	16,000	0.02	0.03	600	14,000	0.015	0.02	480	12,000
	20	12.5	0.01	0.03	500	14,000	0.01	0.02	380	12,000	0.01	0.01	300	10,000
1	3	1.5	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
	4	2.0	0.2	0.5	3,000	25,000	0.2	0.5	2,500	25,000	0.15	0.3	2,000	20,000
	6	3.0	0.2	0.5	2,500	25,000	0.2	0.3	2,000	25,000	0.15	0.3	1,600	20,000
	8	4.0	0.2	0.3	2,000	20,000	0.1	0.2	1,600	18,000	0.1	0.2	1,200	16,000
	10	5.0	0.1	0.3	2,000	18,000	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000
	12	6.0	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000	0.05	0.1	940	12,000
	13	6.5	0.08	0.2	1,600	16,000	0.06	0.1	1,200	14,000	0.04	0.08	940	12,000
	14	7.0	0.07	0.15	1,600	16,000	0.05	0.08	1,200	14,000	0.03	0.07	940	12,000
	16	8.0	0.07	0.15	1,600	16,000	0.05	0.08	1,200	14,000	0.03	0.07	940	12,000
	18	9.0	0.05	0.1	1,400	14,000	0.03	0.05	1,000	12,000	0.02	0.03	850	10,000
	20	10.0	0.05	0.1	1,000	14,000	0.03	0.05	820	12,000	0.02	0.03	720	10,000
	22	11.0	0.03	0.08	850	14,000	0.02	0.06	700	12,000	0.02	0.02	600	10,000
	25	12.5	0.03	0.05	680	12,000	0.02	0.03	560	10,000	0.01	0.02	420	8,500
	30	15.0	0.02	0.03	360	12,000	0.01	0.02	300	10,000	0.008	0.01	240	8,500
	35	17.5	0.01	0.02	150	10,000	0.007	0.01	120	8,000	0.005	0.007	100	6,800
	40	20.0	0.005	0.01	100	10,000	0.003	0.005	80	8,000	0.002	0.003	50	6,800
1.25	6	2.4	0.3	0.4	2,800	20,000	0.2	0.5	2,300	20,000	0.15	0.4	2,000	18,000
	8	3.2	0.25	0.3	2,600	20,000	0.15	0.3	2,100	20,000	0.12	0.25	1,800	18,000
	10	4.0	0.2	0.3	2,500	20,000	0.15	0.2	2,000	20,000	0.1	0.15	1,600	18,000
	15	6.0	0.1	0.2	2,000	18,000	0.07	0.15	1,600	16,000	0.05	0.1	1,200	14,000
	20	8.0	0.07	0.15	1,500	16,000	0.05	0.1	1,200	14,000	0.03	0.05	1,000	10,000
	25	10.0	0.05	0.1	1,000	14,000	0.03	0.07	850	12,000	0.02	0.03	720	8,000
	30	12.0	0.03	0.07	720	12,000	0.02	0.05	640	10,000	0.01	0.02	580	7,000
	35	14.0	0.02	0.03	450	10,000	0.01	0.02	400	8,500	0.007	0.01	320	6,200

Work Material			Hardened Steels SKD61・STAVAX・HPM38(～52HRC)				Hardened Steels SKD11(～62HRC)				High Speed Steels SKH(～65HRC)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
1.5	6	2.0	0.2	0.8	3,000	20,000	0.2	0.6	2,500	18,000	0.2	0.5	2,000	14,000
	8	2.7	0.2	0.8	3,000	20,000	0.2	0.6	2,500	18,000	0.2	0.5	2,000	14,000
	10	3.3	0.2	0.6	2,500	20,000	0.2	0.4	2,000	18,000	0.1	0.3	1,500	14,000
	12	4.0	0.2	0.6	2,500	20,000	0.2	0.4	2,000	18,000	0.1	0.3	1,500	14,000
	14	4.7	0.1	0.4	2,000	18,000	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000
	16	5.3	0.1	0.4	2,000	18,000	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000
	20	6.7	0.1	0.3	1,600	18,000	0.1	0.2	1,200	16,000	0.1	0.1	960	12,000
	25	8.3	0.1	0.2	1,200	16,000	0.07	0.15	920	14,000	0.05	0.07	800	10,000
	30	10.0	0.07	0.1	750	14,000	0.05	0.07	640	12,000	0.03	0.05	600	8,600
	35	11.7	0.05	0.1	620	12,000	0.03	0.07	500	10,000	0.02	0.05	420	7,200
	40	13.3	0.03	0.07	450	10,000	0.02	0.05	320	8,200	0.01	0.03	260	6,400
1.75	15	4.3	0.25	1	3,000	20,000	0.15	0.5	2,300	16,000	0.13	0.4	1,500	14,000
	20	5.7	0.18	0.6	2,500	18,000	0.1	0.3	1,800	15,000	0.1	0.2	1,200	12,000
	25	7.1	0.12	0.35	1,800	16,000	0.1	0.2	1,600	14,000	0.06	0.12	1,000	10,000
	30	8.6	0.1	0.25	1,500	14,000	0.07	0.15	950	11,000	0.05	0.08	800	9,000
	35	10.0	0.08	0.2	1,200	13,000	0.07	0.12	800	10,000	0.03	0.06	650	7,500
	40	11.4	0.07	0.1	800	11,000	0.04	0.07	720	9,000	0.02	0.05	450	7,000
	45	12.9	0.06	0.07	700	10,000	0.035	0.05	600	7,500	0.015	0.03	320	6,000
2	8	2.0	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	10	2.5	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	12	3.0	0.3	1.5	3,000	20,000	0.2	0.8	2,500	16,000	0.2	0.6	2,000	12,000
	14	3.5	0.3	1.5	3,000	20,000	0.2	0.8	2,000	16,000	0.2	0.6	1,600	12,000
	15	3.8	0.3	1.5	3,000	20,000	0.2	0.8	2,000	16,000	0.2	0.6	1,600	12,000
	20	5.0	0.2	1	2,400	16,000	0.1	0.6	1,800	14,000	0.1	0.4	1,400	10,000
	25	6.3	0.2	0.8	1,600	16,000	0.1	0.4	1,200	14,000	0.1	0.2	1,000	10,000
	30	7.5	0.1	0.3	1,600	14,000	0.07	0.2	1,200	10,000	0.05	0.15	1,000	8,200
	35	8.8	0.1	0.2	1,200	14,000	0.07	0.15	1,000	10,000	0.05	0.1	820	8,200
	40	10.0	0.07	0.15	1,200	12,000	0.05	0.1	1,000	8,600	0.03	0.07	820	6,800
	45	11.3	0.07	0.1	750	12,000	0.05	0.07	620	8,600	0.03	0.05	500	6,800
	50	12.5	0.05	0.08	550	10,000	0.03	0.05	500	7,500	0.02	0.03	420	5,500
2.5	10	2.0	0.3	1.5	3,000	18,000	0.2	1.2	2,500	12,000	0.2	0.7	2,000	9,200
	15	3.0	0.3	1.5	3,000	18,000	0.2	1.2	2,500	12,000	0.2	0.7	2,000	9,200
	20	4.0	0.3	1.2	3,000	15,000	0.2	1	2,000	10,000	0.15	0.5	1,600	8,000
	25	5.0	0.2	1	2,500	15,000	0.15	0.8	1,800	8,600	0.1	0.3	1,200	7,200
	30	6.0	0.2	0.8	2,000	12,000	0.15	0.5	1,500	7,600	0.1	0.2	860	6,400
	40	8.0	0.1	0.2	1,200	10,000	0.07	0.15	1,000	6,800	0.05	0.1	650	5,500
3	10	1.7	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	15	2.5	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	20	3.3	0.3	2	3,000	16,000	0.3	1.2	2,500	8,000	0.2	1	2,000	7,000
	25	4.2	0.3	1.5	3,000	16,000	0.2	1	2,000	8,000	0.15	0.7	1,500	7,000
	30	5.0	0.2	1.5	3,000	14,000	0.2	1	2,000	7,200	0.15	0.7	1,500	6,500
	35	5.8	0.2	1.2	2,400	13,000	0.17	0.8	1,600	6,800	0.12	0.5	1,200	5,800
	40	6.7	0.2	1	1,800	12,000	0.15	0.6	1,200	6,400	0.1	0.4	1,000	5,200
	50	8.3	0.1	0.6	1,200	8,200	0.1	0.3	860	4,800	0.05	0.2	620	4,000
	60	10.0	0.07	0.3	600	6,000	0.05	0.15	450	3,200	0.03	0.07	300	2,500

Notes	
	※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 We recommend using oil mist coolant. ※3 Adjust both spindle speed and feed at the same rate. ※4 Adjust milling conditions according to the volume of depth of cut and rigidity of machine. ※5 Length of tool overhang must be as short as possible.

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Ball Coating

MACH225SF

Size R0.1 ~ R3

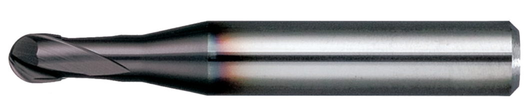
∞ Premium ≦65 HRC

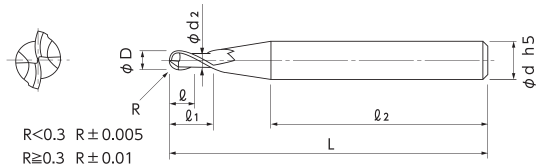
MUGEN COATING PREMIUM 2-Flute Ball End Mill with Short Shank for Hardened Steel

Total 12 sizes

MG 2 25° R ±0.005 (R<0.3) φd h5 3D

Sharp cutting edge reduces cutting load for tough materials.
Suitable for shrink fit holder





- It fits for Shrink Chuck System.
- It is designed for high speed cutting of hardened steels.

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00554-01011	R0.1	0.5	0.2	0.2	0.175	4	28.2	35	0.57	0.60	0.62	0.64	0.71
08-00554-02011	R0.2	1	0.4	0.4	0.365	4	27.9	35	1.12	1.16	1.20	1.25	1.37
08-00554-03011	R0.3	1.5	0.6	0.6	0.56	4	27.6	35	1.65	1.71	1.77	1.85	2.02
08-00554-04011	R0.4	2	0.8	0.8	0.76	4	27.3	35	2.16	2.24	2.33	2.42	2.65
08-00554-05011	R0.5	2.5	1	1	0.95	4	32.1	40	3.51	3.78	4.02	4.26	4.70
08-00554-06011	R0.6	3	1.2	1.2	1.15	4	31.8	40	4.04	4.34	4.60	4.85	5.32
08-00554-07511	R0.75	3.8	1.5	1.5	1.45	4	31.3	40	4.90	5.23	5.52	5.79	6.29
08-00554-10011	R1	5	2	2	1.94	4	30.5	40	6.22	6.59	6.91	7.21	7.74
08-00554-15011	R1.5	8	3	3	2.85	4	28.7	40	9.70	10.11	10.47	10.80	Free
08-00554-20012	R2	10	4	4	3.8	6	24.8	40	10.83	11.23	11.66	12.14	13.26
08-00554-25012	R2.5	12	5	5	4.8	6	30.1	45	12.89	13.36	13.87	14.43	Free
08-00554-30012	R3	15	6	6	5.7	6	29	45	Free	Free	Free	Free	Free

How to Order — When you order, indicate MACH225SF (R). ※( ) is reference value.

MACH225SF

Recommended Milling Conditions

Work Material	Carbon Steels・Prehardened Steels S50C・HPM・NAK (~43HRC)					Hardened Steels SKD61・STAVAX・HPM38 (~55HRC)					Hardened Steels SKD11 (~62HRC)				
Radius	Normal Speed		High Speed		Depth of Cut	Normal Speed		High Speed		Depth of Cut	Normal Speed		High Speed		Depth of Cut
	Spindle Speed	Feed	Spindle Speed	Feed	ap×ae	Spindle Speed	Feed	Spindle Speed	Feed	ap×ae	Spindle Speed	Feed	Spindle Speed	Feed	ap×ae
	min^{-1}	mm/min	min^{-1}	mm/min	mm	min^{-1}	mm/min	min^{-1}	mm/min	mm	min^{-1}	mm/min	min^{-1}	mm/min	mm
0.1	20,000	400	50,000	800	0.01×0.02	20,000	250	50,000	500	0.01×0.02	20,000	250	50,000	500	0.01×0.02
0.2	20,000	600	50,000	1,000	0.02×0.05	20,000	320	50,000	680	0.02×0.05	20,000	320	50,000	680	0.02×0.05
0.3	20,000	1,200	50,000	2,000	0.05×0.1	20,000	460	50,000	1,000	0.03×0.05	20,000	460	50,000	1,000	0.03×0.05
0.4	20,000	1,600	50,000	2,500	0.1×0.2	20,000	580	50,000	1,200	0.05×0.1	20,000	580	50,000	1,200	0.05×0.1
0.5	20,000	2,000	50,000	5,000	0.2×0.3	20,000	1,200	50,000	3,000	0.1×0.2	20,000	800	50,000	2,000	0.1×0.2
0.75	20,000	2,000	50,000	5,000	0.2×0.3	20,000	1,600	42,000	3,000	0.1×0.2	20,000	1,200	32,000	2,000	0.1×0.2
1	20,000	3,200	50,000	8,000	0.3×0.5	20,000	2,500	32,000	3,500	0.2×0.5	20,000	2,000	24,000	2,400	0.2×0.5
1.5	16,000	2,800	32,000	6,000	0.3×0.5	16,000	2,500	21,000	3,500	0.2×0.5	13,000	2,000	16,000	2,400	0.2×0.5
2	12,000	2,400	24,000	5,000	0.5×1	12,000	2,000	16,000	3,000	0.2×0.7	9,600	1,600	12,000	2,000	0.2×0.7
2.5	9,600	2,000	20,000	5,000	0.5×1	9,600	2,000	13,000	3,000	0.2×0.7	7,600	1,300	9,600	1,600	0.2×0.7
3	8,000	2,000	16,000	4,000	0.5×1.5	8,000	1,600	10,000	2,500	0.2×1	6,400	1,000	8,000	1,300	0.2×1

Notes

※1 Depth of Cut : ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※2 We recommend using oil mist coolant.
※3 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.
※4 Adjust both spindle speed and feed at the same rate.
※5 Length of tool overhang must be as short as possible.

MACH225

Size R0.1 ～ R3

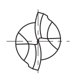
Premium ≦65 HRC

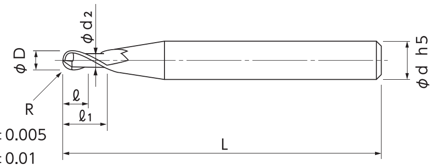
MUGEN COATING PREMIUM 2-Flute Ball End Mill for Hardened Steel

Total 26 sizes

Sharp cutting edge reduces cutting load for tough materials

MG 2 25° R ±0.005 (R<0.25) φd h5 3D





R<0.25 R±0.005
R≧0.25 R±0.01

- It is designed for high speed cutting of hardened steels.
- Perform efficiently under high feed condition and able to take large depth of cut.

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00555-01011	R0.1	0.5	0.2	0.2	0.175	4	50	0.57	0.60	0.62	0.64	0.71
08-00555-01012		0.5	0.2	0.2	0.175	6	50	0.57	0.60	0.62	0.64	0.71
08-00555-02011	R0.2	1	0.4	0.4	0.365	4	50	1.12	1.16	1.20	1.25	1.37
08-00555-02012		1	0.4	0.4	0.365	6	50	1.12	1.16	1.20	1.25	1.37
08-00555-02511	R0.25	1.25	0.5	0.5	0.46	4	50	1.39	1.44	1.49	1.56	1.70
08-00555-02512		1.25	0.5	0.5	0.46	6	50	1.39	1.44	1.49	1.56	1.70
08-00555-03011	R0.3	1.5	0.6	0.6	0.56	4	50	1.65	1.71	1.77	1.85	2.02
08-00555-03012		1.5	0.6	0.6	0.56	6	50	1.65	1.71	1.77	1.85	2.02
08-00555-04011	R0.4	2	0.8	0.8	0.76	4	50	2.16	2.24	2.33	2.42	2.65
08-00555-04012		2	0.8	0.8	0.76	6	50	2.16	2.24	2.33	2.42	2.65
08-00555-05011	R0.5	2.5	1	1	0.95	4	50	3.51	3.78	4.02	4.26	4.70
08-00555-05012		2.5	1	1	0.95	6	50	3.51	3.78	4.02	4.26	4.70
▌08-00555-05021		4	1	1	0.95	6	50	5.14	5.49	5.80	6.08	6.60
▌08-00555-05022		6	1	1	0.95	6	50	7.29	7.73	8.10	8.44	9.04
08-00555-07511	R0.75	3.8	1.5	1.5	1.45	4	50	4.90	5.23	5.52	5.79	6.29
08-00555-07512		3.8	1.5	1.5	1.45	6	50	4.90	5.23	5.52	5.79	6.29
08-00555-10011	R1	5	2	2	1.94	4	50	6.22	6.59	6.91	7.21	7.74
08-00555-10012		5	2	2	1.94	6	50	6.22	6.59	6.91	7.21	7.74
▌08-00555-10022		6	2	2	1.94	6	50	7.30	7.71	8.06	8.38	8.96
▌08-00555-10032		8	2	2	1.94	6	50	9.43	9.91	10.32	10.69	11.33
08-00555-15012	R1.5	8	3	3	2.85	6	60	8.88	9.33	9.85	10.45	11.94
▌08-00555-15022		10	3	3	2.85	6	60	10.99	11.58	12.25	13.01	14.93
▌08-00555-15032		15	3	3	2.85	6	60	16.28	17.20	18.24	19.43	22.40
08-00555-20012	R2	10	4	4	3.8	6	60	11.13	11.70	12.34	13.08	14.92
08-00555-25012	R2.5	12	5	5	4.8	6	60	13.22	13.88	14.64	15.50	Free
08-00555-30012	R3	15	6	6	5.7	6	60	Free	Free	Free	Free	Free

How to Order　When you order, indicate MACH225 (R)×(ℓ1)×(d).　※( ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

MACH225

Recommended Milling Conditions

Work Material	Carbon Steels・Prehardened Steels S50C・HPM・NAK (～43HRC)					Hardened Steels SKD61・STAVAX・HPM38 (～55HRC)					Hardened Steels SKD11 (～62HRC)				
Radius	Normal Speed		High Speed		Depth of Cut	Normal Speed		High Speed		Depth of Cut	Normal Speed		High Speed		Depth of Cut
	Spindle Speed	Feed	Spindle Speed	Feed	ap×ae	Spindle Speed	Feed	Spindle Speed	Feed	ap×ae	Spindle Speed	Feed	Spindle Speed	Feed	ap×ae
	min^{-1}	mm/min	min^{-1}	mm/min	mm	min^{-1}	mm/min	min^{-1}	mm/min	mm	min^{-1}	mm/min	min^{-1}	mm/min	mm
0.1	20,000	400	50,000	800	0.01×0.02	20,000	250	50,000	500	0.01×0.02	20,000	250	50,000	500	0.01×0.02
0.2	20,000	600	50,000	1,000	0.02×0.05	20,000	320	50,000	680	0.02×0.05	20,000	320	50,000	680	0.02×0.05
0.25	20,000	800	50,000	1,200	0.03×0.05	20,000	400	50,000	800	0.02×0.05	20,000	400	50,000	800	0.02×0.05
0.3	20,000	1,200	50,000	2,000	0.05×0.1	20,000	460	50,000	1,000	0.03×0.05	20,000	460	50,000	1,000	0.03×0.05
0.4	20,000	1,600	50,000	2,500	0.1×0.2	20,000	580	50,000	1,200	0.05×0.1	20,000	580	50,000	1,200	0.05×0.1
0.5	20,000	2,000	50,000	5,000	0.2×0.3	20,000	1,200	50,000	3,000	0.1×0.2	20,000	800	50,000	2,000	0.1×0.2
0.75	20,000	2,000	50,000	5,000	0.2×0.3	20,000	1,600	42,000	3,000	0.1×0.2	20,000	1,200	32,000	2,000	0.1×0.2
1	20,000	3,200	50,000	8,000	0.3×0.5	20,000	2,500	32,000	3,500	0.2×0.5	20,000	2,000	24,000	2,400	0.2×0.5
1.5	16,000	2,800	32,000	6,000	0.3×0.5	16,000	2,500	21,000	3,500	0.2×0.5	13,000	2,000	16,000	2,400	0.2×0.5
2	12,000	2,400	24,000	5,000	0.5×1	12,000	2,000	16,000	3,000	0.2×0.7	9,600	1,600	12,000	2,000	0.2×0.7
2.5	9,600	2,000	20,000	5,000	0.5×1	9,600	2,000	13,000	3,000	0.2×0.7	7,600	1,300	9,600	1,600	0.2×0.7
3	8,000	2,000	16,000	4,000	0.5×1.5	8,000	1,600	10,000	2,500	0.2×1	6,400	1,000	8,000	1,300	0.2×1

Notes

※1 Depth of Cut : ap = Axial Depth of Cut / ae = Radial Depth of Cut.
※2 We recommend using oil mist coolant.
※3 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.
※4 Adjust both spindle speed and feed at the same rate.
※5 Length of tool overhang must be as short as possible.

Prehardened Steel P · ～55 HRC Hardened Steel H · ～65 HRC Hardened Steel H · Stainless Steel M · Titanium Alloy Heat Resistant Alloy S · Long Neck Ball Coating

MRBTNH230

Size R0.05 × neck taper angle3°～ R2 × neck taper angle1°

Premium ≦65HRC

MRBTNH230

Regular Line
MUGEN PREMIUM
Long Neck Type

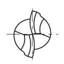
MUGEN COATING PREMIUM 2-Flute Long Taper Neck Ball End Mill

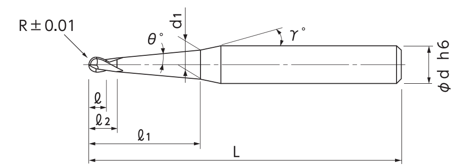
Total 209 sizes

MUGEN COATING PREMIUM 2-Flute Long Taper Neck Ball End Mill

MG 2 30° 3D

Taper neck to improve tool rigidity.
Opition of same taper angle as inclined working angle





- Taper neck type ball end mill improves accuracy for deep milling.
- Optimized taper neck design and MUGEN COATING PREMIUM realized to show its higher ability for hardened steels.
- Lineup of total 209 size with high versatility 2-flute end mills.

※Please select the tool with the same neck angle as the inclined angle of the milling surface.

〔Neck Shape〕
(γ) is reference value. Tool measurement required in order to avoid interference to the work material.

Preharndened Steel P
Hardened Steel ~55HRC H
Hardened Steel ~65HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Tapered Ball Coating

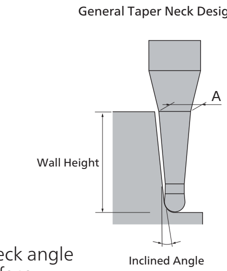
Unit : mm

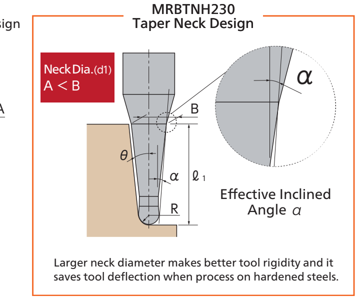
Code No.	Radius (R)	Neck ※ Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00588-00571	R0.05	3°	0.5	0.14	0.07	0.2	12°	2°59′	4	50
08-00588-00573			0.75	0.17	0.07	0.2	12°	2°59′	4	50
08-00588-00771	R0.075	3°	1	0.24	0.1	0.3	12°	2°59′	4	50
08-00588-00773			1.5	0.29	0.1	0.3	12°	2°59′	4	50
08-00588-01021	R0.1	30′	1.5	0.21	0.15	0.3	12°	0°29′	4	50
08-00588-01023			2	0.22	0.15	0.3	12°	0°28′	4	50
08-00588-01031		1°	1.5	0.24	0.15	0.3	12°	0°58′	4	50
08-00588-01033			2	0.25	0.15	0.3	12°	0°58′	4	50
08-00588-01041		1°30′	1.5	0.26	0.15	0.3	12°	1°29′	4	50
08-00588-01043			2	0.29	0.15	0.3	12°	1°28′	4	50
08-00588-01051		2°	1.5	0.29	0.15	0.3	12°	1°59′	4	50
08-00588-01053			2	0.32	0.15	0.3	12°	1°59′	4	50
08-00588-01073		3°	3	0.49	0.15	0.3	12°	2°59′	4	50
08-00588-01075			5	0.7	0.15	0.3	12°	2°59′	4	50
08-00588-01093		5°	3	0.7	0.15	0.3	12°	4°59′	4	50
08-00588-01095			5	1.05	0.15	0.3	12°	4°59′	4	50
08-00588-01521	R0.15	30′	2	0.32	0.2	0.45	12°	0°28′	4	50
08-00588-01523			3	0.34	0.2	0.45	12°	0°29′	4	50
08-00588-01531		1°	2	0.35	0.2	0.45	12°	0°59′	4	50
08-00588-01533			3	0.39	0.2	0.45	12°	0°59′	4	50
08-00588-01541		1°30′	2	0.38	0.2	0.45	12°	1°29′	4	50
08-00588-01543			3	0.44	0.2	0.45	12°	1°29′	4	50
08-00588-01551		2°	2	0.42	0.2	0.45	12°	1°58′	4	50
08-00588-01553			3	0.49	0.2	0.45	12°	1°59′	4	50
08-00588-01572		3°	2	0.48	0.2	0.45	12°	2°59′	4	50
08-00588-01573			3	0.59	0.2	0.45	12°	2°59′	4	50
08-00588-01575			5	0.8	0.2	0.45	12°	2°59′	4	50
08-00588-01577			7	1.01	0.2	0.45	12°	2°59′	4	50
08-00588-01593		5°	3	0.79	0.2	0.45	12°	4°59′	4	50
08-00588-01595			5	1.14	0.2	0.45	12°	4°59′	4	50
08-00588-01597			7	1.49	0.2	0.45	12°	4°59′	4	50
08-00588-02021	R0.2	30′	3	0.43	0.3	0.6	12°	0°29′	4	50
08-00588-02023			4	0.45	0.3	0.6	12°	0°29′	4	50
08-00588-02025			6	0.48	0.3	0.6	12°	0°29′	4	50
08-00588-02031		1°	3	0.48	0.3	0.6	12°	0°59′	4	50
08-00588-02033			4	0.51	0.3	0.6	12°	0°59′	4	50
08-00588-02035			6	0.58	0.3	0.6	12°	0°59′	4	50
08-00588-02041		1°30′	3	0.53	0.3	0.6	12°	1°29′	4	50
08-00588-02043			4	0.58	0.3	0.6	12°	1°29′	4	50
08-00588-02045			6	0.68	0.3	0.6	12°	1°29′	4	50
08-00588-02051		2°	3	0.58	0.3	0.6	12°	1°59′	4	50
08-00588-02053			4	0.65	0.3	0.6	12°	1°59′	4	50
08-00588-02055			6	0.79	0.3	0.6	12°	1°59′	4	50

How to Order When you order, indicate MRBTNH230 (R)×(θ)×(ℓ1). ※(γ) is reference value.

Machining case S-022

▌Semi-standard products, please inquire for price and delivery.





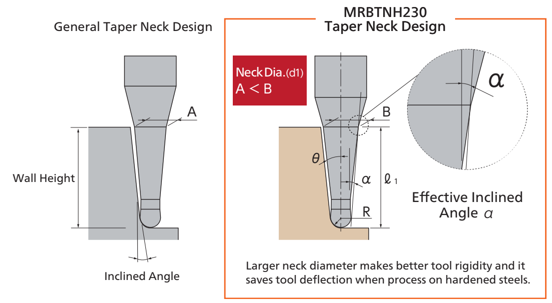
※Please select the tool with the same neck angle as the inclined angle of the milling surface.

Unit : mm

Code No.	Radius (R)	Neck ※ Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00588-02073	R0.2	3°	5	0.88	0.3	0.6	12°	2°59′	4	50
08-00588-02075			7	1.09	0.3	0.6	12°	2°59′	4	50
08-00588-02093		5°	5	1.22	0.3	0.6	12°	4°59′	4	50
08-00588-02095			7	1.57	0.3	0.6	12°	4°59′	4	50
08-00588-02521	R0.25	30′	4	0.54	0.35	0.75	12°	0°29′	4	50
08-00588-02523			5	0.56	0.35	0.75	12°	0°29′	4	50
08-00588-02531		1°	4	0.61	0.35	0.75	12°	0°59′	4	50
08-00588-02533			5	0.64	0.35	0.75	12°	0°59′	4	50
08-00588-02541		1°30′	4	0.67	0.35	0.75	12°	1°29′	4	50
08-00588-02543			5	0.73	0.35	0.75	12°	1°29′	4	50
08-00588-02551		2°	4	0.74	0.35	0.75	12°	1°59′	4	50
08-00588-02553			5	0.81	0.35	0.75	12°	1°59′	4	50
08-00588-03021	R0.3	30′	4	0.64	0.45	0.9	12°	0°29′	4	50
08-00588-03023			5	0.66	0.45	0.9	12°	0°29′	4	50
08-00588-03025			6	0.67	0.45	0.9	12°	0°29′	4	50
08-00588-03027			8	0.71	0.45	0.9	12°	0°29′	4	50
08-00588-03031		1°	4	0.7	0.45	0.9	12°	0°59′	4	50
08-00588-03033			5	0.74	0.45	0.9	12°	0°59′	4	50
08-00588-03035			6	0.77	0.45	0.9	12°	0°59′	4	50
08-00588-03037			8	0.84	0.45	0.9	12°	0°59′	4	50
08-00588-03041		1°30′	4	0.77	0.45	0.9	12°	1°29′	4	50
08-00588-03043			5	0.82	0.45	0.9	12°	1°29′	4	50
08-00588-03045			6	0.87	0.45	0.9	12°	1°29′	4	50
08-00588-03047			8	0.98	0.45	0.9	12°	1°29′	4	50
08-00588-03053		2°	5	0.9	0.45	0.9	12°	1°59′	4	50
08-00588-03055			6	0.97	0.45	0.9	12°	1°59′	4	50
08-00588-03057			8	1.11	0.45	0.9	12°	1°59′	4	50
08-00588-03072		3°	4	0.96	0.45	0.9	12°	2°59′	4	50
08-00588-03073			5	1.07	0.45	0.9	12°	2°59′	4	50
08-00588-03075			7	1.28	0.45	0.9	12°	2°59′	4	50
08-00588-03092		5°	5	1.4	0.45	0.9	12°	4°59′	4	50
08-00588-03094			7	1.75	0.45	0.9	12°	4°59′	4	50
08-00588-04021	R0.4	30′	8	0.89	0.6	1.2	12°	0°29′	4	60
08-00588-04023			12	0.96	0.6	1.2	12°	0°29′	4	60
08-00588-04031		1°	8	1.03	0.6	1.2	12°	0°59′	4	60
08-00588-04033			12	1.17	0.6	1.2	12°	0°59′	4	60
08-00588-04041		1°30′	8	1.16	0.6	1.2	12°	1°29′	4	60
08-00588-04043			12	1.37	0.6	1.2	12°	1°29′	4	60
08-00588-04051		2°	8	1.29	0.6	1.2	12°	1°59′	4	60
08-00588-04053			12	1.57	0.6	1.2	12°	1°59′	4	60
▌08-00588-04521	R0.45	30′	8	0.99	0.65	1.35	12°	0°29′	4	60
▌08-00588-04523			12	1.06	0.65	1.35	12°	0°29′	4	60
▌08-00588-04525			16	1.13	0.65	1.35	12°	0°29′	4	60
▌08-00588-04531		1°	8	1.12	0.65	1.35	12°	0°59′	4	60
▌08-00588-04533			12	1.26	0.65	1.35	12°	0°59′	4	60
▌08-00588-04535			16	1.4	0.65	1.35	12°	0°59′	4	60
▌08-00588-04541		1°30′	8	1.25	0.65	1.35	12°	1°29′	4	60
▌08-00588-04543			12	1.46	0.65	1.35	12°	1°29′	4	60
▌08-00588-04545			16	1.67	0.65	1.35	12°	1°29′	4	60
08-00588-05021	R0.5	30′	6	1.05	0.75	1.5	12°	0°29′	4	60
08-00588-05022			8	1.08	0.75	1.5	12°	0°29′	4	60
08-00588-05023			10	1.12	0.75	1.5	12°	0°29′	4	60
08-00588-05024			12	1.15	0.75	1.5	12°	0°29′	4	60
08-00588-05025			16	1.22	0.75	1.5	12°	0°29′	4	60
08-00588-05026			20	1.29	0.75	1.5	12°	0°29′	4	70

MUGEN COATING PREMIUM 2-Flute Long Taper Neck Ball End Mill

〔Neck Shape〕
(γ) is reference value. Tool measurement required in order to avoid interference to the work material.



Unit : mm

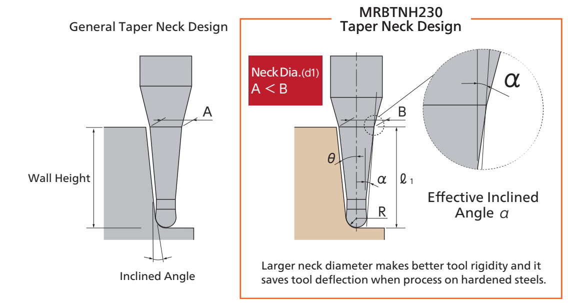
Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00588-05027	R0.5	30′	25	1.38	0.75	1.5	12°	0°29′	4	70
08-00588-05028			30	1.47	0.75	1.5	12°	0°29′	4	70
08-00588-05031		1°	6	1.15	0.75	1.5	12°	0°59′	4	60
08-00588-05032			8	1.22	0.75	1.5	12°	0°59′	4	60
08-00588-05033			10	1.29	0.75	1.5	12°	0°59′	4	60
08-00588-05034			12	1.36	0.75	1.5	12°	0°59′	4	60
08-00588-05035			16	1.5	0.75	1.5	12°	0°59′	4	60
08-00588-05036			20	1.63	0.75	1.5	12°	0°59′	4	70
08-00588-05037			25	1.81	0.75	1.5	12°	0°59′	4	70
08-00588-05038			30	1.98	0.75	1.5	12°	0°59′	4	70
08-00588-05041		1°30′	6	1.24	0.75	1.5	12°	1°29′	4	60
08-00588-05042			8	1.35	0.75	1.5	12°	1°29′	4	60
08-00588-05043			10	1.45	0.75	1.5	12°	1°29′	4	60
08-00588-05044			12	1.56	0.75	1.5	12°	1°29′	4	60
08-00588-05045			16	1.77	0.75	1.5	12°	1°29′	4	60
08-00588-05046			20	1.98	0.75	1.5	12°	1°29′	4	70
08-00588-05047			25	2.24	0.75	1.5	12°	1°29′	4	70
08-00588-05048			30	2.5	0.75	1.5	12°	1°29′	4	70
08-00588-05052		2°	8	1.48	0.75	1.5	12°	1°59′	4	60
08-00588-05053			10	1.62	0.75	1.5	12°	1°59′	4	60
08-00588-05056			20	2.32	0.75	1.5	12°	1°59′	4	70
08-00588-05058			30	3.01	0.75	1.5	12°	1°59′	4	70
08-00588-05073		3°	10	1.95	0.75	1.5	12°	2°59′	4	60
08-00588-05076			20	3	0.75	1.5	12°	2°59′	4	70
08-00588-05078			30	4.05	0.75	1.5	12°	2°59′	6	70
▌08-00588-06031	R0.6	1°	6	1.34	0.9	1.8	12°	0°59′	4	60
▌08-00588-06032			8	1.41	0.9	1.8	12°	0°59′	4	60
▌08-00588-06033			10	1.48	0.9	1.8	12°	0°59′	4	60
▌08-00588-06036			20	1.83	0.9	1.8	12°	0°59′	4	70
▌08-00588-06038			30	2.18	0.9	1.8	12°	0°59′	4	70
▌08-00588-06041		1°30′	6	1.43	0.9	1.8	12°	1°29′	4	60
▌08-00588-06042			8	1.54	0.9	1.8	12°	1°29′	4	60
▌08-00588-06043			10	1.64	0.9	1.8	12°	1°29′	4	60
▌08-00588-06046			20	2.17	0.9	1.8	12°	1°29′	4	70
▌08-00588-06048			30	2.69	0.9	1.8	12°	1°29′	4	70
▌08-00588-06073		3°	10	2.14	0.9	1.8	12°	2°59′	4	60
▌08-00588-06076			20	3.19	0.9	1.8	12°	2°59′	4	70
▌08-00588-06078			35	4.76	0.9	1.8	12°	2°59′	6	80
08-00588-07521	R0.75	30′	10	1.61	1.1	2.25	12°	0°29′	4	60
08-00588-07523			15	1.69	1.1	2.25	12°	0°29′	4	60
08-00588-07525			20	1.78	1.1	2.25	12°	0°29′	4	70
08-00588-07527			25	1.87	1.1	2.25	12°	0°29′	4	70
08-00588-07529			30	1.96	1.1	2.25	12°	0°29′	4	70
08-00588-07531		1°	10	1.77	1.1	2.25	12°	0°59′	4	60
08-00588-07533			15	1.94	1.1	2.25	12°	0°59′	4	60
08-00588-07535			20	2.12	1.1	2.25	12°	0°59′	4	70
08-00588-07537			25	2.29	1.1	2.25	12°	0°59′	4	70
08-00588-07539			30	2.47	1.1	2.25	12°	0°59′	4	70
08-00588-07541		1°30′	10	1.93	1.1	2.25	12°	1°29′	4	60
08-00588-07543			15	2.19	1.1	2.25	12°	1°29′	4	60
08-00588-07545			20	2.45	1.1	2.25	12°	1°29′	4	70
08-00588-07551		2°	10	2.09	1.1	2.25	12°	1°59′	4	60
08-00588-07553			15	2.44	1.1	2.25	12°	1°59′	4	60
08-00588-07555			20	2.79	1.1	2.25	12°	1°59′	4	70
08-00588-10021	R1	30′	12	2.14	1.5	3	12°	0°29′	4	60
08-00588-10022			16	2.21	1.5	3	12°	0°29′	4	60

How to Order When you order, indicate MRBTNH230 (R)×(θ)×(ℓ1). ※(γ) is reference value.

Machining case S-022

MRBTNH230

MUGEN COATING PREMIUM 2-Flute Long Taper Neck Ball End Mill



※Please select the tool with the same neck angle as the inclined angle of the milling surface.

Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00588-10023	R1	30′	20	2.28	1.5	3	12°	0°29′	4	70
08-00588-10024			25	2.37	1.5	3	12°	0°29′	4	70
08-00588-10025			30	2.46	1.5	3	12°	0°29′	4	70
08-00588-10026			35	2.54	1.5	3	12°	0°29′	4	80
08-00588-10027			40	2.63	1.5	3	12°	0°29′	4	80
08-00588-10028			50	2.81	1.5	3	12°	0°30′	4	90
08-00588-10031		1°	12	2.33	1.5	3	12°	0°59′	4	60
08-00588-10032			16	2.47	1.5	3	12°	0°59′	4	60
08-00588-10033			20	2.61	1.5	3	12°	0°59′	4	70
08-00588-10034			25	2.79	1.5	3	12°	0°59′	4	70
08-00588-10035			30	2.96	1.5	3	12°	0°59′	4	70
08-00588-10036			35	3.14	1.5	3	12°	0°59′	6	80
08-00588-10037			40	3.31	1.5	3	12°	0°59′	6	80
08-00588-10038			50	3.66	1.5	3	12°	0°59′	6	90
08-00588-10041		1°30′	12	2.53	1.5	3	12°	1°29′	4	60
08-00588-10042			16	2.74	1.5	3	12°	1°29′	4	60
08-00588-10043			20	2.95	1.5	3	12°	1°29′	4	70
08-00588-10044			25	3.21	1.5	3	12°	1°29′	4	70
08-00588-10045			30	3.47	1.5	3	12°	1°29′	6	70
08-00588-10046			35	3.73	1.5	3	12°	1°29′	6	80
08-00588-10047			40	3.99	1.5	3	12°	1°29′	6	80
08-00588-10048			50	4.52	1.5	3	12°	1°30′	6	90
08-00588-10051		2°	12	2.72	1.5	3	12°	1°59′	4	60
08-00588-10052			16	3	1.5	3	12°	1°59′	4	60
08-00588-10053			20	3.28	1.5	3	12°	1°59′	4	70
08-00588-10054			25	3.63	1.5	3	12°	1°59′	6	70
08-00588-10055			30	3.98	1.5	3	12°	1°59′	6	70
08-00588-10057			40	4.67	1.5	3	12°	1°59′	6	80
08-00588-10058			50	5.37	1.5	3	12°	2°00′	6	90
08-00588-15021	R1.5	30′	15	3.13	2.5	4.5	12°	0°29′	6	70
08-00588-15022			20	3.22	2.5	4.5	12°	0°29′	6	70
08-00588-15023			25	3.31	2.5	4.5	12°	0°29′	6	70
08-00588-15024			30	3.4	2.5	4.5	12°	0°29′	6	70
08-00588-15025			40	3.57	2.5	4.5	12°	0°29′	6	80
08-00588-15026			50	3.74	2.5	4.5	12°	0°29′	6	90
08-00588-15031		1°	15	3.37	2.5	4.5	12°	0°59′	6	70
08-00588-15032			20	3.54	2.5	4.5	12°	0°59′	6	70
08-00588-15033			25	3.72	2.5	4.5	12°	0°59′	6	70
08-00588-15034			30	3.89	2.5	4.5	12°	0°59′	6	70
08-00588-15035			40	4.24	2.5	4.5	12°	0°59′	6	80
08-00588-15036			50	4.59	2.5	4.5	12°	0°59′	6	90
08-00588-15041		1°30′	15	3.61	2.5	4.5	12°	1°29′	6	70
08-00588-15042			20	3.87	2.5	4.5	12°	1°29′	6	70
08-00588-15043			25	4.13	2.5	4.5	12°	1°29′	6	70
08-00588-15044			30	4.39	2.5	4.5	12°	1°29′	6	70
08-00588-15045			40	4.91	2.5	4.5	12°	1°29′	6	80
08-00588-15046			50	5.44	2.5	4.5	12°	1°29′	6	90
08-00588-15051		2°	15	3.84	2.5	4.5	12°	1°59′	6	70
08-00588-15052			20	4.19	2.5	4.5	12°	1°59′	6	70
08-00588-15054			30	4.89	2.5	4.5	12°	1°59′	6	70
08-00588-20031	R2	1°	20	4.57	3	6	12°	0°59′	6	80
08-00588-20033			30	4.92	3	6	12°	0°59′	6	80
08-00588-20035			40	5.26	3	6	12°	0°59′	6	80
08-00588-20036			50	5.62	3	6	12°	0°59′	6	90
08-00588-20037			61.1	6	3	6	–	0°59′	6	110

Recommended Milling Conditions

Prehardened Steel P
~55 HRC Hardened Steel H
~65 HRC Hardened Steel H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Tapered Ball Coating

Work Material			Prehardened Steels HPM･NAK (~41HRC)				Hardened Steels STAVAX･SKD61 (~52HRC)				Hardened Steels SKD11･PD613 (~62HRC)				High Speed Steels SKH･HAP (~65HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.05	3°	0.5	0.005	0.005	120	40,000	0.003	0.005	100	40,000	0.002	0.005	70	40,000	0.002	0.003	50	40,000
		0.75	0.003	0.005	100	40,000	0.002	0.003	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
0.075	3°	1	0.005	0.005	180	40,000	0.003	0.005	150	40,000	0.002	0.005	120	40,000	0.002	0.003	70	40,000
		1.5	0.003	0.005	100	40,000	0.002	0.003	70	40,000	0.001	0.003	50	40,000	0.001	0.002	30	40,000
0.1	30′	1.5	0.003	0.01	200	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
		2	0.003	0.005	150	40,000	0.002	0.003	120	40,000	0.001	0.002	100	40,000	0.001	0.002	60	40,000
	1°	1.5	0.003	0.007	200	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
		2	0.003	0.007	160	40,000	0.003	0.005	140	40,000	0.002	0.003	120	40,000	0.001	0.002	80	40,000
	1°30′	1.5	0.005	0.01	230	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.001	0.002	120	40,000
		2	0.003	0.01	200	40,000	0.003	0.005	160	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
	2°	1.5	0.007	0.01	250	40,000	0.005	0.01	230	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000
		2	0.003	0.01	230	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
	3°	3	0.005	0.01	230	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
		5	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.001	0.002	120	40,000	0.001	0.002	80	40,000
	5°	3	0.007	0.01	250	40,000	0.005	0.01	200	40,000	0.003	0.005	160	40,000	0.002	0.003	120	40,000
		5	0.005	0.01	230	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	100	40,000
0.15	30′	2	0.003	0.007	230	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.002	0.002	120	40,000
		3	0.003	0.005	180	40,000	0.002	0.003	140	40,000	0.001	0.002	120	40,000	0.001	0.002	70	40,000
	1°	2	0.003	0.01	230	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.002	0.002	120	40,000
		3	0.003	0.007	200	40,000	0.003	0.005	160	40,000	0.002	0.003	140	40,000	0.001	0.002	90	40,000
	1°30′	2	0.005	0.01	250	40,000	0.003	0.005	230	40,000	0.002	0.003	180	40,000	0.002	0.002	140	40,000
		3	0.003	0.01	220	40,000	0.003	0.005	180	40,000	0.002	0.003	150	40,000	0.001	0.002	110	40,000
	2°	2	0.007	0.01	280	40,000	0.005	0.01	250	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000
		3	0.003	0.01	250	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.002	0.002	120	40,000
	3°	2	0.01	0.015	300	40,000	0.007	0.01	280	40,000	0.005	0.007	230	40,000	0.003	0.005	200	40,000
		3	0.007	0.015	280	40,000	0.005	0.01	250	40,000	0.003	0.007	200	40,000	0.002	0.005	180	40,000
		5	0.007	0.01	250	40,000	0.005	0.007	230	40,000	0.003	0.005	180	40,000	0.002	0.003	160	40,000
		7	0.005	0.007	230	40,000	0.003	0.005	200	40,000	0.002	0.003	160	40,000	0.001	0.002	140	40,000
	5°	3	0.01	0.015	300	40,000	0.007	0.01	280	40,000	0.005	0.007	230	40,000	0.003	0.005	200	40,000
		5	0.007	0.015	280	40,000	0.005	0.01	250	40,000	0.003	0.007	200	40,000	0.002	0.005	180	40,000
		7	0.007	0.01	250	40,000	0.005	0.007	230	40,000	0.003	0.005	180	40,000	0.002	0.003	160	40,000
0.2	30′	3	0.01	0.02	360	40,000	0.007	0.01	300	40,000	0.005	0.007	240	40,000	0.003	0.005	160	40,000
		4	0.007	0.01	240	40,000	0.005	0.005	160	40,000	0.003	0.003	120	40,000	0.002	0.003	100	40,000
		6	0.005	0.01	160	40,000	0.003	0.005	120	40,000	0.002	0.003	100	40,000	0.001	0.003	70	40,000
	1°	3	0.01	0.02	400	40,000	0.007	0.01	320	40,000	0.005	0.007	260	40,000	0.003	0.005	200	40,000
		4	0.01	0.015	320	40,000	0.005	0.007	240	40,000	0.003	0.005	160	40,000	0.002	0.003	120	40,000
		6	0.005	0.007	200	40,000	0.005	0.005	160	40,000	0.003	0.003	120	40,000	0.002	0.002	90	40,000
	1°30′	3	0.015	0.02	450	40,000	0.007	0.01	360	40,000	0.005	0.007	280	40,000	0.003	0.005	240	40,000
		4	0.01	0.02	400	40,000	0.007	0.01	300	40,000	0.005	0.007	240	40,000	0.003	0.005	160	40,000
		6	0.007	0.01	300	40,000	0.005	0.007	240	40,000	0.003	0.005	160	40,000	0.002	0.003	120	40,000
	2°	3	0.015	0.02	480	40,000	0.007	0.01	400	40,000	0.005	0.007	320	40,000	0.003	0.005	280	40,000
		4	0.01	0.02	400	40,000	0.007	0.01	320	40,000	0.005	0.007	260	40,000	0.003	0.005	220	40,000
		6	0.01	0.015	320	40,000	0.005	0.007	240	40,000	0.003	0.005	180	40,000	0.002	0.003	140	40,000
	3°	5	0.01	0.02	400	40,000	0.007	0.01	320	40,000	0.005	0.007	240	40,000	0.003	0.005	220	40,000
		7	0.01	0.015	320	40,000	0.005	0.007	240	40,000	0.003	0.005	160	40,000	0.002	0.003	140	40,000
	5°	5	0.015	0.02	420	40,000	0.01	0.015	360	40,000	0.007	0.01	300	40,000	0.005	0.007	260	40,000
		7	0.015	0.015	400	40,000	0.007	0.01	320	40,000	0.005	0.007	240	40,000	0.003	0.005	220	40,000
0.25	30′	4	0.012	0.02	500	40,000	0.007	0.01	450	40,000	0.005	0.007	360	40,000	0.003	0.005	280	40,000
		5	0.008	0.01	460	40,000	0.005	0.005	400	40,000	0.003	0.003	300	40,000	0.002	0.003	240	40,000
	1°	4	0.015	0.03	580	40,000	0.007	0.01	520	40,000	0.005	0.007	400	40,000	0.003	0.005	320	40,000
		5	0.012	0.02	500	40,000	0.007	0.01	440	40,000	0.005	0.007	360	40,000	0.003	0.005	260	40,000
	1°30′	4	0.015	0.035	640	40,000	0.01	0.02	560	40,000	0.007	0.01	480	40,000	0.005	0.007	360	40,000
		5	0.012	0.02	500	40,000	0.007	0.01	460	40,000	0.005	0.007	380	40,000	0.003	0.005	280	40,000
	2°	4	0.015	0.035	700	40,000	0.01	0.02	640	40,000	0.007	0.01	540	40,000	0.005	0.007	400	40,000
		5	0.015	0.03	600	40,000	0.007	0.015	520	40,000	0.005	0.01	420	40,000	0.003	0.007	300	40,000
0.3	30′	4	0.025	0.07	900	40,000	0.02	0.03	800	40,000	0.01	0.03	580	40,000	0.01	0.02	450	30,000
		5	0.025	0.05	750	40,000	0.02	0.03	700	35,000	0.01	0.02	500	35,000	0.008	0.015	420	30,000
		6	0.015	0.02	500	35,000	0.01	0.015	460	30,000	0.007	0.01	400	30,000	0.005	0.008	360	30,000

MRBTNH230

Recommended Milling Conditions

Regular Line
MUGEN PREMIUM
Long Neck Type

Work Material			Prehardened Steels HPM･NAK (~41HRC)				Hardened Steels STAVAX･SKD61 (~52HRC)				Hardened Steels SKD11･PD613 (~62HRC)				High Speed Steels SKH･HAP (~65HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.3	30′	8	0.008	0.015	400	30,000	0.005	0.007	360	25,000	0.003	0.005	300	25,000	0.003	0.003	260	20,000
	1°	4	0.025	0.07	900	40,000	0.02	0.03	800	40,000	0.01	0.03	580	40,000	0.01	0.02	450	30,000
		5	0.025	0.05	750	40,000	0.02	0.03	700	35,000	0.01	0.02	500	35,000	0.008	0.015	420	30,000
		6	0.02	0.04	540	35,000	0.01	0.02	500	30,000	0.007	0.015	460	30,000	0.007	0.01	400	30,000
		8	0.01	0.02	460	35,000	0.007	0.01	400	30,000	0.005	0.007	360	30,000	0.003	0.005	320	30,000
	1°30′	4	0.025	0.07	1,000	40,000	0.02	0.03	900	40,000	0.01	0.03	620	40,000	0.01	0.02	480	30,000
		5	0.025	0.05	800	40,000	0.02	0.03	750	40,000	0.01	0.03	560	40,000	0.01	0.02	440	30,000
		6	0.025	0.04	750	40,000	0.02	0.025	700	35,000	0.01	0.02	500	35,000	0.008	0.015	420	30,000
		8	0.013	0.02	500	35,000	0.01	0.015	460	30,000	0.007	0.01	400	30,000	0.005	0.008	360	30,000
	2°	5	0.025	0.07	1,000	40,000	0.02	0.03	900	40,000	0.01	0.03	620	40,000	0.01	0.02	480	30,000
		6	0.025	0.05	800	40,000	0.02	0.03	750	35,000	0.01	0.02	560	35,000	0.008	0.015	440	30,000
		8	0.02	0.03	540	35,000	0.01	0.02	500	30,000	0.007	0.015	460	30,000	0.007	0.01	400	30,000
	3°	4	0.03	0.1	1,200	40,000	0.03	0.05	1,200	40,000	0.025	0.03	800	40,000	0.02	0.025	600	30,000
		5	0.03	0.07	1,000	40,000	0.03	0.05	1,000	40,000	0.025	0.03	600	40,000	0.02	0.025	500	30,000
		7	0.025	0.05	800	40,000	0.02	0.03	900	35,000	0.015	0.025	500	35,000	0.01	0.02	400	30,000
	5°	5	0.03	0.1	1,200	40,000	0.03	0.05	1,200	40,000	0.025	0.03	800	40,000	0.02	0.025	600	30,000
		7	0.03	0.07	1,000	40,000	0.03	0.05	1,000	35,000	0.025	0.03	600	35,000	0.02	0.025	500	30,000
0.4	30′	8	0.015	0.03	720	35,000	0.012	0.02	600	30,000	0.007	0.015	540	30,000	0.005	0.01	480	25,000
		12	0.005	0.01	460	30,000	0.005	0.005	400	25,000	0.003	0.003	360	25,000	0.002	0.003	320	25,000
	1°	8	0.03	0.05	800	35,000	0.02	0.03	700	30,000	0.01	0.02	680	30,000	0.007	0.01	520	25,000
		12	0.005	0.01	480	30,000	0.005	0.005	420	25,000	0.003	0.003	380	25,000	0.002	0.003	340	25,000
	1°30′	8	0.05	0.07	900	35,000	0.03	0.05	800	30,000	0.02	0.03	760	30,000	0.01	0.02	560	25,000
		12	0.015	0.03	640	35,000	0.01	0.02	500	30,000	0.007	0.01	500	30,000	0.005	0.01	480	25,000
	2°	8	0.05	0.08	1,000	35,000	0.03	0.05	900	30,000	0.02	0.03	760	30,000	0.01	0.02	560	25,000
		12	0.03	0.05	800	35,000	0.02	0.03	700	30,000	0.01	0.02	600	30,000	0.007	0.01	520	25,000
0.45	30′	8	0.05	0.07	1,400	35,000	0.03	0.05	1,100	30,000	0.02	0.03	1,000	30,000	0.015	0.025	800	25,000
		12	0.03	0.05	1,000	30,000	0.02	0.03	800	25,000	0.015	0.025	600	25,000	0.01	0.015	400	25,000
		16	0.01	0.02	500	25,000	0.007	0.015	400	20,000	0.005	0.01	300	20,000	0.003	0.005	250	20,000
	1°	8	0.05	0.07	1,500	35,000	0.03	0.05	1,200	30,000	0.02	0.03	1,000	30,000	0.015	0.025	800	25,000
		12	0.03	0.05	1,200	30,000	0.02	0.03	1,000	25,000	0.015	0.025	700	25,000	0.01	0.015	500	25,000
		16	0.012	0.025	600	25,000	0.01	0.02	500	20,000	0.007	0.015	400	20,000	0.005	0.01	350	20,000
	1°30′	8	0.07	0.1	1,600	35,000	0.05	0.05	1,200	30,000	0.03	0.03	1,000	30,000	0.02	0.025	800	25,000
		12	0.03	0.05	1,400	35,000	0.03	0.05	1,000	30,000	0.025	0.03	700	25,000	0.01	0.02	550	25,000
		16	0.015	0.025	800	30,000	0.012	0.025	600	25,000	0.01	0.02	500	20,000	0.007	0.015	400	20,000
0.5	30′	6	0.1	0.2	1,600	35,000	0.05	0.1	1,400	30,000	0.04	0.05	1,200	25,000	0.02	0.05	740	20,000
		8	0.08	0.2	1,300	35,000	0.04	0.06	1,200	30,000	0.03	0.04	950	25,000	0.02	0.03	680	20,000
		10	0.03	0.06	1,000	30,000	0.03	0.05	820	25,000	0.015	0.03	750	20,000	0.01	0.02	500	18,000
		12	0.03	0.06	820	30,000	0.03	0.05	720	25,000	0.015	0.03	620	20,000	0.01	0.02	450	18,000
		16	0.012	0.025	540	25,000	0.008	0.02	500	20,000	0.005	0.01	420	18,000	0.003	0.006	350	16,000
		20	0.005	0.01	300	20,000	0.005	0.005	250	18,000	0.003	0.005	200	16,000	0.002	0.003	150	14,000
		25	0.005	0.005	180	20,000	0.005	0.005	150	18,000	0.002	0.005	120	16,000	0.002	0.002	85	14,000
		30	0.003	0.005	120	16,000	0.003	0.003	100	16,000	0.002	0.003	75	14,000	0.001	0.002	60	12,000
	1°	6	0.1	0.25	2,000	35,000	0.05	0.15	1,800	30,000	0.04	0.1	1,600	25,000	0.03	0.05	920	20,000
		8	0.1	0.2	1,600	35,000	0.05	0.1	1,400	30,000	0.04	0.05	1,200	25,000	0.02	0.05	740	20,000
		10	0.05	0.1	1,200	35,000	0.04	0.06	1,000	30,000	0.03	0.04	800	25,000	0.02	0.03	560	20,000
		12	0.04	0.06	1,000	30,000	0.03	0.05	820	25,000	0.02	0.03	700	20,000	0.01	0.02	500	18,000
		16	0.015	0.025	600	25,000	0.01	0.025	500	20,000	0.007	0.02	450	18,000	0.005	0.01	400	16,000
		20	0.012	0.025	500	25,000	0.008	0.02	400	20,000	0.005	0.01	360	18,000	0.003	0.006	320	16,000
		25	0.005	0.01	300	20,000	0.005	0.005	250	18,000	0.003	0.005	200	16,000	0.002	0.003	150	14,000
		30	0.005	0.005	200	20,000	0.003	0.005	150	18,000	0.002	0.005	120	16,000	0.002	0.002	85	14,000
	1°30′	6	0.15	0.25	2,000	40,000	0.1	0.2	2,000	40,000	0.05	0.15	1,600	30,000	0.05	0.1	1,200	25,000
		8	0.1	0.2	1,800	35,000	0.05	0.1	1,600	30,000	0.04	0.05	1,200	25,000	0.02	0.05	800	20,000
		10	0.08	0.2	1,400	35,000	0.04	0.06	1,200	30,000	0.03	0.04	900	25,000	0.02	0.03	700	20,000
		12	0.05	0.1	1,200	35,000	0.04	0.06	1,000	30,000	0.03	0.04	800	25,000	0.02	0.03	550	20,000
		16	0.03	0.05	800	30,000	0.02	0.05	700	25,000	0.02	0.03	600	20,000	0.01	0.02	500	18,000
		20	0.015	0.025	600	25,000	0.01	0.025	500	20,000	0.007	0.02	450	18,000	0.005	0.01	400	16,000
		25	0.012	0.025	500	25,000	0.008	0.02	400	20,000	0.005	0.01	350	18,000	0.003	0.006	300	16,000
		30	0.01	0.02	400	20,000	0.005	0.01	300	20,000	0.003	0.007	250	18,000	0.002	0.005	200	16,000

Prehardened Steel P
~55 HRC Hardened Steel H
~65 HRC Hardened Steel H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Tapered Ball Coating

MRBTNH230

Recommended Milling Conditions

MRBTNH230

Recommended Milling Conditions

Prehardened Steel P
Hardened Steel ~55 HRC H
Hardened Steel ~65 HRC H
Stainless Steel M
Titanium Alloy Heat Resistant Alloy S
Long Neck Tapered Ball Coating

Work Material			Prehardened Steels HPM･NAK (~41HRC)				Hardened Steels STAVAX･SKD61 (~52HRC)				Hardened Steels SKD11･PD613 (~62HRC)				High Speed Steels SKH･HAP (~65HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹
0.5	2°	8	0.1	0.2	2,000	35,000	0.05	0.1	1,600	30,000	0.04	0.05	1,200	25,000	0.02	0.05	900	20,000
		10	0.05	0.2	1,600	35,000	0.04	0.1	1,200	30,000	0.03	0.05	1,000	25,000	0.02	0.05	700	20,000
		20	0.03	0.05	800	30,000	0.02	0.05	700	25,000	0.02	0.03	600	20,000	0.01	0.02	450	18,000
		30	0.015	0.03	600	20,000	0.01	0.03	500	20,000	0.007	0.02	400	18,000	0.005	0.01	350	16,000
	3°	10	0.1	0.2	2,000	35,000	0.05	0.1	1,600	30,000	0.03	0.07	1,200	25,000	0.025	0.05	800	20,000
		20	0.04	0.1	1,200	30,000	0.03	0.05	1,000	25,000	0.02	0.03	800	20,000	0.015	0.025	500	18,000
		30	0.02	0.05	700	20,000	0.015	0.03	700	20,000	0.01	0.025	600	18,000	0.01	0.02	400	16,000
0.6	1°	6	0.15	0.3	2,500	35,000	0.07	0.15	2,000	30,000	0.05	0.1	1,500	25,000	0.03	0.07	1,000	20,000
		8	0.1	0.25	2,000	35,000	0.07	0.1	1,600	30,000	0.05	0.07	1,200	25,000	0.03	0.05	800	20,000
		10	0.1	0.2	1,200	35,000	0.05	0.1	1,000	30,000	0.03	0.07	800	25,000	0.025	0.05	600	20,000
		20	0.02	0.03	600	25,000	0.015	0.03	500	20,000	0.01	0.025	450	18,000	0.007	0.02	400	16,000
		30	0.01	0.02	400	20,000	0.005	0.01	250	18,000	0.005	0.007	200	16,000	0.003	0.005	150	14,000
	1°30′	6	0.2	0.3	3,000	40,000	0.1	0.2	2,400	35,000	0.07	0.15	2,000	30,000	0.05	0.1	1,600	25,000
		8	0.15	0.25	2,400	35,000	0.07	0.15	1,600	30,000	0.05	0.1	1,400	25,000	0.03	0.07	1,000	20,000
		10	0.15	0.2	2,000	35,000	0.07	0.1	1,200	30,000	0.05	0.07	1,000	25,000	0.03	0.05	800	20,000
		20	0.05	0.1	1,200	25,000	0.03	0.05	600	20,000	0.025	0.03	500	18,000	0.02	0.025	450	16,000
		30	0.02	0.04	400	20,000	0.01	0.02	350	20,000	0.007	0.015	300	18,000	0.005	0.01	250	16,000
	3°	10	0.15	0.25	3,000	35,000	0.1	0.2	2,000	30,000	0.07	0.15	1,600	25,000	0.05	0.1	1,200	20,000
		20	0.1	0.15	2,000	30,000	0.07	0.1	1,400	25,000	0.05	0.07	1,000	20,000	0.03	0.05	800	18,000
		35	0.03	0.05	1,000	20,000	0.02	0.03	700	20,000	0.015	0.025	600	18,000	0.01	0.02	500	16,000
0.75	30′	10	0.15	0.2	2,000	30,000	0.1	0.15	1,600	25,000	0.05	0.15	1,400	25,000	0.05	0.07	1,000	20,000
		15	0.07	0.15	1,400	25,000	0.05	0.08	1,000	20,000	0.03	0.07	800	20,000	0.02	0.04	600	18,000
		20	0.03	0.05	800	18,000	0.02	0.04	600	16,000	0.012	0.025	450	16,000	0.008	0.015	360	14,000
		25	0.02	0.04	540	18,000	0.01	0.03	450	16,000	0.01	0.02	360	16,000	0.007	0.01	300	14,000
		30	0.01	0.03	360	14,000	0.007	0.02	320	14,000	0.005	0.01	240	14,000	0.003	0.005	200	12,000
	1°	10	0.15	0.25	2,000	30,000	0.1	0.2	1,800	25,000	0.05	0.2	1,400	25,000	0.05	0.1	1,000	20,000
		15	0.08	0.15	1,600	25,000	0.05	0.1	1,200	20,000	0.03	0.1	920	20,000	0.02	0.05	780	18,000
		20	0.05	0.1	1,000	20,000	0.03	0.07	800	18,000	0.02	0.05	600	18,000	0.015	0.03	550	16,000
		25	0.03	0.05	700	18,000	0.02	0.04	550	16,000	0.012	0.025	400	16,000	0.008	0.015	350	14,000
		30	0.02	0.04	450	16,000	0.01	0.03	360	16,000	0.01	0.02	300	16,000	0.007	0.01	250	14,000
	1°30′	10	0.15	0.25	2,000	30,000	0.1	0.2	2,000	25,000	0.05	0.2	1,600	25,000	0.05	0.1	1,200	20,000
		15	0.08	0.15	1,800	25,000	0.05	0.1	1,400	20,000	0.03	0.1	920	20,000	0.02	0.05	780	18,000
		20	0.06	0.1	1,200	25,000	0.05	0.07	1,000	20,000	0.03	0.05	820	20,000	0.02	0.03	650	18,000
	2°	10	0.2	0.3	2,000	30,000	0.1	0.2	2,000	25,000	0.05	0.2	1,600	25,000	0.05	0.1	1,200	20,000
		15	0.1	0.2	2,000	30,000	0.1	0.1	1,600	25,000	0.05	0.1	1,200	25,000	0.05	0.05	900	20,000
		20	0.07	0.12	1,400	25,000	0.05	0.1	1,200	20,000	0.03	0.1	900	20,000	0.02	0.05	750	18,000
1	30′	12	0.15	0.3	2,400	20,000	0.1	0.3	2,000	18,000	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000
		16	0.1	0.2	1,800	18,000	0.07	0.15	1,600	16,000	0.05	0.08	1,200	14,000	0.03	0.07	800	12,000
		20	0.07	0.12	1,600	16,000	0.05	0.1	1,400	14,000	0.03	0.06	1,000	12,000	0.02	0.04	700	10,000
		25	0.05	0.1	1,000	14,000	0.03	0.08	850	14,000	0.02	0.05	700	12,000	0.02	0.02	600	10,000
		30	0.03	0.08	800	12,000	0.03	0.05	700	12,000	0.02	0.03	540	10,000	0.01	0.02	420	8,500
		35	0.03	0.05	600	12,000	0.025	0.04	500	12,000	0.015	0.025	420	10,000	0.008	0.015	320	8,500
		40	0.02	0.04	420	12,000	0.02	0.03	360	12,000	0.01	0.02	300	10,000	0.008	0.01	240	8,500
		50	0.01	0.03	300	10,000	0.01	0.02	240	10,000	0.005	0.01	200	8,500	0.005	0.005	160	7,000
	1°	12	0.15	0.3	2,400	20,000	0.15	0.3	2,000	18,000	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000
		16	0.12	0.2	1,800	18,000	0.1	0.15	1,600	16,000	0.1	0.1	1,400	14,000	0.05	0.1	900	12,000
		20	0.1	0.15	1,600	18,000	0.07	0.1	1,400	16,000	0.05	0.08	1,200	14,000	0.03	0.05	800	12,000
		25	0.07	0.12	1,400	14,000	0.05	0.1	1,200	14,000	0.03	0.05	1,000	12,000	0.02	0.03	700	10,000
		30	0.05	0.1	1,000	14,000	0.035	0.08	850	14,000	0.025	0.05	700	12,000	0.02	0.02	600	10,000
		35	0.05	0.1	800	12,000	0.035	0.06	700	12,000	0.02	0.05	600	10,000	0.015	0.02	500	8,500
		40	0.03	0.05	700	12,000	0.03	0.05	600	12,000	0.02	0.04	540	10,000	0.01	0.02	400	8,500
		50	0.025	0.04	420	12,000	0.02	0.03	360	12,000	0.01	0.02	300	10,000	0.008	0.01	240	8,500
	1°30′	12	0.2	0.35	2,400	20,000	0.15	0.35	2,000	18,000	0.12	0.2	1,600	16,000	0.1	0.15	1,200	14,000
		16	0.15	0.2	1,800	18,000	0.1	0.2	1,600	16,000	0.1	0.15	1,400	14,000	0.05	0.1	1,000	12,000
		20	0.1	0.2	1,800	18,000	0.07	0.15	1,600	16,000	0.05	0.1	1,200	14,000	0.03	0.1	900	12,000
		25	0.1	0.15	1,600	16,000	0.07	0.12	1,400	16,000	0.05	0.08	1,200	14,000	0.03	0.07	900	12,000
		30	0.07	0.12	1,400	14,000	0.05	0.1	1,200	14,000	0.03	0.06	1,000	12,000	0.02	0.03	850	10,000
		35	0.06	0.12	1,000	14,000	0.05	0.1	900	14,000	0.03	0.05	800	12,000	0.02	0.03	700	10,000

Work Material			Prehardened Steels HPM･NAK (~41HRC)				Hardened Steels STAVAX･SKD61 (~52HRC)				Hardened Steels SKD11･PD613 (~62HRC)				High Speed Steels SKH･HAP (~65HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min⁻¹
1	1°30′	40	0.05	0.1	900	14,000	0.03	0.08	800	14,000	0.02	0.05	700	12,000	0.02	0.02	600	10,000
		50	0.04	0.07	800	12,000	0.03	0.05	700	12,000	0.02	0.04	600	10,000	0.01	0.02	420	8,500
	2°	12	0.2	0.4	2,400	20,000	0.2	0.3	2,000	20,000	0.15	0.25	1,600	18,000	0.1	0.2	1,200	16,000
		16	0.15	0.3	2,400	20,000	0.1	0.3	2,000	18,000	0.1	0.2	1,600	16,000	0.1	0.1	1,200	14,000
		20	0.12	0.2	2,000	18,000	0.1	0.2	1,800	16,000	0.1	0.1	1,400	14,000	0.05	0.1	1,100	12,000
		25	0.1	0.2	1,800	16,000	0.07	0.15	1,600	16,000	0.05	0.1	1,200	14,000	0.03	0.07	1,000	12,000
		30	0.1	0.15	1,600	16,000	0.07	0.15	1,400	16,000	0.05	0.08	1,100	14,000	0.03	0.07	900	12,000
		40	0.07	0.12	1,400	14,000	0.05	0.1	1,200	14,000	0.03	0.05	1,000	12,000	0.02	0.03	800	10,000
		50	0.05	0.12	1,000	14,000	0.05	0.1	900	14,000	0.03	0.05	800	12,000	0.02	0.03	600	10,000
1.5	30′	15	0.2	0.4	2,400	18,000	0.1	0.4	2,000	18,000	0.1	0.3	1,600	14,000	0.1	0.2	1,200	12,000
		20	0.15	0.3	2,000	18,000	0.1	0.3	1,600	18,000	0.1	0.2	1,400	14,000	0.08	0.1	1,000	12,000
		25	0.12	0.3	1,800	16,000	0.1	0.25	1,400	16,000	0.07	0.15	1,200	12,000	0.05	0.07	900	10,000
		30	0.12	0.25	1,200	16,000	0.08	0.2	1,200	14,000	0.05	0.1	1,000	12,000	0.035	0.06	700	10,000
		40	0.07	0.15	800	14,000	0.04	0.1	720	12,000	0.025	0.06	600	10,000	0.02	0.04	480	8,000
		50	0.05	0.1	600	12,000	0.025	0.04	540	10,000	0.015	0.02	480	7,000	0.01	0.02	360	5,000
	1°	15	0.2	0.5	2,400	20,000	0.15	0.5	2,000	20,000	0.15	0.4	1,600	18,000	0.1	0.3	1,400	14,000
		20	0.15	0.4	2,000	18,000	0.1	0.4	1,800	18,000	0.1	0.2	1,400	16,000	0.08	0.2	1,200	12,000
		25	0.15	0.3	1,800	18,000	0.1	0.3	1,600	16,000	0.1	0.15	1,200	12,000	0.06	0.1	1,000	10,000
		30	0.12	0.3	1,600	16,000	0.08	0.2	1,200	14,000	0.05	0.1	1,000	12,000	0.035	0.07	700	10,000
		40	0.07	0.15	1,000	16,000	0.04	0.1	800	12,000	0.03	0.06	600	10,000	0.02	0.04	500	8,000
		50	0.05	0.12	700	12,000	0.025	0.04	580	10,000	0.015	0.02	480	7,000	0.01	0.02	360	5,000
	1°30′	15	0.25	0.5	3,000	20,000	0.2	0.5	2,400	20,000	0.2	0.4	2,000	18,000	0.15	0.3	1,400	14,000
		20	0.15	0.4	2,400	18,000	0.1	0.4	2,000	18,000	0.1	0.3	1,600	16,000	0.1	0.2	1,200	12,000
		25	0.15	0.3	2,000	18,000	0.1	0.3	1,600	18,000	0.1	0.2	1,400	16,000	0.1	0.1	1,000	12,000
		30	0.12	0.3	1,800	16,000	0.1	0.25	1,400	16,000	0.07	0.15	1,200	14,000	0.05	0.07	900	12,000
		40	0.1	0.25	1,200	16,000	0.06	0.2	1,000	14,000	0.04	0.1	800	12,000	0.03	0.05	520	10,000
		50	0.07	0.15	800	12,000	0.035	0.1	600	10,000	0.02	0.07	500	8,000	0.02	0.05	400	6,000
	2°	15	0.25	0.6	3,000	20,000	0.2	0.6	2,400	20,000	0.2	0.4	2,000	18,000	0.15	0.3	1,600	14,000
		20	0.2	0.5	2,400	18,000	0.15	0.4	2,000	18,000	0.12	0.3	1,600	16,000	0.1	0.2	1,200	12,000
		30	0.2	0.4	2,000	16,000	0.15	0.3	1,800	16,000	0.1	0.2	1,400	14,000	0.07	0.12	1,000	12,000
2	1°	20	0.5	1.5	3,000	18,000	0.4	1	2,400	18,000	0.2	0.8	2,000	16,000	0.15	0.6	1,600	12,000
		30	0.3	1	2,400	16,000	0.2	0.7	1,600	14,000	0.1	0.3	1,200	12,000	0.06	0.15	1,000	10,000
		40	0.2	0.3	2,000	12,000	0.1	0.15	1,200	9,000	0.06	0.1	1,000	6,000	0.035	0.07	800	5,000
		50	0.1	0.2	1,600	10,000	0.07	0.1	900	7,000	0.04	0.07	750	5,000	0.02	0.05	550	4,000
		61.1	0.05	0.1	1,200	8,000	0.025	0.04	600	5,000	0.015	0.025	480	3,500	0.01	0.02	360	3,000

Notes

※1 Above conditions are for contour line roughing process.
※2 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Coolant supply and chip disposal in the deep portion are very important.
※5 Recommended oil mist coolant.
※6 Adjust milling conditions according to the volume of Depth of Cut and rigidity of machine.

MRBTNH345

Size R0.5 × neck taper angle30′ ~ R2 × neck taper angle1°

Premium ≦65 HRC

MRBTNH345

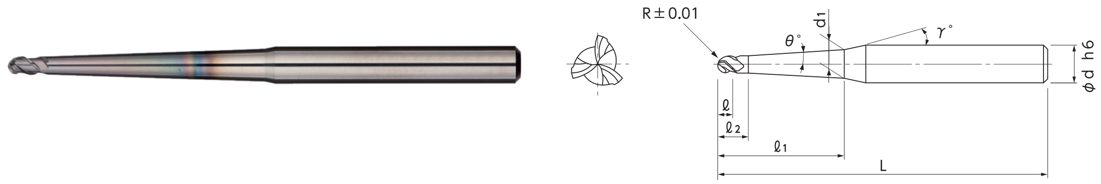
MUGEN COATING PREMIUM 3-Flute Long Taper Neck Ball End Mill

Total 69 sizes

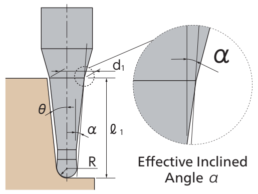
MUGEN COATING PREMIUM 3-Flute Long Taper Neck Ball End Mill

MG 3 45° 3D

3-flute with high helix angle and taper neck design for deep area milling with high efficiency



- Higher rigidity brought by taper neck than existing long neck.
- MUGEN COATING PREMIUM because of high heat resistance, realized long tool life for hardened steels.
- High effective machining achieved by NS original 3-flute design.



Prehardened Steel P ◎
Hardened Steel ~55 HRC H ◎
Hardened Steel ~65 HRC H ◎
Stainless Steel M ○
Titanium Alloy Heat Resistant Alloy S ○

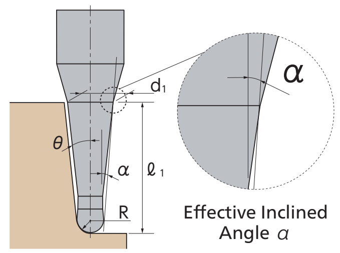
Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00590-05020	R0.5	30′	12	1.11	0.75	1.25	12°	0°15′	6	60
08-00590-05021			16	1.18	0.75	1.25	12°	0°19′	6	60
08-00590-05022			20	1.25	0.75	1.25	12°	0°21′	6	70
08-00590-05023			25	1.34	0.75	1.25	12°	0°23′	6	70
08-00590-05024			30	1.42	0.75	1.25	12°	0°24′	6	70
08-00590-05030		1°	12	1.30	0.75	1.25	12°	0°42′	6	60
08-00590-05031			16	1.44	0.75	1.25	12°	0°46′	6	60
08-00590-05032			20	1.58	0.75	1.25	12°	0°49′	6	70
08-00590-05033			25	1.75	0.75	1.25	12°	0°51′	6	70
08-00590-05034			30	1.93	0.75	1.25	12°	0°53′	6	70
08-00590-05040		1°30′	12	1.48	0.75	1.25	12°	1°09′	6	60
08-00590-05041			16	1.69	0.75	1.25	12°	1°14′	6	60
08-00590-05042			20	1.90	0.75	1.25	12°	1°17′	6	70
08-00590-05043			25	2.17	0.75	1.25	12°	1°20′	6	70
08-00590-05044			30	2.43	0.75	1.25	12°	1°21′	6	70
08-00590-05050		2°	20	2.23	0.75	1.25	12°	1°45′	6	70
08-00590-05051			30	2.93	0.75	1.25	12°	1°50′	6	70
08-00590-07520	R0.75	30′	12	1.58	1.1	1.85	12°	0°12′	6	60
08-00590-07521			16	1.65	1.1	1.85	12°	0°16′	6	60
08-00590-07523			20	1.72	1.1	1.85	12°	0°19′	6	70
08-00590-07524			25	1.81	1.1	1.85	12°	0°21′	6	70
08-00590-07525			30	1.90	1.1	1.85	12°	0°22′	6	70
08-00590-07530		1°	12	1.76	1.1	1.85	12°	0°37′	6	60
08-00590-07531			16	1.90	1.1	1.85	12°	0°43′	6	60
08-00590-07532			20	2.04	1.1	1.85	12°	0°46′	6	70
08-00590-07533			25	2.22	1.1	1.85	12°	0°49′	6	70
08-00590-07534			30	2.39	1.1	1.85	12°	0°51′	6	70
08-00590-07540		1°30′	20	2.36	1.1	1.85	12°	1°13′	6	70
08-00590-07541			30	2.88	1.1	1.85	12°	1°19′	6	70
08-00590-07552		2°	30	3.37	1.1	1.85	12°	1°47′	6	70

How to Order When you order, indicate MRBTNH345 (R)×(θ)×(ℓ1). ※(γ) is reference value.

Machining case S-023 S-024

Long Neck Tapered Ball Coating



Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00590-10020	R1	30′	12	2.06	1.5	2.5	12°	0°08′	6	60
08-00590-10021			16	2.13	1.5	2.5	12°	0°13′	6	60
08-00590-10022			20	2.20	1.5	2.5	12°	0°16′	6	70
08-00590-10023			25	2.28	1.5	2.5	12°	0°19′	6	70
08-00590-10024			30	2.37	1.5	2.5	12°	0°21′	6	70
08-00590-10025			40	2.54	1.5	2.5	12°	0°23′	6	80
08-00590-10030		1°	12	2.22	1.5	2.5	12°	0°31′	6	60
08-00590-10031			16	2.36	1.5	2.5	12°	0°38′	6	60
08-00590-10032			20	2.50	1.5	2.5	12°	0°43′	6	70
08-00590-10033			25	2.68	1.5	2.5	12°	0°46′	6	70
08-00590-10034			30	2.85	1.5	2.5	12°	0°48′	6	70
08-00590-10035			40	3.20	1.5	2.5	12°	0°51′	6	80
08-00590-10040		1°30′	20	2.81	1.5	2.5	12°	1°09′	6	70
08-00590-10041			25	3.07	1.5	2.5	12°	1°13′	6	70
08-00590-10042			30	3.33	1.5	2.5	12°	1°16′	6	70
08-00590-10043			40	3.85	1.5	2.5	12°	1°19′	6	80
08-00590-10050		2°	20	3.11	1.5	2.5	12°	1°35′	6	70
08-00590-10051			25	3.46	1.5	2.5	12°	1°40′	6	70
08-00590-10052			30	3.81	1.5	2.5	12°	1°43′	6	70
08-00590-10053			40	4.51	1.5	2.5	12°	1°47′	6	80
08-00590-15020	R1.5	30′	15	3.16	4.5	6	12°	0°18′	6	70
08-00590-15021			20	3.24	4.5	6	12°	0°21′	6	70
08-00590-15022			25	3.33	4.5	6	12°	0°22′	6	70
08-00590-15023			30	3.42	4.5	6	12°	0°24′	6	70
08-00590-15024			40	3.59	4.5	6	12°	0°25′	6	80
08-00590-15030		1°	15	3.31	4.5	6	12°	0°36′	6	70
08-00590-15031			20	3.49	4.5	6	12°	0°42′	6	70
08-00590-15032			25	3.66	4.5	6	12°	0°45′	6	70
08-00590-15033			30	3.84	4.5	6	12°	0°48′	6	70
08-00590-15034			40	4.19	4.5	6	12°	0°51′	6	80
08-00590-15040		1°30′	30	4.26	4.5	6	12°	1°12′	6	70
08-00590-15041			40	4.78	4.5	6	12°	1°16′	6	80
08-00590-15042			50	5.30	4.5	6	12°	1°19′	6	100
08-00590-15050		2°	30	4.68	4.5	6	12°	1°36′	6	70
08-00590-15051			40	5.37	4.5	6	12°	1°42′	6	80
08-00590-20031	R2	1°	30	4.77	6	8	12°	0°44′	6	80
08-00590-20032			40	5.12	6	8	12°	0°48′	6	80
08-00590-20033			50	5.47	6	8	12°	0°50′	6	100
08-00590-20034			65.2	–	6	8	–	0°53′	6	110

Regular Line
MUGEN PREMIUM
Long Neck Type

P Prehardened Steel ◎
H ~55 HRC Hardened Steel ◎
H ~65 HRC Hardened Steel ◎
M Stainless Steel ○
S Titanium Alloy Heat Resistant Alloy ○
Long Neck Tapered Ball Coating

MRBTNH345
Recommended Milling Conditions
Regular Line
MUGEN PREMIUM
Long Neck Type

P Prehardened Steel
H Hardened Steel ~55HRC
H Hardened Steel ~65HRC
M Stainless Steel
S Titanium Alloy Heat Resistant Alloy
Long Neck Tapered Ball Coating

Work Material			Hardened Steels SKD61・STAVAX (~52HRC)				Hardened Steels SKD11 (~62HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.5	30′	12	0.02	0.1	1,000	16,000	0.01	0.07	800	14,000
		16	0.01	0.1	600	12,000	0.005	0.07	500	10,000
		20	0.01	0.07	400	10,000	0.005	0.05	300	8,000
		25	0.005	0.05	300	8,000	0.003	0.03	250	6,000
		30	0.005	0.02	200	6,000	0.003	0.01	150	4,000
	1°	12	0.03	0.15	1,200	16,000	0.02	0.1	1,000	14,000
		16	0.02	0.15	700	12,000	0.01	0.1	600	10,000
		20	0.02	0.1	500	10,000	0.01	0.08	400	8,000
		25	0.01	0.08	400	8,000	0.008	0.06	300	6,000
		30	0.01	0.06	300	6,000	0.005	0.04	200	4,000
	1°30′	12	0.03	0.15	1,200	16,000	0.02	0.1	1,000	14,000
		16	0.02	0.15	700	12,000	0.01	0.1	600	10,000
		20	0.02	0.1	500	10,000	0.01	0.08	400	8,000
		25	0.01	0.08	400	8,000	0.008	0.06	300	6,000
		30	0.01	0.06	300	6,000	0.005	0.04	200	4,000
	2°	20	0.03	0.2	700	12,000	0.02	0.15	600	10,000
		30	0.02	0.1	500	8,000	0.01	0.08	400	6,000
0.75	30′	12	0.06	0.2	1,500	18,000	0.04	0.15	1,200	16,000
		16	0.04	0.2	1,200	16,000	0.02	0.15	950	14,000
		20	0.02	0.1	700	12,000	0.015	0.07	600	10,000
		25	0.01	0.1	500	9,000	0.01	0.07	350	7,000
		30	0.01	0.05	300	7,000	0.01	0.04	200	5,000
	1°	12	0.06	0.2	1,500	18,000	0.05	0.15	1,300	16,000
		16	0.04	0.2	1,200	16,000	0.04	0.15	1,000	14,000
		20	0.04	0.15	700	12,000	0.04	0.1	700	10,000
		25	0.03	0.15	600	9,000	0.01	0.1	400	7,000
		30	0.02	0.1	400	7,000	0.015	0.08	270	5,000
	1°30′	20	0.05	0.2	800	12,000	0.04	0.15	800	10,000
		30	0.03	0.1	400	7,000	0.02	0.1	350	5,000
	2°	30	0.04	0.2	500	7,000	0.03	0.15	400	6,000
1	30′	12	0.1	0.3	1,500	16,000	0.08	0.2	1,400	14,000
		16	0.1	0.3	1,200	12,000	0.08	0.2	1,000	10,000
		20	0.07	0.25	800	10,000	0.05	0.2	600	8,000
		25	0.07	0.2	600	8,500	0.05	0.15	500	6,500
		30	0.04	0.1	400	7,000	0.02	0.07	300	5,000
		40	0.02	0.07	300	5,000	0.01	0.05	200	4,000
	1°	12	0.1	0.3	1,500	16,000	0.08	0.25	1,400	14,000
		16	0.1	0.3	1,200	12,000	0.08	0.25	1,000	10,000
		20	0.08	0.25	1,000	10,000	0.06	0.2	800	8,000
		25	0.08	0.2	800	8,500	0.06	0.15	600	6,500
		30	0.07	0.15	600	7,000	0.04	0.1	400	5,000
		40	0.04	0.08	400	5,000	0.02	0.06	300	4,000
	1°30′	20	0.08	0.3	1,000	10,000	0.06	0.25	800	8,000
		25	0.08	0.2	800	8,500	0.06	0.15	600	6,500
		30	0.07	0.15	600	7,000	0.04	0.1	400	5,000
		40	0.04	0.08	400	5,000	0.02	0.06	300	4,000

Work Material			Hardened Steels SKD61・STAVAX (~52HRC)				Hardened Steels SKD11 (~62HRC)			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
1	2°	20	0.1	0.35	1,200	10,000	0.08	0.25	1,000	8,000
		25	0.1	0.3	1,000	8,000	0.08	0.2	800	6,500
		30	0.08	0.25	800	6,000	0.06	0.15	600	5,000
		40	0.05	0.1	500	4,000	0.03	0.08	400	4,000
1.5	30′	15	0.2	0.4	2,000	18,000	0.1	0.3	1,600	15,000
		20	0.1	0.3	1,500	14,000	0.07	0.2	1,200	12,000
		25	0.1	0.3	1,200	12,000	0.07	0.2	1,000	10,000
		30	0.07	0.2	1,000	8,500	0.05	0.1	700	7,000
		40	0.05	0.2	600	6,000	0.02	0.1	400	4,200
	1°	15	0.2	0.4	2,000	18,000	0.1	0.3	1,600	15,000
		20	0.1	0.3	1,500	16,000	0.08	0.2	1,200	12,000
		25	0.1	0.3	1,200	14,000	0.08	0.2	1,000	10,000
		30	0.08	0.2	1,000	10,000	0.06	0.15	800	7,000
		40	0.07	0.1	700	7,000	0.04	0.08	500	4,200
	1°30′	30	0.08	0.2	1,000	12,000	0.06	0.15	800	7,000
		40	0.07	0.1	700	8,000	0.04	0.08	500	4,200
		50	0.05	0.1	400	6,000	0.03	0.08	300	3,500
	2°	30	0.1	0.3	1,500	12,000	0.08	0.3	1,200	10,000
		40	0.08	0.2	800	8,000	0.06	0.2	600	7,000
2	1°	30	0.3	0.5	1,500	8,500	0.2	0.4	1,200	7,000
		40	0.2	0.5	1,200	6,000	0.1	0.4	1,000	5,000
		50	0.1	0.3	700	5,000	0.05	0.2	600	4,000
		65.2	0.07	0.2	400	4,000	0.03	0.1	300	3,000

Notes

※1 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※2 Coolant supply and chip disposal are important for machining deep-rib.
※3 We recommend using oil mist coolant.
※4 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.

MHRH230R

Size ϕ 0.2 × R0.02 ～ ϕ 0.9 × R0.1

Premium ≦65HRC

MHRH230R

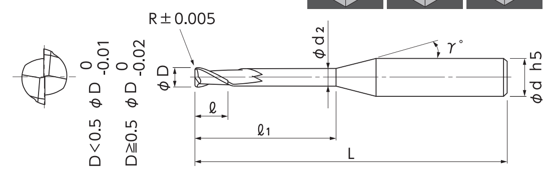
MUGEN COATING PREMIUM 2-Flute Long Neck Radius End Mill for Hardened Steel

Total 97 sizes

MUGEN COATING PREMIUM 2-Flute Long Neck Radius End Mill for Hardened Steel

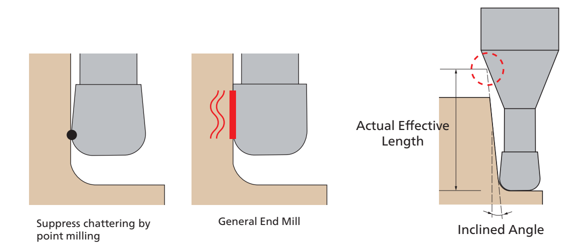
Long neck corner radius end mill
for prehardened steels and hardened steels(≦ 65HRC).
Maximum L/D=16

MG | 2 | 30° | Corner R ±0.005 | φd h5
Side | Slot | Face



- MUGEN COATING PREMIUM for hardened steels and unique new design excel in chipping prevention and resolve chattering to realize excellent finished surface.

[Neck Shape]
(γ) is reference value.Tool measurement required in order to avoid interference to the work material.



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00227-02021	0.2	R0.02	0.5	0.15	0.18	12°	4	45	0.56	0.59	0.62	0.65	0.71
08-00227-02023			1					45	1.09	1.13	1.19	1.24	1.38
08-00227-02025			1.5					45	1.61	1.68	1.76	1.84	2.04
08-00227-02027			2					45	2.13	2.22	2.33	2.44	2.71
08-00227-02051		R0.05	0.5					45	0.56	0.59	0.61	0.64	0.70
08-00227-02053			1					45	1.08	1.13	1.18	1.24	1.37
08-00227-02055			1.5					45	1.61	1.68	1.75	1.84	2.03
08-00227-02057			2					45	2.13	2.22	2.32	2.43	2.70
08-00227-03021	0.3	R0.02	1	0.25	0.28	12°	4	45	1.09	1.13	1.19	1.24	1.38
08-00227-03022			1.5					45	1.61	1.68	1.76	1.84	2.04
08-00227-03023			2					45	2.13	2.22	2.33	2.44	2.71
08-00227-03024			2.5					45	2.65	2.77	2.90	3.04	3.37
08-00227-03025			3					45	3.17	3.31	3.47	3.64	4.03
08-00227-03051		R0.05	1					45	1.08	1.13	1.18	1.24	1.37
08-00227-03052			1.5					45	1.61	1.68	1.75	1.84	2.03
08-00227-03053			2					45	2.13	2.22	2.32	2.43	2.70
08-00227-03054			2.5					45	2.65	2.77	2.89	3.03	3.36
08-00227-03055			3					45	3.17	3.31	3.46	3.63	4.02
08-00227-04021	0.4	R0.02	1	0.3	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.41
08-00227-04022			1.5					45	1.63	1.70	1.78	1.87	2.07
08-00227-04023			2					45	2.15	2.25	2.35	2.47	2.74
08-00227-04024			2.5					45	2.67	2.79	2.92	3.07	3.40
08-00227-04025			3					45	3.20	3.34	3.49	3.67	4.06
08-00227-04027			4					45	4.24	4.43	4.63	4.86	5.39
08-00227-04051		R0.05	1					45	1.11	1.16	1.21	1.27	1.40
08-00227-04052			1.5					45	1.63	1.70	1.78	1.86	2.06
08-00227-04053			2					45	2.15	2.25	2.35	2.46	2.73
08-00227-04054			2.5					45	2.67	2.79	2.92	3.06	3.39
08-00227-04055			3					45	3.19	3.34	3.49	3.66	4.05
08-00227-04057			4					45	4.24	4.43	4.63	4.86	5.38
08-00227-04101		R0.1	1					45	1.11	1.15	1.20	1.26	1.38
08-00227-04103			2					45	2.15	2.24	2.34	2.45	2.71
08-00227-04105			3					45	3.19	3.33	3.48	3.65	4.04
08-00227-04107			4					45	4.24	4.42	4.62	4.85	5.36
08-00227-05021	0.5	R0.02	1	0.4	0.46	12°	4	45	1.14	1.19	1.24	1.30	1.44
08-00227-05022			2					45	2.18	2.27	2.38	2.50	2.77
08-00227-05023			3					45	3.22	3.36	3.52	3.69	4.10
08-00227-05024			4					45	4.26	4.45	4.66	4.89	5.42
08-00227-05025			5					45	5.31	5.54	5.80	6.09	6.75
08-00227-05026			6					45	6.35	6.63	6.94	7.28	8.08
08-00227-05051		R0.05	1					45	1.13	1.18	1.24	1.29	1.43
08-00227-05052			2					45	2.18	2.27	2.38	2.49	2.76
08-00227-05053			3					45	3.22	3.36	3.52	3.69	4.09
08-00227-05054			4					45	4.26	4.45	4.66	4.88	5.41
08-00227-05055			5					45	5.31	5.54	5.80	6.08	6.74
08-00227-05056			6					45	6.35	6.63	6.94	7.28	8.07

How to Order When you order, indicate MHRH230R (D)×(R)×(ℓ1). ※(γ) is reference value.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00227-05101	0.5	R0.1	1	0.4	0.46	12°	4	45	1.13	1.18	1.23	1.28	1.41
08-00227-05102			2					45	2.17	2.27	2.37	2.48	2.74
08-00227-05103			3					45	3.22	3.36	3.51	3.68	4.07
08-00227-05104			4					45	4.26	4.45	4.65	4.87	5.40
08-00227-05105			5					45	5.30	5.54	5.79	6.07	6.72
08-00227-05106			6					45	6.35	6.63	6.93	7.27	8.05
08-00227-06021	0.6	R0.02	2	0.5	0.56	12°	4	45	2.18	2.27	2.38	2.50	2.77
08-00227-06023			4					45	4.26	4.45	4.66	4.89	5.42
08-00227-06025			6					45	6.35	6.63	6.94	7.28	8.08
08-00227-06027			8					50	8.43	8.81	9.22	9.68	10.73
08-00227-06029			10					50	10.52	10.99	11.50	12.07	13.39
08-00227-06051		R0.05	2					45	2.18	2.27	2.38	2.49	2.76
08-00227-06053			4					45	4.26	4.45	4.66	4.88	5.41
08-00227-06055			6					45	6.35	6.63	6.94	7.28	8.07
08-00227-06057			8					50	8.43	8.81	9.22	9.67	10.72
08-00227-06059			10					50	10.52	10.99	11.50	12.06	13.38
08-00227-06101		R0.1	2					45	2.17	2.27	2.37	2.48	2.74
08-00227-06103			4					45	4.26	4.45	4.65	4.87	5.40
08-00227-06105			6					45	6.35	6.63	6.93	7.27	8.05
08-00227-06107			8					50	8.43	8.80	9.21	9.66	10.71
08-00227-06109			10					50	10.52	10.98	11.49	12.05	13.36
08-00227-07020	0.7	R0.02	2	0.55	0.66	12°	4	45	2.18	2.27	2.38	2.50	2.77
08-00227-07021			4					45	4.26	4.45	4.66	4.89	5.42
08-00227-07023			6					45	6.35	6.63	6.94	7.28	8.08
08-00227-07050		R0.05	2					45	2.18	2.27	2.38	2.49	2.76
08-00227-07051			4					45	4.26	4.45	4.66	4.88	5.41
08-00227-07053			6					45	6.35	6.63	6.94	7.28	8.07
08-00227-07100		R0.1	2					45	2.17	2.27	2.37	2.48	2.74
08-00227-07101			4					45	4.26	4.45	4.65	4.87	5.40
08-00227-07103			6					45	6.35	6.63	6.93	7.27	8.05
08-00227-08020	0.8	R0.02	2	0.65	0.76	12°	4	45	2.18	2.27	2.38	2.50	2.77
08-00227-08021			4					45	4.26	4.45	4.66	4.89	5.42
08-00227-08023			6					45	6.35	6.63	6.94	7.28	8.08
08-00227-08025			8					50	8.43	8.81	9.22	9.68	10.73
08-00227-08050		R0.05	2					45	2.18	2.27	2.38	2.49	2.76
08-00227-08051			4					45	4.26	4.45	4.66	4.88	5.41
08-00227-08053			6					45	6.35	6.63	6.94	7.28	8.07
08-00227-08055			8					50	8.43	8.81	9.22	9.67	10.72
08-00227-08059			12					50	12.60	13.17	13.78	14.46	16.03
08-00227-08100		R0.1	2					45	2.17	2.27	2.37	2.48	2.74
08-00227-08101			4					45	4.26	4.45	4.65	4.87	5.40
08-00227-08103			6					45	6.35	6.63	6.93	7.27	8.05
08-00227-08105			8					50	8.43	8.80	9.21	9.66	10.71
08-00227-08109			12					50	12.60	13.16	13.77	14.45	16.01
08-00227-08200		R0.2	2					45	2.17	2.26	2.36	2.46	2.71
08-00227-08201			4					45	4.26	4.44	4.64	4.85	5.36
08-00227-08203			6					45	6.34	6.62	6.92	7.25	8.02
08-00227-08205			8					50	8.43	8.80	9.20	9.64	10.67
08-00227-08209			12					50	12.60	13.15	13.76	14.43	15.98
08-00227-09101	0.9	R0.1	4	0.7	0.85	12°	4	45	4.28	4.47	4.68	4.90	5.43
08-00227-09105			8					50	8.46	8.83	9.24	9.69	10.74

Regular Line MUGEN PREMIUM Long Neck Type
P Prehardened Steel
H ~55HRC Hardened Steel
H ~65HRC Hardened Steel
M Stainless Steel
S Titanium Alloy Heat Resistant Alloy
Long Neck Corner Radius Coating

MHRH230R

Recommended Milling Conditions

Work Material			Prehardened Steels HPM･NAK (~42HRC)				Hardened Steels HPM38･STAVAX･SKD61 (~55HRC)				Hardened Steels SKD11･PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
0.2	0.02	0.5	30,000	240	0.005	0.05	30,000	200	0.003	0.04	30,000	160	0.003	0.02	30,000	120	0.003	0.01
		1	30,000	180	0.005	0.05	30,000	150	0.003	0.04	30,000	120	0.002	0.02	30,000	80	0.002	0.01
		1.5	30,000	120	0.004	0.05	30,000	100	0.002	0.04	30,000	80	0.002	0.02	30,000	60	0.001	0.01
		2	30,000	70	0.003	0.05	30,000	50	0.002	0.04	30,000	40	0.001	0.02	30,000	30	0.001	0.01
	0.05	0.5	30,000	240	0.01	0.05	30,000	200	0.003	0.04	30,000	160	0.003	0.02	30,000	120	0.003	0.01
		1	30,000	180	0.007	0.05	30,000	150	0.003	0.04	30,000	120	0.003	0.02	30,000	80	0.003	0.01
		1.5	30,000	120	0.005	0.05	30,000	100	0.002	0.04	30,000	80	0.002	0.02	30,000	60	0.002	0.01
		2	30,000	70	0.003	0.05	30,000	50	0.002	0.04	30,000	40	0.002	0.02	30,000	30	0.002	0.01
0.3	0.02	1	30,000	350	0.015	0.1	30,000	300	0.003	0.08	30,000	250	0.003	0.04	30,000	200	0.003	0.03
		1.5	30,000	240	0.01	0.1	30,000	200	0.003	0.08	30,000	160	0.003	0.04	30,000	120	0.003	0.03
		2	30,000	180	0.007	0.1	30,000	150	0.003	0.08	30,000	120	0.003	0.04	25,000	100	0.003	0.03
		2.5	30,000	150	0.005	0.1	25,000	100	0.002	0.08	25,000	80	0.002	0.04	20,000	60	0.002	0.03
		3	30,000	70	0.004	0.1	25,000	50	0.002	0.08	25,000	40	0.002	0.04	20,000	30	0.002	0.03
	0.05	1	30,000	350	0.02	0.1	30,000	300	0.003	0.08	30,000	250	0.003	0.04	30,000	200	0.003	0.03
		1.5	30,000	240	0.015	0.1	30,000	200	0.003	0.08	30,000	160	0.003	0.04	30,000	120	0.003	0.03
		2	30,000	180	0.01	0.1	30,000	150	0.003	0.08	30,000	120	0.003	0.04	25,000	100	0.003	0.03
		2.5	30,000	150	0.007	0.1	25,000	100	0.002	0.08	25,000	80	0.002	0.04	20,000	60	0.002	0.03
		3	30,000	70	0.005	0.1	25,000	50	0.002	0.08	25,000	40	0.002	0.04	20,000	30	0.002	0.03
0.4	0.02	1	30,000	450	0.015	0.12	30,000	400	0.005	0.1	28,000	350	0.005	0.05	25,000	300	0.004	0.04
		1.5	30,000	400	0.012	0.12	30,000	350	0.005	0.1	28,000	300	0.005	0.05	25,000	260	0.004	0.04
		2	30,000	360	0.01	0.12	30,000	300	0.005	0.1	25,000	250	0.005	0.05	25,000	220	0.003	0.04
		2.5	30,000	340	0.008	0.12	28,000	280	0.004	0.1	25,000	240	0.004	0.05	20,000	180	0.003	0.04
		3	30,000	320	0.008	0.12	25,000	250	0.004	0.1	23,000	220	0.003	0.05	18,000	160	0.002	0.04
		4	30,000	250	0.006	0.12	25,000	200	0.003	0.1	20,000	160	0.002	0.05	18,000	120	0.002	0.04
	0.05	1	30,000	450	0.025	0.12	30,000	400	0.005	0.1	28,000	350	0.005	0.05	25,000	300	0.005	0.04
		1.5	30,000	400	0.022	0.12	30,000	350	0.005	0.1	28,000	300	0.005	0.05	25,000	260	0.005	0.04
		2	30,000	360	0.02	0.12	30,000	300	0.005	0.1	25,000	250	0.005	0.05	25,000	220	0.005	0.04
		2.5	30,000	340	0.015	0.12	28,000	280	0.004	0.1	25,000	240	0.004	0.05	20,000	180	0.004	0.04
		3	30,000	320	0.015	0.12	25,000	250	0.004	0.1	23,000	220	0.003	0.05	18,000	160	0.003	0.04
		4	30,000	250	0.01	0.12	25,000	200	0.003	0.1	20,000	160	0.002	0.05	18,000	120	0.002	0.04
	0.1	1	30,000	450	0.025	0.12	30,000	400	0.005	0.1	28,000	350	0.005	0.05	25,000	300	0.005	0.04
		2	30,000	360	0.02	0.12	30,000	300	0.005	0.1	25,000	250	0.005	0.05	25,000	220	0.005	0.04
		3	30,000	320	0.015	0.12	25,000	250	0.004	0.1	23,000	220	0.003	0.05	18,000	160	0.003	0.04
		4	30,000	250	0.01	0.12	25,000	200	0.003	0.1	20,000	160	0.002	0.05	18,000	120	0.002	0.04
0.5	0.02	1	30,000	600	0.016	0.14	25,000	500	0.008	0.15	23,000	450	0.006	0.1	20,000	400	0.004	0.08
		2	30,000	500	0.014	0.14	25,000	420	0.007	0.15	23,000	360	0.005	0.1	20,000	300	0.003	0.08
		3	30,000	420	0.012	0.14	25,000	350	0.006	0.15	23,000	320	0.004	0.1	20,000	280	0.003	0.08
		4	25,000	380	0.01	0.14	25,000	300	0.004	0.15	23,000	240	0.002	0.1	20,000	180	0.002	0.08
		5	25,000	300	0.008	0.14	20,000	200	0.003	0.15	18,000	150	0.002	0.1	16,000	100	0.002	0.08
		6	25,000	250	0.004	0.14	20,000	160	0.002	0.15	18,000	100	0.001	0.1	16,000	70	0.001	0.08
	0.05 0.1	1	30,000	600	0.03	0.14	25,000	500	0.01	0.15	23,000	450	0.007	0.1	20,000	400	0.005	0.08
		2	30,000	500	0.025	0.14	25,000	420	0.01	0.15	23,000	360	0.007	0.1	20,000	300	0.005	0.08
		3	30,000	420	0.02	0.14	25,000	350	0.008	0.15	23,000	320	0.005	0.1	20,000	280	0.003	0.08
		4	25,000	380	0.015	0.14	25,000	300	0.005	0.15	23,000	240	0.003	0.1	20,000	180	0.002	0.08
		5	25,000	300	0.01	0.14	20,000	200	0.004	0.15	18,000	150	0.003	0.1	16,000	100	0.002	0.08
		6	25,000	250	0.008	0.14	20,000	160	0.003	0.15	18,000	100	0.002	0.1	16,000	70	0.001	0.08

MHRH230R

Recommended Milling Conditions

Work Material			Prehardened Steels HPM･NAK (~42HRC)				Hardened Steels HPM38･STAVAX･SKD61 (~55HRC)				Hardened Steels SKD11･PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
0.6	0.02	2	30,000	600	0.016	0.2	25,000	500	0.012	0.2	23,000	400	0.006	0.15	20,000	320	0.004	0.1
		4	25,000	450	0.012	0.2	23,000	400	0.007	0.2	20,000	300	0.004	0.15	18,000	200	0.003	0.1
		6	23,000	300	0.008	0.2	20,000	200	0.005	0.2	18,000	150	0.003	0.15	12,000	100	0.002	0.1
		8	18,000	200	0.006	0.2	16,000	150	0.003	0.2	14,000	100	0.001	0.15	10,000	80	0.001	0.1
		10	16,000	120	0.003	0.2	14,000	100	0.001	0.2	12,000	80	0.001	0.15	8,000	50	0.001	0.1
	0.05 0.1	2	30,000	600	0.035	0.2	25,000	500	0.02	0.2	23,000	400	0.01	0.15	20,000	320	0.007	0.1
		4	25,000	450	0.025	0.2	23,000	400	0.015	0.2	20,000	300	0.007	0.15	18,000	200	0.005	0.1
		6	23,000	300	0.015	0.2	20,000	200	0.008	0.2	18,000	150	0.005	0.15	12,000	100	0.003	0.1
		8	18,000	200	0.01	0.2	16,000	150	0.005	0.2	14,000	100	0.002	0.15	10,000	80	0.001	0.1
		10	16,000	120	0.005	0.2	14,000	100	0.002	0.2	12,000	80	0.001	0.15	8,000	50	0.001	0.1
0.7	0.02	2	30,000	900	0.016	0.25	25,000	700	0.012	0.25	23,000	600	0.006	0.15	20,000	450	0.003	0.12
		4	28,000	700	0.012	0.25	25,000	600	0.008	0.25	23,000	500	0.005	0.15	20,000	350	0.002	0.12
		6	25,000	500	0.008	0.25	20,000	350	0.005	0.25	18,000	250	0.003	0.15	16,000	200	0.002	0.12
	0.05 0.1	2	30,000	900	0.04	0.25	25,000	700	0.03	0.25	23,000	600	0.015	0.15	20,000	450	0.01	0.12
		4	28,000	700	0.03	0.25	25,000	600	0.02	0.25	23,000	500	0.01	0.15	20,000	350	0.007	0.12
		6	25,000	500	0.02	0.25	20,000	350	0.01	0.25	18,000	250	0.007	0.15	16,000	200	0.005	0.12
0.8	0.02	2	28,000	1,000	0.016	0.3	25,000	800	0.014	0.25	23,000	700	0.006	0.16	20,000	500	0.005	0.14
		4	28,000	900	0.012	0.3	25,000	700	0.008	0.25	23,000	600	0.005	0.16	20,000	400	0.003	0.14
		6	23,000	700	0.009	0.3	20,000	550	0.006	0.25	18,000	450	0.004	0.16	16,000	320	0.002	0.14
		8	18,000	500	0.006	0.3	16,000	400	0.003	0.25	14,000	300	0.002	0.16	12,000	200	0.002	0.14
	0.05 0.1 0.2	2	28,000	1,000	0.05	0.3	25,000	800	0.03	0.25	23,000	700	0.02	0.16	20,000	500	0.015	0.14
		4	28,000	900	0.045	0.3	25,000	700	0.025	0.25	23,000	600	0.015	0.16	20,000	400	0.01	0.14
		6	23,000	700	0.03	0.3	20,000	550	0.02	0.25	18,000	450	0.01	0.16	16,000	320	0.007	0.14
		8	18,000	500	0.02	0.3	16,000	400	0.01	0.25	14,000	300	0.005	0.16	12,000	200	0.005	0.14
		12	16,000	300	0.007	0.3	14,000	200	0.005	0.25	12,000	120	0.003	0.16	10,000	80	0.001	0.14
0.9	0.1	4	25,000	1,100	0.05	0.3	25,000	850	0.03	0.3	20,000	700	0.02	0.2	18,000	600	0.01	0.15
		8	18,000	500	0.03	0.3	16,000	400	0.01	0.3	14,000	350	0.008	0.2	10,000	250	0.005	0.15

Notes

※1 Adjust milling conditions according to milling shape and machine type.
※2 ap : Axial Depth of Cut, ae : Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Recommend to apply helical or ramping for approaching into axial direction.
※5 Adjust feed rate 50% lower and cutting depth (ae) 30% lower for milling deep wall area when L/D exceeds 8 for stable milling.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

P Prehardened Steel
H Hardened Steel ~55HRC
H Hardened Steel ~65HRC
M Stainless Steel
S Titanium Alloy Heat Resistant Alloy
Long Neck Corner Radius Coating

Regular Line
MUGEN PREMIUM
Long Neck Type

MHRH430R

Size φ 0.1 × R0.01 ～ φ 6 × R1

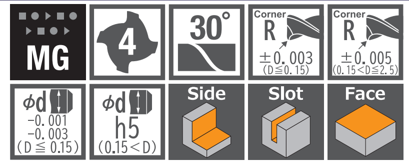
Premium ≦65 HRC

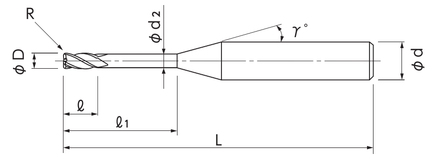
MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel

Total 336 sizes

Prehardened Steel P ◎
Hardened Steel ~55 HRC H ◎
Hardened Steel ~65 HRC H ◎
Stainless Steel M ○
Titanium Alloy Heat Resistant Alloy S ○

4-flute long neck corner radius end mill for prehardened steels and hardened steels(～65HRC). Maximum L/D=16





- MUGEN COATING PREMIUM for hardened steels and unique new design excel in chipping prevention and resolve chattering to realize excellent finished surface.
- 4 flutes end mill for higher efficiency.

Beware of stocks because there is no blade to the shaft center of end teeth of φ0.1 to φ0.3.

[Neck Shape]
(γ) is reference value.Tool measurement required in order to avoid interference to the work material.

Size	Diameter Tolerance	Corner R Tolerance	Shank Dia. Tolerance
D≦0.15	0 -0.007	±0.003	-0.001※ -0.003
0.15<D<0.5	0 -0.01	±0.005	h5
0.5≦D≦2.5	0 -0.02		
D>2.5		±0.01	

※Shank tolerance is h4(JIS), NS TOOL produces within 0.002mm from -0.001mm ～ -0.003mm.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00237-01013	0.1	R0.01	0.3	0.08	0.085	12°	4	45	0.34	0.36	0.38	0.39	0.44
08-00237-01015			0.5					45	0.55	0.58	0.60	0.63	0.70
08-00237-01512	0.15	R0.01	0.3	0.12	0.135	12°	4	45	0.34	0.36	0.38	0.39	0.44
08-00237-01513			0.5					45	0.55	0.58	0.60	0.63	0.70
08-00237-01515			0.75					45	0.81	0.85	0.89	0.93	1.03
08-00237-01517			1					45	1.07	1.12	1.17	1.23	1.37
08-00237-01522		R0.02	0.3					45	0.34	0.36	0.37	0.39	0.43
08-00237-01523			0.5					45	0.55	0.58	0.60	0.63	0.70
08-00237-01525			0.75					45	0.81	0.85	0.89	0.93	1.03
08-00237-01527			1					45	1.07	1.12	1.17	1.23	1.36
08-00237-02021	0.2	R0.02	0.5	0.15	0.18	12°	4	45	0.56	0.59	0.62	0.65	0.71
08-00237-02023			1					45	1.09	1.13	1.19	1.24	1.38
08-00237-02025			1.5					45	1.61	1.68	1.76	1.84	2.04
08-00237-02027			2					45	2.13	2.22	2.33	2.44	2.71
08-00237-02051		R0.05	0.5					45	0.56	0.59	0.61	0.64	0.70
08-00237-02053			1					45	1.08	1.13	1.18	1.24	1.37
08-00237-02055			1.5					45	1.61	1.68	1.75	1.84	2.03
08-00237-02057			2					45	2.13	2.22	2.32	2.43	2.70
08-00237-03021	0.3	R0.02	1	0.25	0.28	12°	4	45	1.09	1.13	1.19	1.24	1.38
08-00237-03022			1.5					45	1.61	1.68	1.76	1.84	2.04
08-00237-03023			2					45	2.13	2.22	2.33	2.44	2.71
08-00237-03024			2.5					45	2.65	2.77	2.90	3.04	3.37
08-00237-03025			3					45	3.17	3.31	3.47	3.64	4.03
08-00237-03051		R0.05	1					45	1.08	1.13	1.18	1.24	1.37
08-00237-03052			1.5					45	1.61	1.68	1.75	1.84	2.03
08-00237-03053			2					45	2.13	2.22	2.32	2.43	2.70
08-00237-03054			2.5					45	2.65	2.77	2.89	3.03	3.36
08-00237-03055			3					45	3.17	3.31	3.46	3.63	4.02
08-00237-04021	0.4	R0.02	1	0.3	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.41
08-00237-04022			1.5					45	1.63	1.70	1.78	1.87	2.07
08-00237-04023			2					45	2.15	2.25	2.35	2.47	2.74
08-00237-04024			2.5					45	2.67	2.79	2.92	3.07	3.40
08-00237-04025			3					45	3.20	3.34	3.49	3.67	4.06
08-00237-04027			4					45	4.24	4.43	4.63	4.86	5.39

How to Order — When you order, indicate MHRH430R (D)×(R)×(ℓ1). ※(γ) is reference value.

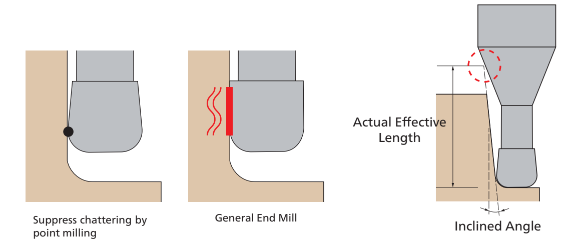
Machining case S-025

Long Neck Corner Radius Coating

Regular Line
MUGEN PREMIUM
Long Neck Type

MHRH430R

MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel



P Prehardened Steel ◎
H ~55 HRC Hardened Steel ◎
H ~65 HRC Hardened Steel ◎
M Stainless Steel ○
S Titanium Alloy Heat Resistant Alloy ○

Unit : mm

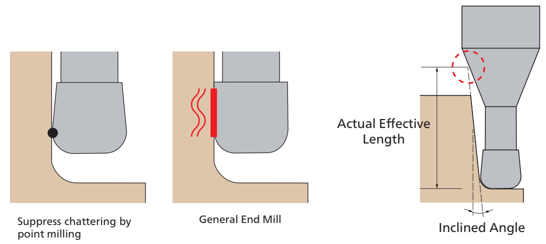
Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00237-04051	0.4	R0.05	1	0.3	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.40
08-00237-04052			1.5					45	1.63	1.70	1.78	1.86	2.06
08-00237-04053			2					45	2.15	2.25	2.35	2.46	2.73
08-00237-04054			2.5					45	2.67	2.79	2.92	3.06	3.39
08-00237-04055			3					45	3.19	3.34	3.49	3.66	4.05
08-00237-04057			4					45	4.24	4.43	4.63	4.86	5.38
08-00237-04101		R0.1	1					45	1.11	1.15	1.20	1.26	1.38
08-00237-04103			2					45	2.15	2.24	2.34	2.45	2.71
08-00237-04105			3					45	3.19	3.33	3.48	3.65	4.04
08-00237-04107			4					45	4.24	4.42	4.62	4.85	5.36
08-00237-05021	0.5	R0.02	1	0.4	0.46	12°	4	45	1.14	1.19	1.24	1.30	1.44
08-00237-05022			2					45	2.18	2.27	2.38	2.50	2.77
08-00237-05023			3					45	3.22	3.36	3.52	3.69	4.10
08-00237-05024			4					45	4.26	4.45	4.66	4.89	5.42
08-00237-05025			5					45	5.31	5.54	5.80	6.09	6.75
08-00237-05026			6					45	6.35	6.63	6.94	7.28	8.08
08-00237-05051		R0.05	1					45	1.13	1.18	1.24	1.29	1.43
08-00237-05052			2					45	2.18	2.27	2.38	2.49	2.76
08-00237-05053			3					45	3.22	3.36	3.52	3.69	4.09
08-00237-05054			4					45	4.26	4.45	4.66	4.88	5.41
08-00237-05055			5					45	5.31	5.54	5.80	6.08	6.74
08-00237-05056			6					45	6.35	6.63	6.94	7.28	8.07
08-00237-05101		R0.1	1					45	1.13	1.18	1.23	1.28	1.41
08-00237-05102			2					45	2.17	2.27	2.37	2.48	2.74
08-00237-05103			3					45	3.22	3.36	3.51	3.68	4.07
08-00237-05104			4					45	4.26	4.45	4.65	4.87	5.40
08-00237-05105			5					45	5.30	5.54	5.79	6.07	6.72
08-00237-05106			6					45	6.35	6.63	6.93	7.27	8.05
08-00237-06021	0.6	R0.02	2	0.5	0.56	12°	4	45	2.18	2.27	2.38	2.50	2.77
08-00237-06023			4					45	4.26	4.45	4.66	4.89	5.42
08-00237-06025			6					45	6.35	6.63	6.94	7.28	8.08
08-00237-06027			8					50	8.43	8.81	9.22	9.68	10.73
08-00237-06029			10					50	10.52	10.99	11.50	12.07	13.39
08-00237-06051		R0.05	2					45	2.18	2.27	2.38	2.49	2.76
08-00237-06053			4					45	4.26	4.45	4.66	4.88	5.41
08-00237-06055			6					45	6.35	6.63	6.94	7.28	8.07
08-00237-06057			8					50	8.43	8.81	9.22	9.67	10.72
08-00237-06059			10					50	10.52	10.99	11.50	12.06	13.38
08-00237-06101		R0.1	2					45	2.17	2.27	2.37	2.48	2.74
08-00237-06103			4					45	4.26	4.45	4.65	4.87	5.40
08-00237-06105			6					45	6.35	6.63	6.93	7.27	8.05
08-00237-06107			8					50	8.43	8.80	9.21	9.66	10.71
08-00237-06109			10					50	10.52	10.98	11.49	12.05	13.36
08-00237-07020	0.7	R0.02	2	0.55	0.66	12°	4	45	2.18	2.27	2.38	2.50	2.77
08-00237-07021			4					45	4.26	4.45	4.66	4.89	5.42
08-00237-07023			6					45	6.35	6.63	6.94	7.28	8.08
08-00237-07050		R0.05	2					45	2.18	2.27	2.38	2.49	2.76
08-00237-07051			4					45	4.26	4.45	4.66	4.88	5.41
08-00237-07053			6					45	6.35	6.63	6.94	7.28	8.07
08-00237-07100		R0.1	2					45	2.17	2.27	2.37	2.48	2.74
08-00237-07101			4					45	4.26	4.45	4.65	4.87	5.40
08-00237-07103			6					45	6.35	6.63	6.93	7.27	8.05
08-00237-08020	0.8	R0.02	2	0.65	0.76	12°	4	45	2.18	2.27	2.38	2.50	2.77
08-00237-08021			4					45	4.26	4.45	4.66	4.89	5.42
08-00237-08023			6					45	6.35	6.63	6.94	7.28	8.08
08-00237-08025			8					50	8.43	8.81	9.22	9.68	10.73

Long Neck Corner Radius Coating

MHRH430R

MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel

[Neck Shape]
(γ) is reference value.Tool measurement required in order to avoid interference to the work material.



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
08-00237-08050	0.8	R0.05	2	0.65	0.76	12°	4	45	2.18	2.27	2.38	2.49	2.76
08-00237-08051			4					45	4.26	4.45	4.66	4.88	5.41
08-00237-08053			6					45	6.35	6.63	6.94	7.28	8.07
08-00237-08055			8					50	8.43	8.81	9.22	9.67	10.72
08-00237-08059			12					50	12.60	13.17	13.78	14.46	16.03
08-00237-08100		R0.1	2					45	2.17	2.27	2.37	2.48	2.74
08-00237-08101			4					45	4.26	4.45	4.65	4.87	5.40
08-00237-08103			6					45	6.35	6.63	6.93	7.27	8.05
08-00237-08105			8					50	8.43	8.80	9.21	9.66	10.71
08-00237-08109			12					50	12.60	13.16	13.77	14.45	16.01
08-00237-08200		R0.2	2					45	2.17	2.26	2.36	2.46	2.71
08-00237-08201			4					45	4.26	4.44	4.64	4.85	5.36
08-00237-08203			6					45	6.34	6.62	6.92	7.25	8.02
08-00237-08205			8					50	8.43	8.80	9.20	9.64	10.67
08-00237-08209			12					50	12.60	13.15	13.76	14.43	15.98
08-00237-09101	0.9	R0.1	4	0.7	0.85	12°	4	45	4.28	4.47	4.68	4.90	5.43
08-00237-09105			8					50	8.46	8.83	9.24	9.69	10.74
08-00237-10028	1	R0.02	2	0.8	0.95	12°	4	50	2.20	2.30	2.41	2.52	2.80
08-00237-10020			3					50	3.25	3.39	3.55	3.72	4.13
08-00237-10021			4					50	4.29	4.48	4.69	4.92	5.45
08-00237-10022			5					50	5.33	5.57	5.83	6.11	6.78
08-00237-10023			6					50	6.37	6.66	6.97	7.31	8.11
08-00237-10025			8					50	8.46	8.84	9.25	9.70	10.76
08-00237-10027			10					50	10.54	11.02	11.53	12.10	13.42
08-00237-10058		R0.05	2					50	2.20	2.30	2.40	2.52	2.79
08-00237-10050			3					50	3.24	3.39	3.54	3.72	4.12
08-00237-10051			4					50	4.29	4.48	4.68	4.91	5.44
08-00237-10052			5					50	5.33	5.57	5.82	6.11	6.77
08-00237-10053			6					50	6.37	6.66	6.97	7.31	8.10
08-00237-10055			8					50	8.46	8.83	9.25	9.70	10.75
08-00237-10057			10					50	10.54	11.01	11.53	12.09	13.41
08-00237-10108		R0.1	2					50	2.20	2.29	2.40	2.51	2.77
08-00237-10100			3					50	3.24	3.38	3.54	3.71	4.10
08-00237-10101			4					50	4.28	4.47	4.68	4.90	5.43
08-00237-10102			5					50	5.33	5.56	5.82	6.10	6.75
08-00237-10103			6					50	6.37	6.65	6.96	7.30	8.08
08-00237-10105			8					50	8.46	8.83	9.24	9.69	10.74
08-00237-10107			10					50	10.54	11.01	11.52	12.08	13.39
08-00237-10208		R0.2	2					50	2.19	2.28	2.38	2.49	2.74
08-00237-10200			3					50	3.24	3.37	3.52	3.69	4.07
08-00237-10201			4					50	4.28	4.46	4.66	4.88	5.39
08-00237-10202			5					50	5.32	5.55	5.80	6.08	6.72
08-00237-10203			6					50	6.37	6.64	6.94	7.28	8.05
08-00237-10205			8					50	8.45	8.82	9.23	9.67	10.70
08-00237-10207			10					50	10.54	11.00	11.51	12.06	13.36
08-00237-10308		R0.3	2					50	2.19	2.28	2.37	2.47	2.71
08-00237-10300			3					50	3.23	3.36	3.51	3.67	4.03
08-00237-10301			4					50	4.28	4.45	4.65	4.86	5.36
08-00237-10302			5					50	5.32	5.54	5.79	6.06	6.69
08-00237-10303			6					50	6.36	6.63	6.93	7.26	8.02
08-00237-10305			8					50	8.45	8.81	9.21	9.65	10.67
08-00237-10307			10					50	10.53	10.99	11.49	12.04	13.33
08-00237-12101	1.2	R0.1	5	1	1.14	12°	4	50	5.35	5.59	5.84	6.13	6.79
08-00237-12103			10					50	10.57	11.03	11.55	12.11	13.42
08-00237-12201		R0.2	5					50	5.35	5.58	5.83	6.11	6.75
08-00237-12203			10					50	10.56	11.03	11.53	12.09	13.39
08-00237-12301		R0.3	5					50	5.34	5.57	5.82	6.09	6.72
08-00237-12303			10					50	10.56	11.02	11.52	12.07	13.36

How to Order When you order, indicate MHRH430R (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case S-025

MHRH430R

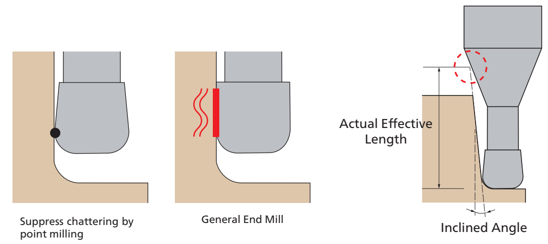
MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
08-00237-15020	1.5	R0.02	3	1.2	1.43	12°	4	50	3.29	3.44	3.60	3.78	4.19
08-00237-15021			4					50	4.34	4.53	4.74	4.97	5.52
08-00237-15023			6					50	6.42	6.71	7.02	7.37	8.17
08-00237-15025			8					50	8.51	8.89	9.30	9.76	10.82
08-00237-15027			12					50	12.68	13.25	13.87	14.55	16.13
08-00237-15029			15					50	15.81	16.51	17.29	18.14	20.12
08-00237-15050		R0.05	3					50	3.29	3.44	3.60	3.77	4.18
08-00237-15051			4					50	4.34	4.53	4.74	4.97	5.51
08-00237-15053			6					50	6.42	6.71	7.02	7.36	8.16
08-00237-15055			8					50	8.51	8.89	9.30	9.75	10.82
08-00237-15057			12					50	12.68	13.24	13.86	14.54	16.12
08-00237-15059			15					50	15.81	16.51	17.28	18.13	20.11
08-00237-15100		R0.1	3					50	3.29	3.43	3.59	3.76	4.16
08-00237-15101			4					50	4.33	4.52	4.73	4.96	5.49
08-00237-15103			6					50	6.42	6.70	7.01	7.35	8.14
08-00237-15105			8					50	8.50	8.88	9.29	9.75	10.80
08-00237-15107			12					50	12.68	13.24	13.85	14.53	16.11
08-00237-15109			15					60	15.80	16.51	17.28	18.12	20.09
08-00237-15200		R0.2	3					50	3.29	3.42	3.58	3.74	4.13
08-00237-15201			4					50	4.33	4.51	4.72	4.94	5.46
08-00237-15203			6					50	6.42	6.69	7.00	7.33	8.11
08-00237-15205			8					50	8.50	8.87	9.28	9.73	10.77
08-00237-15207			12					50	12.67	13.23	13.84	14.51	16.08
08-00237-15209			15					60	15.80	16.50	17.26	18.10	20.06
08-00237-15300		R0.3	3					50	3.28	3.42	3.56	3.72	4.10
08-00237-15301			4					50	4.33	4.51	4.70	4.92	5.42
08-00237-15303			6					50	6.41	6.68	6.98	7.31	8.08
08-00237-15305			8					50	8.50	8.86	9.26	9.71	10.73
08-00237-15307			12					50	12.67	13.22	13.83	14.49	16.04
08-00237-15309			15					60	15.80	16.49	17.25	18.08	20.02
08-00237-15500		R0.5	3					50	3.27	3.40	3.53	3.68	4.03
08-00237-15501			4					50	4.32	4.49	4.67	4.88	5.36
08-00237-15503			6					50	6.40	6.67	6.96	7.27	8.01
08-00237-15505			8					50	8.49	8.85	9.24	9.67	10.67
08-00237-15507			12					50	12.66	13.20	13.80	14.45	15.98
08-00237-15509			15					60	15.79	16.47	17.22	18.04	19.96
08-00237-20020	2	R0.02	4	1.6	1.91	12°	4	50	4.39	4.58	4.80	5.03	5.58
08-00237-20021			6					50	6.47	6.76	7.08	7.42	8.23
08-00237-20023			8					50	8.56	8.94	9.36	9.82	10.89
08-00237-20025			12					50	12.73	13.30	13.92	14.60	16.20
08-00237-20027			16					60	16.90	17.66	18.48	19.39	21.51
08-00237-20029			20					60	21.07	22.01	23.04	24.18	Free
08-00237-20050		R0.05	4					50	4.38	4.58	4.79	5.02	5.57
08-00237-20051			6					50	6.47	6.76	7.07	7.42	8.22
08-00237-20053			8					50	8.56	8.94	9.35	9.81	10.88
08-00237-20055			12					50	12.73	13.29	13.92	14.60	16.19
08-00237-20057			16					60	16.90	17.65	18.48	19.38	21.50
08-00237-20059			20					60	21.07	22.01	23.04	24.17	Free
08-00237-20100		R0.1	4					50	4.38	4.57	4.78	5.02	5.55
08-00237-20101			6					50	6.47	6.75	7.07	7.41	8.21
08-00237-20103			8					50	8.55	8.93	9.35	9.80	10.86
08-00237-20105			12					50	12.73	13.29	13.91	14.59	16.17
08-00237-20107			16					60	16.90	17.65	18.47	19.37	21.48
08-00237-20109			20					60	21.07	22.01	23.03	24.16	Free
08-00237-20200		R0.2	4					50	4.38	4.57	4.77	5.00	5.52
08-00237-20201			6					50	6.46	6.74	7.05	7.39	8.17
08-00237-20203			8					50	8.55	8.92	9.33	9.78	10.83
08-00237-20205			12					50	12.72	13.28	13.89	14.57	16.14
08-00237-20207			16					60	16.89	17.64	18.46	19.35	21.45
08-00237-20209			20					60	21.06	22.00	23.02	24.14	Free
08-00237-20300		R0.3	4					50	4.37	4.56	4.76	4.98	5.49
08-00237-20301			6					50	6.46	6.74	7.04	7.37	8.14
08-00237-20303			8					50	8.55	8.91	9.32	9.76	10.80
08-00237-20305			12					50	12.72	13.27	13.88	14.55	16.10
08-00237-20307			16					60	16.89	17.63	18.44	19.33	21.41
08-00237-20309			20					60	21.06	21.99	23.00	24.12	Free
08-00237-20500		R0.5	4					50	4.37	4.54	4.73	4.94	5.42
08-00237-20501			6					50	6.45	6.72	7.01	7.33	8.08
08-00237-20503			8					50	8.54	8.90	9.29	9.72	10.73
08-00237-20505			12					50	12.71	13.25	13.85	14.51	16.04
08-00237-20507			16					60	16.88	17.61	18.41	19.30	21.35
08-00237-20509			20					60	21.05	21.97	22.98	24.08	Free

MHRH430R

MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel

[Neck Shape]
(γ) is reference value.Tool measurement required in order to avoid interference to the work material.

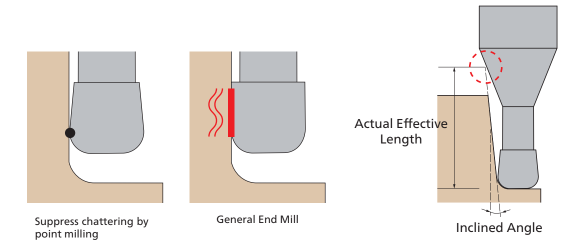


Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00237-25101	2.5	R0.1	10	2	2.39	12°	4	50	10.69	11.16	11.68	12.25	13.58
08-00237-25103			20					60	21.12	22.06	23.09	24.22	Free
08-00237-25105			30					70	31.54	32.95	34.49	Free	Free
08-00237-25201		R0.2	10					50	10.68	11.15	11.67	12.23	13.55
08-00237-25203			20					60	21.11	22.05	23.07	24.20	Free
08-00237-25205			30					70	31.54	32.94	34.48	Free	Free
08-00237-25301		R0.3	10					50	10.68	11.14	11.65	12.21	13.51
08-00237-25303			20					60	21.11	22.04	23.06	24.18	Free
08-00237-25305			30					70	31.54	32.93	34.46	Free	Free
08-00237-25501		R0.5	10					50	10.67	11.13	11.62	12.17	13.45
08-00237-25503			20					60	21.10	22.02	23.03	24.14	Free
08-00237-25505			30					70	31.53	32.92	34.43	Free	Free
08-00237-30058	3	R0.05	4	2.5	2.85	12°	6	50	4.53	4.73	4.95	5.19	5.76
08-00237-30050			6					50	6.62	6.91	7.23	7.59	8.41
08-00237-30051			8					50	8.70	9.09	9.51	9.98	11.06
08-00237-30053			12					50	12.87	13.45	14.08	14.77	16.37
08-00237-30055			16					60	17.05	17.81	18.64	19.55	21.68
08-00237-30057			20					60	21.22	22.16	23.20	24.34	26.99
08-00237-30112		R0.1	4					50	4.53	4.73	4.95	5.18	5.74
08-00237-30100			6					50	6.62	6.91	7.23	7.58	8.39
08-00237-30101			8					50	8.70	9.09	9.51	9.97	11.05
08-00237-30103			12					50	12.87	13.44	14.07	14.76	16.36
08-00237-30105			16					60	17.04	17.80	18.63	19.54	21.67
08-00237-30107			20					60	21.21	22.16	23.19	24.33	26.98
08-00237-30109			25					70	26.43	27.61	28.90	30.31	Free
08-00237-30111			30					70	31.64	33.05	34.60	36.30	Free
08-00237-30212		R0.2	4					50	4.53	4.72	4.93	5.16	5.71
08-00237-30200			6					50	6.61	6.90	7.21	7.56	8.36
08-00237-30201			8					50	8.70	9.08	9.49	9.95	11.02
08-00237-30203			12					50	12.87	13.44	14.06	14.74	16.32
08-00237-30205			16					60	17.04	17.79	18.62	19.52	21.63
08-00237-30207			20					60	21.21	22.15	23.18	24.31	26.94
08-00237-30209			25					70	26.42	27.60	28.88	30.29	Free
08-00237-30211			30					70	31.64	33.05	34.58	36.28	Free
08-00237-30312		R0.3	4					50	4.52	4.71	4.92	5.14	5.67
08-00237-30300			6					50	6.61	6.89	7.20	7.54	8.33
08-00237-30301			8					50	8.69	9.07	9.48	9.93	10.98
08-00237-30303			12					50	12.86	13.43	14.04	14.72	16.29
08-00237-30305			16					60	17.04	17.78	18.60	19.50	21.60
08-00237-30307			20					60	21.21	22.14	23.17	24.29	26.91
08-00237-30309			25					70	26.42	27.59	28.87	30.27	Free
08-00237-30311			30					70	31.63	33.04	34.57	36.26	Free
08-00237-30512		R0.5	4					50	4.51	4.69	4.89	5.11	5.61
08-00237-30500			6					50	6.60	6.87	7.17	7.50	8.26
08-00237-30501			8					50	8.68	9.05	9.45	9.89	10.92
08-00237-30503			12					50	12.86	13.41	14.01	14.68	16.23
08-00237-30505			16					60	17.03	17.77	18.58	19.46	21.54
08-00237-30507			20					60	21.20	22.12	23.14	24.25	26.84
08-00237-30509			25					70	26.41	27.57	28.84	30.23	Free
08-00237-30511			30					70	31.63	33.02	34.54	36.22	Free
08-00237-31001		R1	8					50	8.66	9.01	9.38	9.79	10.75
08-00237-31003			12					50	12.83	13.36	13.94	14.58	16.06
08-00237-31005			16					60	17.01	17.72	18.50	19.37	21.37
08-00237-31007			20					60	21.18	22.08	23.07	24.15	26.68
08-00237-31009			25					70	26.39	27.53	28.77	30.14	33.32
08-00237-31011			30					70	31.60	32.97	34.47	36.12	Free

How to Order When you order, indicate MHRH430R (D)×(R)×(ℓ1). ※(γ) is reference value. Machining case S-025

MHRH430R
MUGEN COATING PREMIUM 4-Flute Long Neck Radius End Mill for Hardened Steel



Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00237-40106	4	R0.1	8	3.2	3.8	12°	6	60	8.82	9.21	9.64	10.11	11.20
08-00237-40100			12					60	13.00	13.57	14.20	14.90	16.51
08-00237-40101			16					60	17.17	17.93	18.77	19.68	21.82
08-00237-40103			24					70	25.51	26.65	27.89	29.26	Free
08-00237-40105			32					70	33.85	35.36	37.01	Free	Free
08-00237-40206		R0.2	8					60	8.82	9.21	9.63	10.09	11.17
08-00237-40200			12					60	12.99	13.56	14.19	14.88	16.48
08-00237-40201			16					60	17.16	17.92	18.75	19.66	21.79
08-00237-40203			24					70	25.50	26.64	27.88	29.24	Free
08-00237-40205			32					70	33.85	35.35	37.00	Free	Free
08-00237-40306		R0.3	8					60	8.82	9.20	9.61	10.07	11.14
08-00237-40300			12					60	12.99	13.55	14.18	14.86	16.45
08-00237-40301			16					60	17.16	17.91	18.74	19.64	21.76
08-00237-40303			24					70	25.50	26.63	27.86	29.22	Free
08-00237-40305			32					70	33.84	35.34	36.99	Free	Free
08-00237-40506		R0.5	8					60	8.81	9.18	9.59	10.03	11.07
08-00237-40500			12					60	12.98	13.54	14.15	14.82	16.38
08-00237-40501			16					60	17.15	17.89	18.71	19.61	21.69
08-00237-40503			24					70	25.49	26.61	27.83	29.18	Free
08-00237-40505			32					70	33.83	35.33	36.96	Free	Free
08-00237-41006		R1	8					60	8.79	9.13	9.52	9.93	10.91
08-00237-41000			12					60	12.96	13.49	14.08	14.72	16.22
08-00237-41001			16					60	17.13	17.85	18.64	19.51	21.53
08-00237-41003			24					70	25.47	26.57	27.76	29.08	Free
08-00237-41005			32					70	33.81	35.28	36.89	Free	Free
08-00237-50100	5	R0.1	15	4	4.75	12°	6	70	16.25	16.97	17.76	18.63	Free
08-00237-50101			20					70	21.46	22.42	23.46	Free	Free
08-00237-50103			40					90	42.32	Free	Free	Free	Free
08-00237-50200		R0.2	15					70	16.24	16.96	17.75	18.61	Free
08-00237-50201			20					70	21.46	22.41	23.45	Free	Free
08-00237-50203			40					90	42.31	Free	Free	Free	Free
08-00237-50300		R0.3	15					70	16.24	16.95	17.73	18.59	Free
08-00237-50301			20					70	21.45	22.40	23.43	Free	Free
08-00237-50303			40					90	42.31	Free	Free	Free	Free
08-00237-50500		R0.5	15					70	16.23	16.93	17.70	18.55	Free
08-00237-50501			20					70	21.44	22.38	23.41	Free	Free
08-00237-50503			40					90	42.30	Free	Free	Free	Free
08-00237-51000		R1	15					70	16.21	16.89	17.63	18.45	Free
08-00237-51001			20					70	21.42	22.34	23.34	Free	Free
08-00237-51003			40					90	42.28	Free	Free	Free	Free
08-00237-60104	6	R0.1	12	5	5.7	–	6	70	Free	Free	Free	Free	Free
08-00237-60100			18					90	Free	Free	Free	Free	Free
08-00237-60101			24					90	Free	Free	Free	Free	Free
08-00237-60103			48					110	Free	Free	Free	Free	Free
08-00237-60204		R0.2	12					70	Free	Free	Free	Free	Free
08-00237-60200			18					90	Free	Free	Free	Free	Free
08-00237-60201			24					90	Free	Free	Free	Free	Free
08-00237-60203			48					110	Free	Free	Free	Free	Free
08-00237-60304		R0.3	12					70	Free	Free	Free	Free	Free
08-00237-60300			18					90	Free	Free	Free	Free	Free
08-00237-60301			24					90	Free	Free	Free	Free	Free
08-00237-60303			48					110	Free	Free	Free	Free	Free
08-00237-60504		R0.5	12					70	Free	Free	Free	Free	Free
08-00237-60500			18					90	Free	Free	Free	Free	Free
08-00237-60501			24					90	Free	Free	Free	Free	Free
08-00237-60503			48					110	Free	Free	Free	Free	Free
08-00237-61004		R1	12					70	Free	Free	Free	Free	Free
08-00237-61000			18					90	Free	Free	Free	Free	Free
08-00237-61001			24					90	Free	Free	Free	Free	Free
08-00237-61003			48					110	Free	Free	Free	Free	Free

MHRH430R

Recommended Milling Conditions

Work Material			Prehardened Steels HPM・NAK (~42HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Corner Radius	Under Neck Length	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm
0.1	0.01	0.3	40,000	240	0.004	0.03	40,000	200	0.003	0.02	40,000	160	0.002	0.01	40,000	120	0.002	0.01
		0.5	40,000	180	0.003	0.03	40,000	150	0.002	0.02	40,000	120	0.001	0.01	40,000	90	0.001	0.01
0.15	0.01	0.3	40,000	360	0.004	0.04	40,000	300	0.003	0.03	40,000	240	0.002	0.015	40,000	180	0.002	0.01
		0.5	40,000	240	0.004	0.04	40,000	200	0.003	0.03	40,000	160	0.002	0.015	40,000	120	0.002	0.01
		0.75	40,000	180	0.003	0.04	40,000	150	0.002	0.03	40,000	120	0.001	0.015	40,000	90	0.001	0.01
		1	40,000	100	0.003	0.04	40,000	80	0.002	0.03	40,000	65	0.001	0.015	40,000	50	0.001	0.01
	0.02	0.3	40,000	360	0.004	0.04	40,000	300	0.003	0.03	40,000	240	0.002	0.015	40,000	180	0.002	0.01
		0.5	40,000	240	0.004	0.04	40,000	200	0.003	0.03	40,000	160	0.002	0.015	40,000	120	0.002	0.01
		0.75	40,000	180	0.003	0.04	40,000	150	0.002	0.03	40,000	120	0.001	0.015	40,000	90	0.001	0.01
		1	40,000	100	0.003	0.04	40,000	80	0.002	0.03	40,000	65	0.001	0.015	40,000	50	0.001	0.01
0.2	0.02	0.5	30,000	480	0.005	0.05	30,000	400	0.003	0.04	30,000	320	0.003	0.02	30,000	240	0.003	0.01
		1	30,000	360	0.005	0.05	30,000	300	0.003	0.04	30,000	240	0.002	0.02	30,000	160	0.002	0.01
		1.5	30,000	240	0.004	0.05	30,000	200	0.002	0.04	30,000	160	0.002	0.02	30,000	120	0.001	0.01
		2	30,000	140	0.003	0.05	30,000	100	0.002	0.04	30,000	80	0.001	0.02	30,000	60	0.001	0.01
	0.05	0.5	30,000	480	0.01	0.05	30,000	400	0.003	0.04	30,000	320	0.003	0.02	30,000	240	0.003	0.01
		1	30,000	360	0.007	0.05	30,000	300	0.003	0.04	30,000	240	0.003	0.02	30,000	160	0.003	0.01
		1.5	30,000	240	0.005	0.05	30,000	200	0.002	0.04	30,000	160	0.002	0.02	30,000	120	0.002	0.01
		2	30,000	140	0.003	0.05	30,000	100	0.002	0.04	30,000	80	0.002	0.02	30,000	60	0.002	0.01
0.3	0.02	1	30,000	700	0.015	0.1	30,000	600	0.003	0.08	30,000	500	0.003	0.04	30,000	400	0.003	0.03
		1.5	30,000	480	0.01	0.1	30,000	400	0.003	0.08	30,000	320	0.003	0.04	30,000	240	0.003	0.03
		2	30,000	360	0.007	0.1	30,000	300	0.003	0.08	30,000	240	0.003	0.04	25,000	200	0.003	0.03
		2.5	30,000	300	0.005	0.1	25,000	200	0.002	0.08	25,000	160	0.002	0.04	20,000	120	0.002	0.03
		3	30,000	140	0.004	0.1	25,000	100	0.002	0.08	25,000	80	0.002	0.04	20,000	60	0.002	0.03
	0.05	1	30,000	700	0.02	0.1	30,000	600	0.003	0.08	30,000	500	0.003	0.04	30,000	400	0.003	0.03
		1.5	30,000	480	0.015	0.1	30,000	400	0.003	0.08	30,000	320	0.003	0.04	30,000	240	0.003	0.03
		2	30,000	360	0.01	0.1	30,000	300	0.003	0.08	30,000	240	0.003	0.04	25,000	200	0.003	0.03
		2.5	30,000	300	0.007	0.1	25,000	200	0.002	0.08	25,000	160	0.002	0.04	20,000	120	0.002	0.03
		3	30,000	140	0.005	0.1	25,000	100	0.002	0.08	25,000	80	0.002	0.04	20,000	60	0.002	0.03
0.4	0.02	1	30,000	900	0.015	0.12	30,000	800	0.005	0.1	28,000	700	0.005	0.05	25,000	600	0.004	0.04
		1.5	30,000	800	0.012	0.12	30,000	700	0.005	0.1	28,000	600	0.005	0.05	25,000	520	0.004	0.04
		2	30,000	720	0.01	0.12	30,000	600	0.005	0.1	25,000	500	0.005	0.05	25,000	440	0.003	0.04
		2.5	30,000	680	0.008	0.12	28,000	560	0.004	0.1	25,000	480	0.004	0.05	20,000	360	0.003	0.04
		3	30,000	640	0.008	0.12	25,000	500	0.004	0.1	23,000	440	0.003	0.05	18,000	320	0.002	0.04
		4	30,000	500	0.006	0.12	25,000	400	0.003	0.1	20,000	320	0.002	0.05	18,000	240	0.002	0.04
	0.05	1	30,000	900	0.025	0.12	30,000	800	0.005	0.1	28,000	700	0.005	0.05	25,000	600	0.005	0.04
		1.5	30,000	800	0.022	0.12	30,000	700	0.005	0.1	28,000	600	0.005	0.05	25,000	520	0.005	0.04
		2	30,000	720	0.02	0.12	30,000	600	0.005	0.1	25,000	500	0.005	0.05	25,000	440	0.005	0.04
		2.5	30,000	680	0.015	0.12	28,000	560	0.004	0.1	25,000	480	0.004	0.05	20,000	360	0.004	0.04
		3	30,000	640	0.015	0.12	25,000	500	0.004	0.1	23,000	440	0.003	0.05	18,000	320	0.003	0.04
		4	30,000	500	0.01	0.12	25,000	400	0.003	0.1	20,000	320	0.002	0.05	18,000	240	0.002	0.04
	0.1	1	30,000	900	0.025	0.12	30,000	800	0.005	0.1	28,000	700	0.005	0.05	25,000	600	0.005	0.04
		2	30,000	720	0.02	0.12	30,000	600	0.005	0.1	25,000	500	0.005	0.05	25,000	440	0.005	0.04
		3	30,000	640	0.015	0.12	25,000	500	0.004	0.1	23,000	440	0.003	0.05	18,000	320	0.003	0.04
		4	30,000	500	0.01	0.12	25,000	400	0.003	0.1	20,000	320	0.002	0.05	18,000	240	0.002	0.04
0.5	0.02	1	30,000	1,200	0.016	0.14	25,000	1,000	0.008	0.15	23,000	900	0.006	0.1	20,000	800	0.004	0.08
		2	30,000	1,000	0.014	0.14	25,000	840	0.007	0.15	23,000	720	0.005	0.1	20,000	600	0.003	0.08
		3	30,000	840	0.012	0.14	25,000	700	0.006	0.15	23,000	640	0.004	0.1	20,000	560	0.003	0.08
		4	25,000	760	0.01	0.14	25,000	600	0.004	0.15	23,000	480	0.002	0.1	20,000	360	0.002	0.08
		5	25,000	600	0.008	0.14	20,000	400	0.003	0.15	18,000	300	0.002	0.1	16,000	200	0.002	0.08
		6	25,000	500	0.004	0.14	20,000	320	0.002	0.15	18,000	200	0.001	0.1	16,000	140	0.001	0.08
	0.05 0.1	1	30,000	1,200	0.03	0.14	25,000	1,000	0.01	0.15	23,000	900	0.007	0.1	20,000	800	0.005	0.08
		2	30,000	1,000	0.025	0.14	25,000	840	0.01	0.15	23,000	720	0.007	0.1	20,000	600	0.005	0.08
		3	30,000	840	0.02	0.14	25,000	700	0.008	0.15	23,000	640	0.005	0.1	20,000	560	0.003	0.08
		4	25,000	760	0.015	0.14	25,000	600	0.005	0.15	23,000	480	0.003	0.1	20,000	360	0.002	0.08
		5	25,000	600	0.01	0.14	20,000	400	0.004	0.15	18,000	300	0.003	0.1	16,000	200	0.002	0.08
		6	25,000	500	0.008	0.14	20,000	320	0.003	0.15	18,000	200	0.002	0.1	16,000	140	0.001	0.08
0.6	0.02	2	30,000	1,200	0.016	0.2	25,000	1,000	0.012	0.2	23,000	800	0.006	0.15	20,000	640	0.004	0.1
		4	25,000	900	0.012	0.2	23,000	800	0.007	0.2	20,000	600	0.004	0.15	18,000	400	0.003	0.1
		6	23,000	600	0.008	0.2	20,000	400	0.005	0.2	18,000	300	0.003	0.15	12,000	200	0.002	0.1
		8	18,000	400	0.006	0.2	16,000	300	0.003	0.2	14,000	200	0.001	0.15	10,000	160	0.001	0.1
		10	16,000	240	0.003	0.2	14,000	200	0.001	0.2	12,000	160	0.001	0.15	8,000	100	0.001	0.1
	0.05 0.1	2	30,000	1,200	0.035	0.2	25,000	1,000	0.02	0.2	23,000	800	0.01	0.15	20,000	640	0.007	0.1
		4	25,000	900	0.025	0.2	23,000	800	0.015	0.2	20,000	600	0.007	0.15	18,000	400	0.005	0.1
		6	23,000	600	0.015	0.2	20,000	400	0.008	0.2	18,000	300	0.005	0.15	12,000	200	0.003	0.1
		8	18,000	400	0.01	0.2	16,000	300	0.005	0.2	14,000	200	0.002	0.15	10,000	160	0.001	0.1
		10	16,000	240	0.005	0.2	14,000	200	0.002	0.2	12,000	160	0.001	0.15	8,000	100	0.001	0.1

Regular Line
MUGEN PREMIUM
Long Neck Type

MHRH430R

Recommended Milling Conditions

Work Material			Prehardened Steels HPM・NAK (~42HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Hardened Steels SKD11・PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Corner Radius	Under Neck Length	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min^{-1}	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm
0.7	0.02	2	30,000	1,800	0.016	0.25	25,000	1,400	0.012	0.25	23,000	1,200	0.006	0.15	20,000	900	0.003	0.12
		4	28,000	1,400	0.012	0.25	25,000	1,200	0.008	0.25	23,000	1,000	0.005	0.15	20,000	700	0.002	0.12
		6	25,000	1,000	0.008	0.25	20,000	700	0.005	0.25	18,000	500	0.003	0.15	16,000	400	0.002	0.12
	0.05 0.1	2	30,000	1,800	0.04	0.25	25,000	1,400	0.03	0.25	23,000	1,200	0.015	0.15	20,000	900	0.01	0.12
		4	28,000	1,400	0.03	0.25	25,000	1,200	0.02	0.25	23,000	1,000	0.01	0.15	20,000	700	0.007	0.12
		6	25,000	1,000	0.02	0.25	20,000	700	0.01	0.25	18,000	500	0.007	0.15	16,000	400	0.005	0.12
0.8	0.02	2	28,000	2,000	0.016	0.3	25,000	1,600	0.014	0.25	23,000	1,400	0.006	0.16	20,000	1,000	0.005	0.14
		4	28,000	1,800	0.012	0.3	25,000	1,400	0.008	0.25	23,000	1,200	0.005	0.16	20,000	800	0.003	0.14
		6	23,000	1,400	0.009	0.3	20,000	1,100	0.006	0.25	18,000	900	0.004	0.16	16,000	650	0.002	0.14
		8	18,000	1,000	0.006	0.3	16,000	800	0.003	0.25	14,000	600	0.002	0.16	12,000	400	0.002	0.14
	0.05 0.1 0.2	2	28,000	2,000	0.05	0.3	25,000	1,600	0.03	0.25	23,000	1,400	0.02	0.16	20,000	1,000	0.015	0.14
		4	28,000	1,800	0.045	0.3	25,000	1,400	0.025	0.25	23,000	1,200	0.015	0.16	20,000	800	0.01	0.14
		6	23,000	1,400	0.03	0.3	20,000	1,100	0.02	0.25	18,000	900	0.01	0.16	16,000	650	0.007	0.14
		8	18,000	1,000	0.02	0.3	16,000	800	0.01	0.25	14,000	600	0.005	0.16	12,000	400	0.005	0.14
		12	16,000	600	0.007	0.3	14,000	400	0.005	0.25	12,000	240	0.003	0.16	10,000	160	0.001	0.14
0.9	0.1	4	25,000	2,200	0.05	0.3	25,000	1,700	0.03	0.3	20,000	1,400	0.02	0.2	18,000	1,200	0.01	0.15
		8	18,000	1,000	0.03	0.3	16,000	800	0.01	0.3	14,000	700	0.008	0.2	10,000	500	0.005	0.15
1	0.02	2	30,000	2,800	0.016	0.35	25,000	2,300	0.012	0.3	21,000	2,000	0.01	0.25	17,000	1,400	0.008	0.2
		3	28,000	2,500	0.016	0.35	23,000	2,100	0.012	0.3	20,000	1,800	0.01	0.25	16,000	1,300	0.008	0.2
		4	25,000	2,200	0.014	0.35	21,000	1,800	0.01	0.3	18,000	1,500	0.008	0.25	14,000	1,100	0.005	0.2
		5	23,000	1,900	0.012	0.35	19,000	1,600	0.008	0.3	16,000	1,400	0.005	0.25	13,000	1,000	0.003	0.2
		6	20,000	1,700	0.01	0.35	16,000	1,400	0.008	0.3	14,000	1,200	0.005	0.25	11,000	850	0.003	0.2
		8	18,000	1,400	0.008	0.35	15,000	1,100	0.006	0.3	13,000	900	0.005	0.25	10,000	650	0.002	0.2
		10	16,000	1,000	0.006	0.35	13,000	800	0.004	0.3	11,000	700	0.003	0.25	9,000	500	0.002	0.2
	0.05 0.1 0.2 0.3	2	30,000	2,800	0.065	0.35	25,000	2,300	0.05	0.3	21,000	2,000	0.04	0.25	17,000	1,400	0.03	0.2
		3	28,000	2,500	0.06	0.35	23,000	2,100	0.05	0.3	20,000	1,800	0.04	0.25	16,000	1,300	0.03	0.2
		4	25,000	2,200	0.055	0.35	21,000	1,800	0.04	0.3	18,000	1,500	0.03	0.25	14,000	1,100	0.02	0.2
		5	23,000	1,900	0.05	0.35	19,000	1,600	0.03	0.3	16,000	1,400	0.02	0.25	13,000	1,000	0.01	0.2
		6	20,000	1,700	0.045	0.35	16,000	1,400	0.02	0.3	14,000	1,200	0.01	0.25	11,000	850	0.007	0.2
		8	18,000	1,400	0.035	0.35	15,000	1,100	0.015	0.3	13,000	900	0.008	0.25	10,000	650	0.005	0.2
		10	16,000	1,000	0.025	0.35	13,000	800	0.01	0.3	11,000	700	0.006	0.25	9,000	500	0.005	0.2
1.2	0.1 0.2 0.3	5	24,000	2,200	0.06	0.45	20,000	1,800	0.045	0.4	17,000	1,500	0.03	0.3	14,000	1,100	0.02	0.2
		10	16,000	1,400	0.04	0.45	13,000	1,100	0.03	0.4	11,000	950	0.01	0.3	9,000	700	0.005	0.2
1.5	0.02	3	28,000	2,800	0.016	0.55	23,000	2,300	0.012	0.5	20,000	2,000	0.01	0.4	16,000	1,400	0.008	0.3
		4	25,000	2,400	0.016	0.55	21,000	2,000	0.012	0.5	18,000	1,700	0.01	0.4	14,000	1,200	0.008	0.3
		6	23,000	2,200	0.014	0.55	19,000	1,800	0.01	0.5	16,000	1,500	0.008	0.4	13,000	1,100	0.005	0.3
		8	20,000	1,800	0.014	0.55	16,000	1,500	0.01	0.5	14,000	1,300	0.008	0.4	11,000	900	0.003	0.3
		12	16,000	1,400	0.012	0.55	13,000	1,100	0.008	0.5	11,000	950	0.005	0.4	9,000	650	0.002	0.3
		15	14,000	1,000	0.008	0.55	11,000	800	0.005	0.5	9,000	700	0.003	0.4	7,000	500	0.002	0.3
	0.05 0.1 0.2 0.3 0.5	3	28,000	2,800	0.1	0.55	23,000	2,300	0.05	0.5	20,000	2,000	0.04	0.4	16,000	1,400	0.03	0.3
		4	25,000	2,400	0.08	0.55	21,000	2,000	0.05	0.5	18,000	1,700	0.04	0.4	14,000	1,200	0.03	0.3
		6	23,000	2,200	0.08	0.55	19,000	1,800	0.045	0.5	16,000	1,500	0.03	0.4	13,000	1,100	0.02	0.3
		8	20,000	1,800	0.06	0.55	16,000	1,500	0.04	0.5	14,000	1,300	0.025	0.4	11,000	900	0.01	0.3
		12	16,000	1,400	0.06	0.55	13,000	1,100	0.03	0.5	11,000	950	0.02	0.4	9,000	650	0.007	0.3
		15	14,000	1,000	0.03	0.55	11,000	800	0.02	0.5	9,000	700	0.007	0.4	7,000	500	0.005	0.3
2	0.02	4	24,000	2,800	0.02	0.7	20,000	2,300	0.015	0.6	17,000	2,000	0.012	0.5	14,000	1,400	0.008	0.35
		6	22,000	2,500	0.018	0.7	18,000	2,100	0.015	0.6	15,000	1,800	0.012	0.5	12,000	1,300	0.008	0.35
		8	20,000	2,200	0.016	0.7	16,000	1,800	0.012	0.6	14,000	1,500	0.01	0.5	11,000	1,100	0.005	0.35
		12	16,000	1,700	0.014	0.7	13,000	1,400	0.01	0.6	11,000	1,200	0.008	0.5	9,000	850	0.003	0.35
		16	14,000	1,400	0.012	0.7	11,000	1,100	0.008	0.6	9,500	950	0.005	0.5	7,500	650	0.002	0.35
		20	10,000	800	0.01	0.7	8,000	650	0.005	0.6	7,000	550	0.003	0.5	5,500	400	0.002	0.35

MHRH430R

Recommended Milling Conditions

Work Material			Prehardened Steels HPM•NAK (~42HRC)				Hardened Steels HPM38•STAVAX•SKD61 (~55HRC)				Hardened Steels SKD11•PD613 (~62HRC)				High Speed Steels SKH (~65HRC)			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
2	0.05 0.1 0.2 0.3 0.5	4	24,000	2,800	0.13	0.7	20,000	2,300	0.06	0.6	17,000	2,000	0.05	0.5	14,000	1,400	0.03	0.35
		6	22,000	2,500	0.12	0.7	18,000	2,100	0.06	0.6	15,000	1,800	0.05	0.5	12,000	1,300	0.03	0.35
		8	20,000	2,200	0.11	0.7	16,000	1,800	0.05	0.6	14,000	1,500	0.04	0.5	11,000	1,100	0.02	0.35
		12	16,000	1,700	0.09	0.7	13,000	1,400	0.04	0.6	11,000	1,200	0.03	0.5	9,000	850	0.01	0.35
		16	14,000	1,400	0.07	0.7	11,000	1,100	0.03	0.6	9,500	950	0.02	0.5	7,500	650	0.007	0.35
		20	10,000	800	0.05	0.7	8,000	650	0.02	0.6	7,000	550	0.01	0.5	5,500	400	0.005	0.35
2.5	0.1 0.2 0.3 0.5	10	16,000	2,200	0.14	0.85	13,000	1,800	0.07	0.7	11,000	1,500	0.05	0.5	9,000	1,100	0.03	0.5
		20	11,000	1,400	0.08	0.85	9,000	1,100	0.04	0.7	7,500	950	0.02	0.5	6,000	650	0.01	0.5
		30	7,000	800	0.03	0.85	5,500	650	0.01	0.7	4,500	550	0.01	0.5	3,500	400	0.005	0.5
3	0.05	4	18,000	2,800	0.18	1	15,000	2,300	0.1	0.8	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6
		6	16,000	2,500	0.17	1	13,000	2,100	0.1	0.8	11,000	1,800	0.07	0.7	9,000	1,300	0.05	0.6
		8	14,000	2,200	0.16	1	11,000	1,800	0.1	0.8	9,500	1,500	0.07	0.7	7,500	1,100	0.05	0.6
		12	13,500	2,000	0.16	1	11,000	1,600	0.08	0.8	9,500	1,400	0.06	0.7	7,500	1,000	0.04	0.6
		16	12,000	1,800	0.14	1	10,000	1,500	0.07	0.8	8,500	1,300	0.05	0.7	7,000	900	0.03	0.6
		20	10,000	1,400	0.12	1	8,000	1,100	0.05	0.8	7,000	950	0.04	0.7	5,500	700	0.02	0.6
	0.1 0.2 0.3 0.5	4	18,000	2,800	0.18	1	15,000	2,300	0.1	0.8	13,000	2,000	0.07	0.7	10,000	1,400	0.05	0.6
		6	16,000	2,500	0.17	1	13,000	2,100	0.1	0.8	11,000	1,800	0.07	0.7	9,000	1,300	0.05	0.6
		8	14,000	2,200	0.16	1	11,000	1,800	0.1	0.8	9,500	1,500	0.07	0.7	7,500	1,100	0.05	0.6
		12	13,500	2,000	0.16	1	11,000	1,600	0.08	0.8	9,500	1,400	0.06	0.7	7,500	1,000	0.04	0.6
		16	12,000	1,800	0.14	1	10,000	1,500	0.07	0.8	8,500	1,300	0.05	0.7	7,000	900	0.03	0.6
		20	10,000	1,400	0.12	1	8,000	1,100	0.05	0.8	7,000	950	0.04	0.7	5,500	700	0.02	0.6
		25	9,000	1,200	0.08	1	7,500	1,000	0.04	0.8	6,500	850	0.02	0.7	5,000	600	0.01	0.6
		30	8,000	800	0.06	1	6,500	650	0.03	0.8	5,500	550	0.02	0.7	4,500	400	0.007	0.6
	1	8	14,000	2,200	0.16	1	11,000	1,800	0.1	0.8	9,500	1,500	0.07	0.7	7,500	1,100	0.05	0.6
		12	13,500	2,000	0.16	1	11,000	1,600	0.08	0.8	9,500	1,400	0.06	0.7	7,500	1,000	0.04	0.6
		16	12,000	1,800	0.14	1	10,000	1,500	0.07	0.8	8,500	1,300	0.05	0.7	7,000	900	0.03	0.6
		20	10,000	1,400	0.12	1	8,000	1,100	0.05	0.8	7,000	950	0.04	0.7	5,500	700	0.02	0.6
		25	9,000	1,200	0.08	1	7,500	1,000	0.04	0.8	6,500	850	0.02	0.7	5,000	600	0.01	0.6
		30	8,000	800	0.06	1	6,500	650	0.03	0.8	5,500	550	0.02	0.7	4,500	400	0.007	0.6
4	0.1 0.2 0.3 0.5 1	8	12,000	2,600	0.25	1.4	10,000	2,100	0.15	1.2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8
		12	12,000	2,600	0.25	1.4	10,000	2,100	0.15	1.2	8,500	1,800	0.08	1	7,000	1,300	0.06	0.8
		16	10,000	2,200	0.17	1.4	8,000	1,800	0.1	1.2	7,000	1,500	0.06	1	5,500	1,100	0.05	0.8
		24	8,000	1,600	0.14	1.4	6,500	1,300	0.08	1.2	5,500	1,100	0.05	1	4,500	750	0.03	0.8
		32	6,500	1,300	0.08	1.4	5,500	1,100	0.04	1.2	4,500	950	0.02	1	3,500	650	0.01	0.8
5	0.1 0.2 0.3 0.5 1	15	9,500	2,400	0.25	2.2	8,000	2,000	0.15	2	7,000	1,700	0.08	1.6	5,500	1,200	0.06	1.2
		20	8,000	2,000	0.18	2.2	6,500	1,600	0.1	2	5,500	1,400	0.07	1.6	4,500	1,000	0.05	1.2
		40	5,000	1,200	0.09	2.2	4,000	1,000	0.05	2	3,500	850	0.02	1.6	3,000	600	0.01	1.2
6	0.1 0.2 0.3 0.5 1	12	8,000	2,500	0.35	2.7	6,500	2,100	0.18	2.5	5,500	1,800	0.08	2	4,500	1,300	0.06	1.5
		18	7,000	2,200	0.3	2.7	5,500	1,800	0.18	2.5	4,500	1,500	0.08	2	3,500	1,100	0.06	1.5
		24	6,000	1,800	0.2	2.7	5,000	1,500	0.15	2.5	4,000	1,300	0.07	2	3,000	900	0.05	1.5
		48	3,000	900	0.1	2.7	2,500	750	0.05	2.5	2,000	650	0.03	2	2,000	450	0.02	1.5

Notes

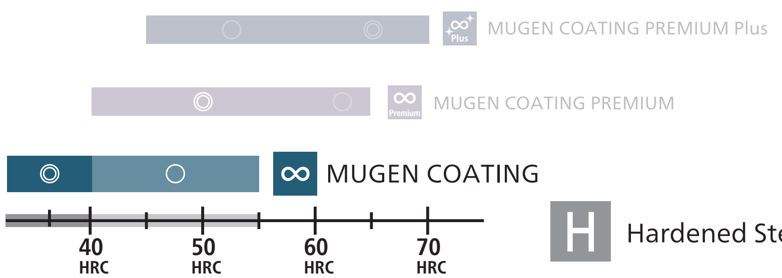
※1 Adjust milling conditions according to milling shape and machine type.
※2 ap : Axial Depth of Cut, ae : Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Recommend to apply helical or ramping for approaching into axial direction.
※5 Adjust feed rate 50% lower and cutting depth (ae) 30% lower for milling deep wall area when L/D exceeds 8 for stable milling.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Abundant variations support machining on different work materials

Progressive evolution of MUGEN COATING

MUGEN COATING have high wear resistance and lubricity for tempered steel, raw materials, and copper or so.
In addition, this excellent coating is compatible with various coolants, water-soluble and insoluble cutting oils, air blowers, and oil mist.

Range of NS TOOL original coating by work material hardness



- H Hardened Steel
- P Alloy steel Prehardened Steel
- M Stainless Steel
- N Aluminium alloy Copper

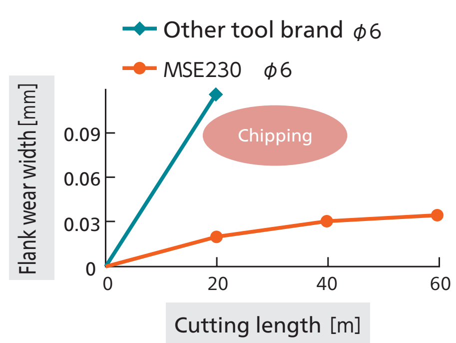
S50C

Tool wear after cutting length 20m

MSE230 $\phi 6$

Other tool brand

n : 3,400min[-1]	vf : 600mm/min	ap 9 × ae 1.2 mm
Water soluble fluid	Machining time : 100 min	Machining length : 60 m

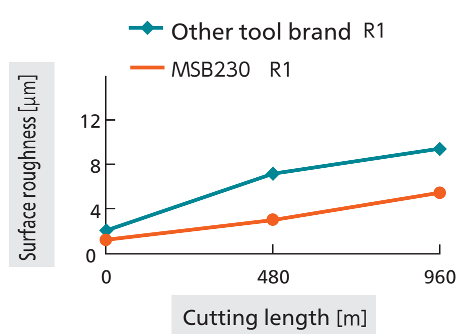


Copper

MSB230 R1

Other tool brand

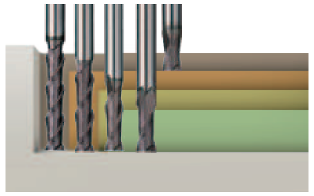
n : 20,000min[-1]	vf : 2,000mm/min	ap 0.05 × ae 0.05 mm
Water soluble fluid	Machining time : 9 hr	Machining length : 960 m

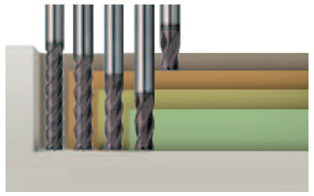


Extensive lineup for various machining shapes

MX Series

Square Multi variations satisfy different machining depth of machining



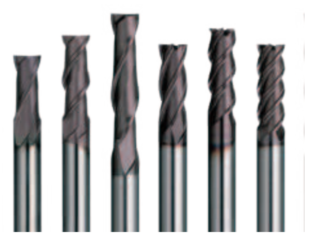


MX □ □

- Number of flute: 2 : 2-flute, 4 : 4-flute
- Helix angle: 25 : Helix 25°, 30 : Helix 30°, 35 : Helix 35°, 40 : Helix 40°, 45 : Helix 45°

MSE Series

Square Many variations in the number of flute, diameter, helix angle, and cutting length are available for multiplied machining operations



MSE □ □ □ □

- M : Medium length of cut
- Helix angle: 30 : Helix 30° 45 : Helix 45°
- Number of flute: 2 : 2-flute 3 : 3-flute 4 : 4-flute
- SS : Short length of cut L/D=1
- P : Sharp edge
- M : Actual diameter indicated

MSB Series

Ball Numerous lineups based on the long-selling MSB230

MSB □ □ □ □

- L : Long shank
- XL : Extra long shank
- G2 : R accuracy ±0.002
- S : Short type
- SF : Compatible for shrink fit
- Number of flute: 2 : 2-flute 3 : 3-flute
- Helix angle: 30 : Helix 30° 45 : Helix 45°

MSRS Series

Corner Radius Standard corner radius end mill for multiple applications from roughing to finishing

MSRS230 $\phi 1 \times R0.1 \sim \phi 6 \times R2$
Total 38 sizes

MSRS430 $\phi 1 \times R0.1 \sim \phi 12 \times R3$
Total 64 sizes

Abundant variations support machining on different work materials

		Model	Maximum cutting depth L/D	Size	Number of flute	Features
Long neck	Square	MHR230	30	ϕ0.1 ～ ϕ 6	2	2-Flute long neck square end mill
		MHR430	20	ϕ1.0 ～ ϕ10	4	4-Flute long neck square end mill
		MHRLN230-6	12.5	ϕ0.3 ～ ϕ 2	2	2-Flute long neck square end mill shank dia. 6
	Ball	MRB230	22	R0.05 ～ R3	2	2-Flute long neck ball end mill Total 282 sizes
		MRB230SF	10	R0.1 ～ R1.5	2	2-Flute long neck ball end mill with short shank
		MRBLN230-6	10	R0.15 ～ R1	2	2-Flute long neck ball end mill shank dia. 6
	Corner radius	MHR230R	20	ϕ0.2 × R0.05 ～ ϕ6 × R1	2	2-Flute long neck corner radius end mill
		MHR430R	12.5	ϕ1 × R0.05 ～ ϕ6 × R1	4	4-Flute long neck corner radius end mill
Long Neck Tapered	Ball	MRBTN230	36	R0.1 × neck taper angle 30' ～ R2 × neck taper angle 1°	2	Tools with the same neck angle as the inclination angle of the machined surface can be used
		MRBTN230L	80	R0.1 × neck taper angle 30' ～ R5 × neck taper angle 1°30'	2	
	Corner radius	MSTNR230	35	ϕ0.2 × R0.05 × neck taper angle 1° ～ ϕ3 × R0.5 × neck taper angle 1°	2	2-Flute long neck tapered corner radius end mill

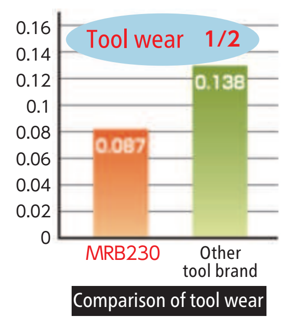
STAVAX 52HRC (SUS420J2)

MRB230 R1 × 10

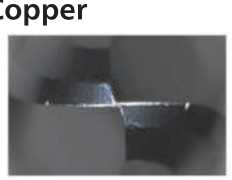
Other tool brand

n : 10,000min^{-1} vf : 1,500mm/min ap 0.1 × ae 0.2 mm

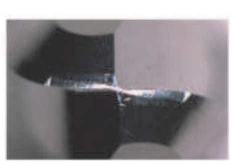
Water soluble fluid Machining time : 132 min Machining length : 150 m



Copper



MRB230 R1 × 20

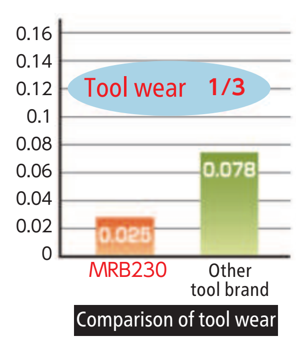


Other tool brand

Roughing n : 12,000min^{-1} vf : 1,200mm/min ap 0.2 × ae 0.3 mm

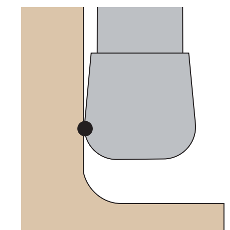
Finishing n : 5,000min^{-1} vf : 700mm/min ap 0.05 × ae 0.03 mm

Water soluble fluid Machining time : 8 hr 54 min

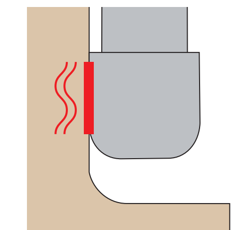


Back tapered design on peripheral cutting edge MHR230R / MHR430R

When the peripheral cutting edge contacts the workpiece surface, the increased cutting load causes chattering vibration, which affects tool life and workpiece surface quality. The back tapered design reduces this effect



Suppress chattering by point milling

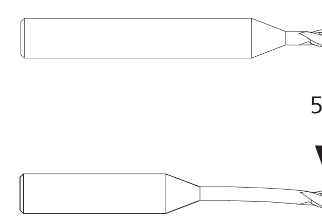


General End Mill

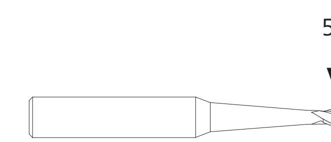
Rigidness of long neck tapered shape

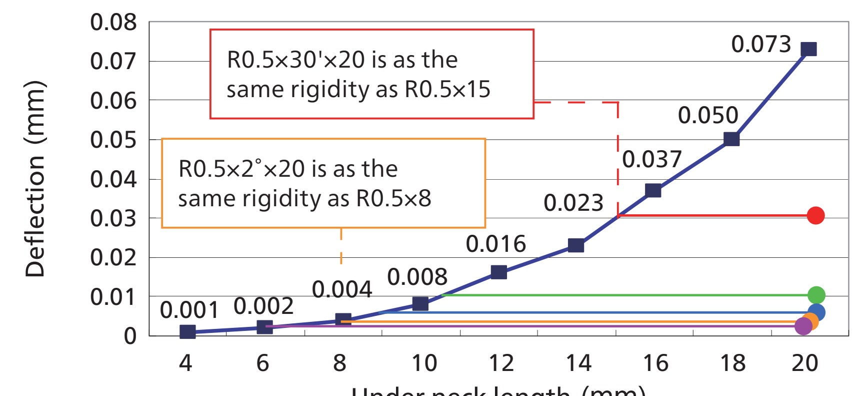
Measureing the amount of deflection with 50g load on the tip of the tool

Long neck ball end mill
MRB230 R0.5×4～20



Long neck tapered ball end mill
MRBTN230 R0.5×30'×20
R0.5×1° ×20
R0.5×1°30' ×20
R0.5×2° ×20
R0.5×3° ×20





Abundant variations support machining on different work materials

Square

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
MX	MX225	ϕ0.3 ~ ϕ12	1D	∞	2	25°	Side	Slot	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	19	G-012
	For various work materials. L/D=1. Best for slotting with high rigidity short length of cut																							
MX	MX230	ϕ0.1 ~ ϕ12	2D	∞	2	30°	Side	Slot	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	65	G-014
	For various work materials. L/D=2. Applicable to both slotting and side milling																							
MX	MX235	ϕ0.1 ~ ϕ12	3D	∞	2	35°	Side	Slot	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	65	G-016
	For various work materials. L/D=3. Applicable to both slotting and side milling																							
MX	MX240	ϕ0.3 ~ ϕ12	4D	∞	2	40°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	63	G-018
	For various work materials. L/D=4. For side milling only																							
MX	MX245	ϕ0.3 ~ ϕ12	5D	∞	2	45°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	19	G-020
	For various work materials. L/D=5. For side milling only																							
MX	MX425	ϕ1 ~ ϕ12	1D	∞	4	25°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-022
	For various work materials. L/D=1. Suitable for side milling with 4-flute																							
MX	MX430	ϕ1 ~ ϕ12	2D	∞	4	30°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-024
	For various work materials. L/D=2. Suitable for side milling with 4-flute																							
MX	MX435	ϕ1 ~ ϕ12	3D	∞	4	35°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-026
	For various work materials. L/D=3. Suitable for side milling with 4-flute																							

Square

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
MX	MX440	ϕ1 ~ ϕ12	4D	∞	4	40°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-028
	For various work materials. L/D=4. Suitable for side milling with 4-flute																							
MX	MX445	ϕ1 ~ ϕ12	5D	∞	4	45°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-030
	For various work materials. L/D=5. Suitable for side milling with 4-flute																							
MSE	MSE230SS	ϕ0.1 ~ ϕ6	1D	∞	2	30°	Side	Slot	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	61	G-032
	L/D=1. High rigidity with short length of cut. Suitable for slotting process																							
MSE	MSES230P	ϕ0.1 ~ ϕ12	≒2D	∞	2	30°	Side	Slot	Face	◎	◎	◎	-	-	-	○	-	○	○	○	-	-	26	G-036
	Sharp edge type with 2-flute and helix angle 30°																							
MSE	MSE230	ϕ0.1 ~ ϕ12	≒2.5D	∞	2	30°	Side	Slot	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	101	G-038
	Standard type of 2-flute with helix angle 30°. For multi-purpose from roughing to finishing																							
MSE	MSEM230	ϕ0.5 ~ ϕ12	4D	∞	2	30°	Side	-	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-042
	Standard type of 2-flute with helix angle 30°. L/D=4																							
MSE	MSE230M	ϕ0.1 ~ ϕ6	≒2.5D	∞	2	30°	Side	Slot	Face	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-044
	Indicated actual mesuremed diameter in micron on the label. Suitable for high accurate finishing																							
MSE	MSE245	ϕ2 ~ ϕ12	≒2.5D	∞	2	45°	Side	Slot	Face	◎	◎	◎	○	-	-	○	○	○	○	○	-	-	9	G-046
	2-flute with high helix angle 45°. Applicable to tough work materials																							

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																									
MSE	MSE345	φ3 ~ φ20	≒2.5D	∞	3	45°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	○	○	○	○	-	-	9	G-048
	3-flute with high helix angle 45°. For high feed rate milling																								
MSE	MSE430P	φ1 ~ φ12	≒2.5D	∞	4	30°	Side	-	Face	-	◎	◎	◎	-	-	-	○	-	○	○	○	-	-	11	G-050
	4-flute sharp edge type with helix angle 30°																								
MSE	MSE430	φ1 ~ φ20	≒2.5D	∞	4	30°	Side	-	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	25	G-052
	4-flute standard type with helix angle 30°. For multi-purpose from roughing to finishing																								
MSE	MSE445	φ2 ~ φ20	≒2.5D	∞	4	45°	Side	-	Face	-	◎	◎	◎	○	-	-	○	○	○	○	○	-	-	11	G-054
	4-flute with high helix angle 45°. Suitable for side milling of tough work materials																								
MSE	MSEM430	φ1 ~ φ20	4D	∞	4	30°	Side	-	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	13	G-056
	4-flute with helix angle 30°. L/D=4																								
MHD	MHD445	φ1 ~ φ4	2D	∞	4	45°	Side	Slot	Face	-	-	-	○	◎	-	-	-		-	-	-	-	-	5	G-058
	4-flute with high helix angle. For finishing of prehardened steels and hardened steels (~ 55HRC)																								
MHD	MHD645	φ5 ~ φ12	2.5D	∞	6	45°	Side	Slot	Face	-	-	-	○	◎	-	-	-		-	-	-	-	-	5	G-060
	6-flute with high helix angle. For finishing of prehardened steels and Hardened steels (~ 55HRC)																								
Ball																									
MSB	MSB230	R0.05 ~ R10	≒1.5D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	87	G-062
	2-flute standard type with helix angle 30°. For multi-purpose, from roughing to finishing																								

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Ball																									
MSB	MSB345	R0.5 ~ R6	1.5D	∞	3	45°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	56	G-066
	3-flute ball end mill. Realized to control chattering by unequal flute spacing																								
MSB	MSB230G2	R0.05 ~ R3	≒1.5D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	14	G-068
	Radius tolerance ±0.002mm. 2-flute high accurate end mill																								
MSB	MSB230S	R0.1 ~ R6	1D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	24	G-070
	2-flute standard type with helix angle 30°. L/D=1 to increase rigidity																								
MSB	MSB230SF	R0.1 ~ R6	1D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	15	G-074
	2-flute standard type with helix angle 30°. Suitable for shrink fit holder																								
MSB	MSBL230	R0.1 ~ R5	2.5D	∞	2	30°	-	-	-	3D	○	○	-	-	-	-	-	-	○	○	○	-	-	42	G-078
	2-flute long ball end mill. Overall length is 150mm at R3																								
MSB	MSBXL230	R0.5 ~ R5	2.5D	∞	2	30°	-	-	-	3D	○	○	-	-	-	-	-	-	○	○	○	-	-	8	G-079
	Long overall length allows deeper area milling																								
Corner Radius																									
MSRS	MSRS230	φ1×R0.1 ~ φ6×R2	2D	∞	2	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	38	G-080
	2-flute standard type corner radius end mill with helix angle 30°. For multi-purpose from roughing to finishing																								
MSRS	MSRS430	φ1×R0.1 ~ φ12×R3	2D	∞	4	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	64	G-082
	4-flute standard type corner radius end mill with helix angle 30°. For multi-purpose from roughing to finishing																								

Abundant variations support machining on different work materials

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Long Neck Square																									
MHR	MHR230	ϕ0.1 ～ ϕ6	30D	∞	2	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	217	G-084
	2-flute long neck square end mill. Maximum L/D=30																								
MHR	MHR430	ϕ1 ～ ϕ10	20D	∞	4	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	103	G-096
	4-flute long neck sqaure end mill. Maximum L/D=20																								
MHR	MHRLN230-6	ϕ0.3 ～ ϕ2	12.5D	∞	2	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	19	G-104
	2-flute long neck sqaure end mill. Shank Dia.6mm																								
Long Neck Ball																									
MRB	MRB230	R0.05 ～ R3	22D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	282	G-106
	Standard type long neck ball end mill. Sufficient variations with 282 sizes																								
MRB	MRB230SF	R0.1 ～ R1.5	10D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	60	G-118
	Standard type long neck ball end mill. Suitable for shrink fit holder																								
MRB	MRBLN230-6	R0.15 ～ R1	10D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	10	G-122
	2-flute long neck ball end mill. Shank Dia.6mm																								
Long Neck Tapered Ball																									
MRBTN	MRBTN230	R0.1×neck taper angle30' ～ R2×neck taper angle1°	36D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	196	G-124
	Taper neck to improve tool rigidity. L/D up to 36. Opition of same taper angle as inclined working angle																								
MRBTN	MRBTN230L	R0.1×neck taper angle30' ～ R5×neck taper angle1°30'	80D	∞	2	30°	-	-	-	3D	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	150	G-134
	Taper neck to improve tool rigidity. L/D up to 80. Opition of same taper angle as inclined working angle																								

Series	Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminum Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Long Neck Corner Radius																									
MHR・R	MHR230R	ϕ0.2 × R0.05 ～ ϕ6 × R1	20D	∞	2	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	387	G-138
	2-flute long neck corner radius end mill. Maximum L/D=20																								
MHR・R	MHR430R	ϕ1 × R0.05 ～ ϕ6 × R1	12.5D	∞	4	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	146	G-152
	4-flute long neck corner radius end mill. Maximum L/D=12																								
Long Neck Tapered Corner Radius																									
MSTNR	MSTNR230	ϕ0.2×R0.05×neck taper angle1° ～ ϕ3×R0.5×neck taper angle1°	35D	∞	2	30°	Side	Slot	Face	-	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	165	G-158
	Taper neck design for significant improvement of tool rigidity! Maximum L/D=35																								

MX225

Size φ0.3～φ12

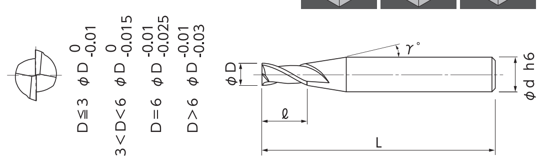
≦55 HRC

MUGEN COATING 2-Flute LEAD25 End Mill

Total 19 sizes

MG 2 25°
Side Slot Face

For various work materials. L/D=1.
Best for slotting with high rigidity short length of cut



- L/D=1 and helix 25° to increase rigidity and realize high efficient machining.
- Suppress chattering and deflection in slotting process.

Unit : mm

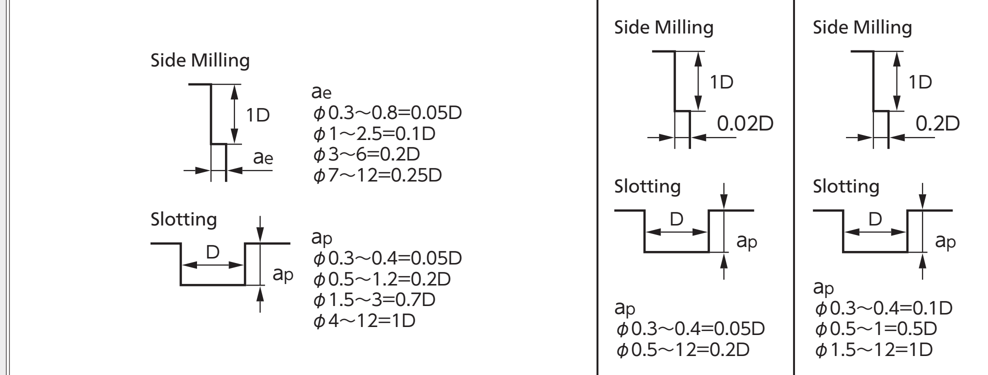
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00025-00030	0.3	0.3	12°	4	45
08-00025-00040	0.4	0.4	12°	4	45
08-00025-00050	0.5	0.5	12°	4	45
08-00025-00080	0.8	0.8	12°	4	45
08-00025-00100	1	1	12°	4	45
08-00025-00120	1.2	1.2	12°	4	45
08-00025-00150	1.5	1.5	12°	4	45
08-00025-00180	1.8	1.8	12°	4	45
08-00025-00200	2	2	12°	4	45
08-00025-00250	2.5	2.5	12°	4	45
08-00025-00300	3	3	12°	6	45
08-00025-00400	4	4	12°	6	45
08-00025-00500	5	5	12°	6	50
08-00025-00600	6	6	–	6	50
08-00025-00700	7	7	12°	8	65
08-00025-00800	8	8	–	8	65
08-00025-00900	9	9	12°	10	75
08-00025-01000	10	10	–	10	75
08-00025-01200	12	12	–	12	80

How to Order　When you order, indicate MX225 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM･SKD･SUS			Prehardened Steels HPM･NAK			Hardened Steels SKD61 (～52HRC)			Copper		
Cutting Speed	50～80m/min			50～70m/min			40～60m/min			20～40m/min			60～80m/min		
Dia.	Spindle Speed min^{-1}	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min^{-1}	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min^{-1}	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min^{-1}	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min^{-1}	Feed mm/min Side Milling	Feed mm/min Slotting
0.3	50,000	100	50	50,000	90	35	50,000	85	40	31,800	–	20	50,000	150	60
0.4	50,000	150	75	47,700	130	50	39,800	110	55	23,900	50	25	50,000	200	80
0.5	41,400	170	85	38,200	130	50	31,800	110	55	19,100	60	30	44,600	220	90
1	20,700	210	100	19,100	150	55	15,900	130	65	9,500	75	40	22,300	270	95
1.5	13,800	210	100	12,700	150	55	10,600	130	65	6,400	75	40	14,900	300	100
2	10,300	210	100	9,500	170	60	8,000	150	75	4,800	75	40	11,100	330	120
2.5	8,300	250	120	7,600	180	65	6,400	160	80	3,800	75	40	8,900	360	120
3	6,900	280	140	6,400	190	70	5,300	170	85	3,200	80	40	7,400	370	130
4	5,200	310	160	4,800	190	70	4,000	170	85	2,400	95	50	5,600	390	130
5	4,100	330	160	3,800	230	75	3,200	210	110	1,900	95	50	4,500	410	130
6	3,400	340	170	3,200	260	85	2,700	240	120	1,600	100	50	3,700	410	130
7	3,000	330	170	2,700	250	80	2,300	230	120	1,400	100	50	3,200	380	130
8	2,600	320	160	2,400	240	75	2,000	220	110	1,200	100	50	2,800	360	120
9	2,300	310	150	2,100	230	75	1,800	220	110	1,100	100	50	2,500	350	120
10	2,100	300	150	1,900	230	75	1,600	210	100	1,000	100	50	2,200	330	110
12	1,700	270	140	1,600	220	70	1,300	200	100	800	100	50	1,900	320	110

Depth of Cut (D：Dia.)



Notes

※1 Use cutting fluid.
※2 Use cutting fluid with smoke retardant.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of depth of cut and rigidity of the machine.

MX230

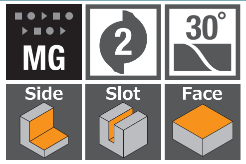
Size ϕ 0.1～ϕ 12

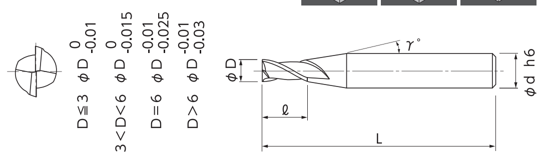
≦55 HRC

MUGEN COATING 2-Flute LEAD30 End Mill

Total 65 sizes

For various work materials. L/D=2.
Applicable to both slotting and side milling





● L/D=2 and helix 30° standard type applicable for both slotting and side milling.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00030-00010	0.1	0.2	12°	4	45
08-00030-00020	0.2	0.4	12°	4	45
08-00030-00030	0.3	0.6	12°	4	45
08-00030-00040	0.4	0.8	12°	4	45
08-00030-00050	0.5	1	12°	4	45
08-00030-00060	0.6	1.2	12°	4	45
08-00030-00070	0.7	1.4	12°	4	45
08-00030-00080	0.8	1.6	12°	4	45
08-00030-00090	0.9	1.8	12°	4	45
08-00030-00100	1	2	12°	4	45
08-00030-00110	1.1	2.2	12°	4	45
08-00030-00120	1.2	2.4	12°	4	45
08-00030-00130	1.3	2.6	12°	4	45
08-00030-00140	1.4	2.8	12°	4	45
08-00030-00150	1.5	3	12°	4	45
08-00030-00160	1.6	3.2	12°	4	45
08-00030-00170	1.7	3.4	12°	4	45
08-00030-00180	1.8	3.6	12°	4	45
08-00030-00190	1.9	3.8	12°	4	45
08-00030-00200	2	4	12°	4	45
08-00030-00210	2.1	4.2	12°	4	45
08-00030-00220	2.2	4.4	12°	4	45
08-00030-00230	2.3	4.6	12°	4	45
08-00030-00240	2.4	4.8	12°	4	45
08-00030-00250	2.5	5	12°	4	45
08-00030-00260	2.6	5.2	12°	4	45
08-00030-00270	2.7	5.4	12°	4	45
08-00030-00280	2.8	5.6	12°	4	45
08-00030-00290	2.9	5.8	12°	4	45
08-00030-00300	3	6	12°	6	45
08-00030-00310	3.1	6.2	12°	6	45
08-00030-00320	3.2	6.4	12°	6	45
08-00030-00330	3.3	6.6	12°	6	45

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00030-00340	3.4	6.8	12°	6	45
08-00030-00350	3.5	7	12°	6	45
08-00030-00360	3.6	7.2	12°	6	45
08-00030-00370	3.7	7.4	12°	6	45
08-00030-00380	3.8	7.6	12°	6	45
08-00030-00390	3.9	7.8	12°	6	45
08-00030-00400	4	8	12°	6	45
08-00030-00410	4.1	8.2	12°	6	45
08-00030-00420	4.2	8.4	12°	6	45
08-00030-00430	4.3	8.6	12°	6	45
08-00030-00440	4.4	8.8	12°	6	45
08-00030-00450	4.5	9	12°	6	50
08-00030-00460	4.6	9.2	12°	6	50
08-00030-00470	4.7	9.4	12°	6	50
08-00030-00480	4.8	9.6	12°	6	50
08-00030-00490	4.9	9.8	12°	6	50
08-00030-00500	5	10	12°	6	50
08-00030-00510	5.1	10.2	12°	6	50
08-00030-00520	5.2	10.4	12°	6	50
08-00030-00530	5.3	10.6	12°	6	50
08-00030-00540	5.4	10.8	12°	6	50
08-00030-00550	5.5	11	12°	6	50
08-00030-00560	5.6	11.2	12°	6	50
08-00030-00570	5.7	11.4	12°	6	50
08-00030-00580	5.8	11.6	12°	6	50
08-00030-00590	5.9	11.8	12°	6	50
08-00030-00600	6	12	–	6	50
08-00030-00700	7	14	12°	8	65
08-00030-00800	8	16	–	8	65
08-00030-00900	9	18	12°	10	75
08-00030-01000	10	20	–	10	75
08-00030-01200	12	24	–	12	80

How to Order　When you order, indicate MX230 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM･SKD･SUS			Prehardened Steels HPM･NAK			Hardened Steels SKD61 (～52HRC)			Copper		
Cutting Speed	50～80m/min			50～70m/min			40～60m/min			20～40m/min			60～80m/min		
Dia.	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min⁻¹	Feed mm/min Side Milling	Feed mm/min Slotting
0.1	50,000	–	25	50,000	–	15	50,000	–	20	50,000	–	15	50,000	60	25
0.2	50,000	–	40	50,000	–	25	50,000	–	30	47,700	–	20	50,000	90	35
0.3	50,000	100	50	50,000	90	35	50,000	85	40	31,800	–	20	50,000	150	60
0.4	50,000	150	75	47,700	130	50	39,800	110	55	23,900	50	25	50,000	200	80
0.5	41,400	170	85	38,200	130	50	31,800	110	55	19,100	60	30	44,600	220	90
1	20,700	210	100	19,100	150	55	15,900	130	65	9,500	75	40	22,300	270	95
1.5	13,800	210	100	12,700	150	55	10,600	130	65	6,400	75	40	14,900	300	100
2	10,300	210	100	9,500	170	60	8,000	150	75	4,800	75	40	11,100	330	120
2.5	8,300	250	120	7,600	180	65	6,400	160	80	3,800	75	40	8,900	360	120
3	6,900	280	140	6,400	190	70	5,300	170	85	3,200	80	40	7,400	370	130
3.5	5,900	300	150	5,500	190	70	4,500	170	85	2,700	85	45	6,400	380	130
4	5,200	310	160	4,800	190	70	4,000	170	85	2,400	95	50	5,600	390	130
4.5	4,600	320	160	4,200	210	75	3,500	190	95	2,100	95	50	5,000	400	130
5	4,100	330	160	3,800	230	75	3,200	210	110	1,900	95	50	4,500	410	130
5.5	3,800	330	160	3,500	240	80	2,900	220	110	1,700	95	50	4,100	410	130
6	3,400	340	170	3,200	260	85	2,700	240	120	1,600	100	50	3,700	410	130
7	3,000	330	170	2,700	250	80	2,300	230	120	1,400	100	50	3,200	380	130
8	2,600	320	160	2,400	240	75	2,000	220	110	1,200	100	50	2,800	360	120
9	2,300	310	150	2,100	230	75	1,800	220	110	1,100	100	50	2,500	350	120
10	2,100	300	150	1,900	230	75	1,600	210	100	1,000	100	50	2,200	330	110
12	1,700	270	140	1,600	220	70	1,300	200	100	800	100	50	1,900	320	110

Depth of Cut (D:Dia.)

Carbon Steels, Alloy Steels, Prehardened Steels:

Side Milling
2D
ae
ae
ϕ0.3～0.9=0.05D
ϕ1～2.9=0.07D
ϕ3～12=0.15D

Slotting
D
ap
ap
ϕ0.1～0.4=0.05D
ϕ0.5～1.4=0.15D
ϕ1.5～3.9=0.5D
ϕ4～12=0.75D

Hardened Steels:

Side Milling
2D
0.02D

Slotting
D
ap
ap
ϕ0.1～0.4=0.05D
ϕ0.5～12=0.15D

Copper:

Side Milling
2D
0.2D

Slotting
D
ap
ap
ϕ0.1～0.4=0.1D
ϕ0.5～1.4=0.4D
ϕ1.5～12=0.75D

Notes

※1 Use cutting fluid.
※2 Use cutting fluid with smoke retardant.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MX235

Size ϕ 0.1～ϕ 12

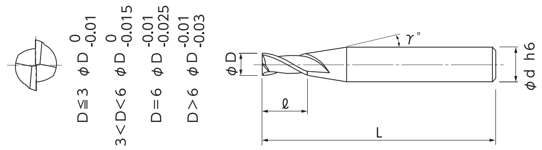
≦55 HRC

MUGEN COATING 2-Flute LEAD35 End Mill

Total 65 sizes

MG　2　35°
Side　Slot　Face

For various work materials. L/D=3.
Applicable to both slotting and side milling



● L/D=3 and helix 35° for appropriate length of cut to avoid the inconveniences in size selection.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00035-00010	0.1	0.3	12°	4	45
08-00035-00020	0.2	0.6	12°	4	45
08-00035-00030	0.3	0.9	12°	4	45
08-00035-00040	0.4	1.2	12°	4	45
08-00035-00050	0.5	1.5	12°	4	45
08-00035-00060	0.6	1.8	12°	4	45
08-00035-00070	0.7	2.1	12°	4	45
08-00035-00080	0.8	2.4	12°	4	45
08-00035-00090	0.9	2.7	12°	4	45
08-00035-00100	1	3	12°	4	45
08-00035-00110	1.1	3.3	12°	4	45
08-00035-00120	1.2	3.6	12°	4	45
08-00035-00130	1.3	3.9	12°	4	45
08-00035-00140	1.4	4.2	12°	4	45
08-00035-00150	1.5	4.5	12°	4	45
08-00035-00160	1.6	4.8	12°	4	45
08-00035-00170	1.7	5.1	12°	4	45
08-00035-00180	1.8	5.4	12°	4	45
08-00035-00190	1.9	5.7	12°	4	45
08-00035-00200	2	6	12°	4	45
08-00035-00210	2.1	6.3	12°	4	45
08-00035-00220	2.2	6.6	12°	4	45
08-00035-00230	2.3	6.9	12°	4	45
08-00035-00240	2.4	7.2	12°	4	45
08-00035-00250	2.5	7.5	12°	4	45
08-00035-00260	2.6	7.8	12°	4	45
08-00035-00270	2.7	8.1	12°	4	45
08-00035-00280	2.8	8.4	12°	4	45
08-00035-00290	2.9	8.7	12°	4	45
08-00035-00300	3	9	12°	6	45
08-00035-00310	3.1	9.3	12°	6	45
08-00035-00320	3.2	9.6	12°	6	45
08-00035-00330	3.3	9.9	12°	6	45

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00035-00340	3.4	10.2	12°	6	45
08-00035-00350	3.5	10.5	12°	6	45
08-00035-00360	3.6	10.8	12°	6	45
08-00035-00370	3.7	11.1	12°	6	45
08-00035-00380	3.8	11.4	12°	6	45
08-00035-00390	3.9	11.7	12°	6	45
08-00035-00400	4	12	12°	6	50
08-00035-00410	4.1	12.3	12°	6	50
08-00035-00420	4.2	12.6	12°	6	50
08-00035-00430	4.3	12.9	12°	6	50
08-00035-00440	4.4	13.2	12°	6	50
08-00035-00450	4.5	13.5	12°	6	50
08-00035-00460	4.6	13.8	12°	6	55
08-00035-00470	4.7	14.1	12°	6	55
08-00035-00480	4.8	14.4	12°	6	55
08-00035-00490	4.9	14.7	12°	6	55
08-00035-00500	5	15	12°	6	55
08-00035-00510	5.1	15.3	12°	6	55
08-00035-00520	5.2	15.6	12°	6	55
08-00035-00530	5.3	15.9	12°	6	55
08-00035-00540	5.4	16.2	12°	6	55
08-00035-00550	5.5	16.5	12°	6	60
08-00035-00560	5.6	16.8	12°	6	60
08-00035-00570	5.7	17.1	12°	6	60
08-00035-00580	5.8	17.4	12°	6	60
08-00035-00590	5.9	17.7	12°	6	60
08-00035-00600	6	18	–	6	60
08-00035-00700	7	21	12°	8	65
08-00035-00800	8	24	–	8	65
08-00035-00900	9	27	12°	10	75
08-00035-01000	10	30	–	10	75
08-00035-01200	12	36	–	12	80

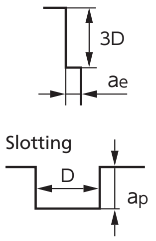
How to Order　When you order, indicate MX235 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM・SKD・SUS			Prehardened Steels HPM・NAK			Hardened Steels SKD61 (～52HRC)			Copper		
Cutting Speed	45～75m/min			45～65m/min			35～55m/min			15～35m/min			55～75m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min^{-1}	mm/min Side Milling	mm/min Slotting	min^{-1}	mm/min Side Milling	mm/min Slotting	min^{-1}	mm/min Side Milling	mm/min Slotting	min^{-1}	mm/min Side Milling	mm/min Slotting	min^{-1}	mm/min Side Milling	mm/min Slotting
0.1	50,000	–	25	50,000	–	15	50,000	–	20	50,000	–	15	50,000	60	25
0.2	50,000	–	40	50,000	–	25	50,000	–	30	39,800	–	20	50,000	90	40
0.3	50,000	100	50	50,000	90	35	47,700	80	40	26,500	–	20	50,000	150	60
0.4	47,700	140	70	43,800	120	50	35,800	100	50	19,900	–	20	50,000	200	80
0.5	38,200	150	75	35,000	120	50	28,600	100	50	15,900	50	25	41,400	210	85
1	19,100	190	95	17,500	140	50	14,300	110	60	8,000	65	30	20,700	250	90
1.5	12,700	190	95	11,700	140	50	9,500	110	60	5,300	65	30	13,800	280	100
2	9,500	190	95	8,800	160	55	7,200	140	70	4,000	65	30	10,300	310	110
2.5	7,600	230	110	7,000	170	60	5,700	140	70	3,200	70	35	8,300	330	120
3	6,400	260	130	5,800	170	60	4,800	150	80	2,700	70	35	6,900	350	120
3.5	5,500	270	135	5,000	180	60	4,100	150	80	2,300	75	35	5,900	350	120
4	4,800	280	140	4,400	180	60	3,600	150	80	2,000	80	40	5,200	360	120
4.5	4,200	290	145	3,900	200	65	3,200	170	90	1,800	80	40	4,600	360	120
5	3,800	300	150	3,500	210	70	2,900	190	95	1,600	80	40	4,100	370	120
5.5	3,500	310	155	3,200	220	70	2,600	200	100	1,400	80	40	3,800	370	120
6	3,200	320	160	2,900	230	75	2,400	210	110	1,300	80	40	3,400	370	120
7	2,700	300	150	2,500	220	70	2,000	200	100	1,100	80	40	3,000	360	120
8	2,400	280	140	2,200	220	70	1,800	200	100	1,000	80	40	2,600	340	110
9	2,100	270	135	1,900	210	65	1,600	190	95	900	80	40	2,300	330	100
10	1,900	260	130	1,800	210	65	1,400	180	90	800	80	40	2,100	320	100
12	1,600	260	130	1,500	210	65	1,200	170	85	700	80	40	1,700	290	95

Depth of Cut (D:Dia.)

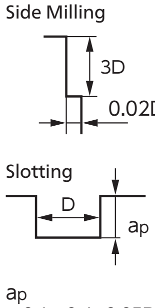
Carbon Steels / Alloy Steels / Prehardened Steels:



ae
ϕ0.3～0.9=0.04D
ϕ1～2.9=0.05D
ϕ3～12=0.1D

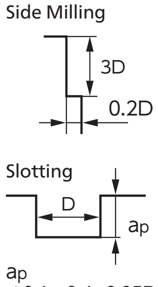
ap
ϕ0.1～0.4=0.05D
ϕ0.5～1.4=0.08D
ϕ1.5～3.9=0.25D
ϕ4～12=0.4D

Hardened Steels:



ap
ϕ0.1～0.4=0.05D
ϕ0.5～12=0.1D

Copper:



ap
ϕ0.1～0.4=0.05D
ϕ0.5～1.4=0.3D
ϕ1.5～12=0.5D

Notes

※1 Use cutting fluid.
※2 Use cutting fluid with smoke retardant.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Adjust both spindle speed and feed at the same rate.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MX240

Size ϕ 0.3～ϕ 12

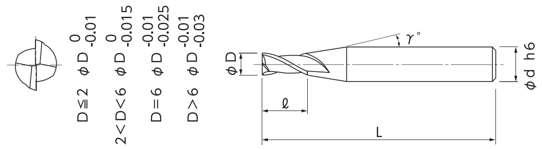
≦55 HRC

MUGEN COATING 2-Flute LEAD40 End Mill

Total 63 sizes

For various work materials. L/D=4. For side milling only

MG　2　40°　Side　Face



● L/D=4 and helix 40° is suitable for deep machining with minimum deflection of cutting up-right surface.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00040-00030	0.3	1.2	12°	4	45
08-00040-00040	0.4	1.6	12°	4	45
08-00040-00050	0.5	2	12°	4	45
08-00040-00060	0.6	2.4	12°	4	45
08-00040-00070	0.7	2.8	12°	4	45
08-00040-00080	0.8	3.2	12°	4	45
08-00040-00090	0.9	3.6	12°	4	45
08-00040-00100	1	4	12°	4	45
08-00040-00110	1.1	4.4	12°	4	45
08-00040-00120	1.2	4.8	12°	4	45
08-00040-00130	1.3	5.2	12°	4	45
08-00040-00140	1.4	5.6	12°	4	45
08-00040-00150	1.5	6	12°	4	45
08-00040-00160	1.6	6.4	12°	4	45
08-00040-00170	1.7	6.8	12°	4	45
08-00040-00180	1.8	7.2	12°	4	45
08-00040-00190	1.9	7.6	12°	4	45
08-00040-00200	2	8	12°	4	45
08-00040-00210	2.1	8.4	12°	4	45
08-00040-00220	2.2	8.8	12°	4	45
08-00040-00230	2.3	9.2	12°	4	45
08-00040-00240	2.4	9.6	12°	4	45
08-00040-00250	2.5	10	12°	4	45
08-00040-00260	2.6	10.4	12°	4	50
08-00040-00270	2.7	10.8	12°	4	50
08-00040-00280	2.8	11.2	12°	4	50
08-00040-00290	2.9	11.6	12°	4	50
08-00040-00300	3	12	12°	6	50
08-00040-00310	3.1	12.4	12°	6	50
08-00040-00320	3.2	12.8	12°	6	50
08-00040-00330	3.3	13.2	12°	6	50
08-00040-00340	3.4	13.6	12°	6	50
08-00040-00350	3.5	14	12°	6	50
08-00040-00360	3.6	14.4	12°	6	50
08-00040-00370	3.7	14.8	12°	6	50
08-00040-00380	3.8	15.2	12°	6	50
08-00040-00390	3.9	15.6	12°	6	50
08-00040-00400	4	16	12°	6	55
08-00040-00410	4.1	16.4	12°	6	55
08-00040-00420	4.2	16.8	12°	6	55
08-00040-00430	4.3	17.2	12°	6	55
08-00040-00440	4.4	17.6	12°	6	55
08-00040-00450	4.5	18	12°	6	55
08-00040-00460	4.6	18.4	12°	6	55
08-00040-00470	4.7	18.8	12°	6	55
08-00040-00480	4.8	19.2	12°	6	55
08-00040-00490	4.9	19.6	12°	6	55
08-00040-00500	5	20	12°	6	60
08-00040-00510	5.1	20.4	12°	6	60
08-00040-00520	5.2	20.8	12°	6	60
08-00040-00530	5.3	21.2	12°	6	60
08-00040-00540	5.4	21.6	12°	6	60
08-00040-00550	5.5	22	12°	6	65
08-00040-00560	5.6	22.4	12°	6	65
08-00040-00570	5.7	22.8	12°	6	65
08-00040-00580	5.8	23.2	12°	6	65
08-00040-00590	5.9	23.6	12°	6	65
08-00040-00600	6	24	–	6	65
08-00040-00700	7	28	12°	8	90
08-00040-00800	8	32	–	8	90
08-00040-00900	9	36	12°	10	100
08-00040-01000	10	40	–	10	100
08-00040-01200	12	48	–	12	105

How to Order　When you order, indicate MX240 (D).　※(γ) is reference value.

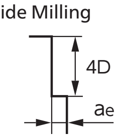
MX240

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Copper	
Cutting Speed	20～30m/min		15～25m/min		15～20m/min		20～40m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.3	26,500	50	21,200	40	18,600	30	31,800	100
0.4	19,900	60	15,900	45	13,900	40	23,900	100
0.5	15,900	65	12,700	45	11,100	40	19,100	100
1	8,000	80	6,400	50	5,600	45	9,500	110
1.5	5,300	80	4,200	50	3,700	45	6,400	130
2	4,000	80	3,200	60	2,800	50	4,800	140
2.5	3,200	100	2,500	60	2,200	55	3,800	150
3	2,700	110	2,100	60	1,900	60	3,200	160
3.5	2,300	120	1,800	60	1,600	60	2,700	170
4	2,000	120	1,600	65	1,400	60	2,400	170
4.5	1,800	130	1,400	70	1,200	65	2,100	170
5	1,600	130	1,300	80	1,100	70	1,900	170
5.5	1,400	130	1,200	90	1,000	80	1,700	180
6	1,300	130	1,100	90	900	80	1,600	180
7	1,100	120	900	90	800	80	1,400	170
8	1,000	120	800	80	700	75	1,200	160
9	900	110	700	80	650	75	1,100	155
10	800	110	600	70	600	75	1,000	150
12	700	110	500	70	500	75	800	140

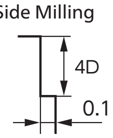
Depth of Cut (D：Dia.)

Side Milling (Carbon Steels, Alloy Steels, Prehardened Steels)



ae
ϕ0.3～0.9=0.03D
ϕ1～2.9=0.04D
ϕ3～12=0.08D

Side Milling (Copper)



Notes

※1 Use cutting fluid.
※2 Use cutting fluid with smoke retardant.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

Carbon Steel P ◎ / Alloy Steel P ◎ / Prehardened Steel P ◎ / Hardened Steel ~55 HRC H ◯ / Stainless Steel M ◯ / Aluminium Alloy N ◯ / Copper N ◯ / Resin O ◯ / Square Coating

MX245

Size φ0.3～φ12

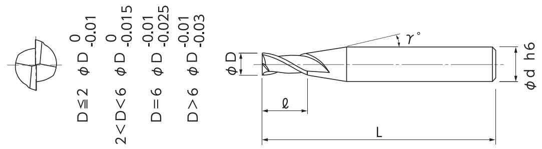
≦55 HRC

MUGEN COATING 2-Flute LEAD45 End Mill

Total 19 sizes

MG 2 45° Side Face

For various work materials. L/D=5. For side milling only



- L/D=5 and helix 45° to minimize the milling deflection even though the long cutting length design.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00045-00030	0.3	1.5	12°	4	45
08-00045-00040	0.4	2	12°	4	45
08-00045-00050	0.5	2.5	12°	4	45
08-00045-00080	0.8	4	12°	4	45
08-00045-00100	1	5	12°	4	45
08-00045-00120	1.2	6	12°	4	45
08-00045-00150	1.5	7.5	12°	4	45
08-00045-00180	1.8	9	12°	4	50
08-00045-00200	2	10	12°	4	50
08-00045-00250	2.5	12.5	12°	4	50
08-00045-00300	3	15	12°	6	55
08-00045-00400	4	20	12°	6	60
08-00045-00500	5	25	12°	6	65
08-00045-00600	6	30	–	6	75
08-00045-00700	7	35	12°	8	90
08-00045-00800	8	40	–	8	90
08-00045-00900	9	45	12°	10	100
08-00045-01000	10	50	–	10	100
08-00045-01200	12	60	–	12	105

How to Order When you order, indicate MX245 (D). ※(γ) is reference value.

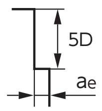
MX245

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Copper	
Cutting Speed	15～25m/min		10～20m/min		10～15m/min		15～35m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.3	21,200	40	15,900	30	13,300	25	26,500	80
0.4	15,900	50	11,900	35	9,900	30	19,900	80
0.5	12,700	50	9,500	35	8,000	30	15,900	80
1	6,400	65	4,800	40	4,000	35	8,000	100
1.5	4,200	65	3,200	40	2,700	35	5,300	110
2	3,200	65	2,400	45	2,000	40	4,000	120
2.5	2,500	75	1,900	45	1,600	40	3,200	130
3	2,100	85	1,600	50	1,300	45	2,700	140
4	1,600	95	1,200	50	1,000	45	2,000	140
5	1,300	100	1,000	60	800	55	1,600	140
6	1,100	110	800	65	700	60	1,300	140
7	900	100	700	60	600	55	1,100	135
8	800	95	600	60	500	55	1,000	130
9	700	90	550	60	450	50	900	125
10	600	85	500	60	400	50	800	120
12	500	80	400	55	300	45	700	120

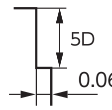
Depth of Cut (D：Dia.)

Side Milling (Carbon Steels, Alloy Steels, Prehardened Steels)



ae
φ0.3～0.8=0.02D
φ1～2.5=0.03D
φ3～12=0.06D

Side Milling (Copper)



Notes

※1 Use cutting fluid.
※2 Use cutting fluid with smoke retardant.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MX425

Size ϕ1～ϕ12

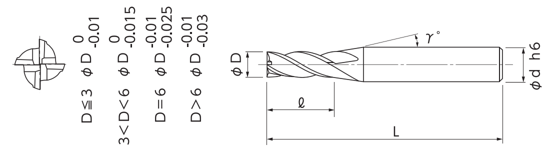
≦55 HRC

MUGEN COATING 4-Flute LEAD25 End Mill

Total 14 sizes

MG 4 25° Side Face

For various work materials. L/D=1.
Suitable for side milling with 4-flute



- L/D=1 and helix 25° type, increased the rigidity to suppress chattering and minimized milling deflection.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00075-00100	1	1	12°	4	45
08-00075-00150	1.5	1.5	12°	4	45
08-00075-00200	2	2	12°	4	45
08-00075-00250	2.5	2.5	12°	4	45
08-00075-00300	3	3	12°	6	45
08-00075-00350	3.5	3.5	12°	6	45
08-00075-00400	4	4	12°	6	45
08-00075-00450	4.5	4.5	12°	6	50
08-00075-00500	5	5	12°	6	50
08-00075-00550	5.5	5.5	12°	6	50
08-00075-00600	6	6	–	6	50
08-00075-00800	8	8	–	8	65
08-00075-01000	10	10	–	10	75
08-00075-01200	12	12	–	12	80

How to Order　When you order, indicate MX425 (D).　※(γ) is reference value.

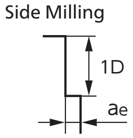
MX425

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (～52HRC)		Copper	
Cutting Speed	50～80m/min		50～70m/min		40～60m/min		20～40m/min		60～80m/min	
Dia.	Side Milling		Side Milling		Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,700	320	19,100	230	15,900	200	9,500	120	22,300	410
1.5	13,800	320	12,700	230	10,600	200	6,400	120	14,900	450
2	10,300	320	9,500	260	8,000	230	4,800	120	11,100	500
2.5	8,300	380	7,600	270	6,400	240	3,800	120	8,900	540
3	6,900	420	6,400	290	5,300	260	3,200	120	7,400	560
3.5	5,900	450	5,500	290	4,500	260	2,700	130	6,400	570
4	5,200	530	4,800	320	4,000	290	2,400	160	5,600	660
4.5	4,600	540	4,200	360	3,500	320	2,100	160	5,000	680
5	4,100	560	3,800	390	3,200	360	1,900	160	4,500	700
5.5	3,800	560	3,500	410	2,900	370	1,700	160	4,100	700
6	3,400	580	3,200	440	2,700	410	1,600	170	3,700	700
8	2,600	540	2,400	410	2,000	370	1,200	170	2,800	610
10	2,100	510	1,900	390	1,600	360	1,000	170	2,200	560
12	1,700	460	1,600	370	1,300	340	800	170	1,900	540

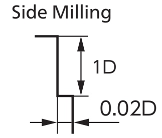
Depth of Cut (D：Dia.)

Side Milling (Carbon Steels, Alloy Steels, Prehardened Steels)

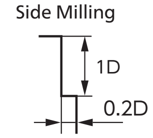


ae
ϕ1～2.5=0.1D
ϕ3～6=0.2D
ϕ8～12=0.25D

Side Milling (Hardened Steels)



Side Milling (Copper)



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MX430

Size ϕ 1 ～ ϕ 12

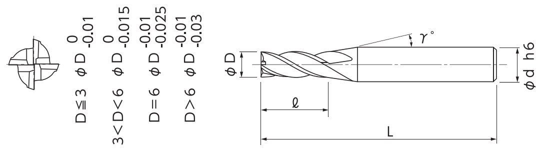
≦55 HRC

MUGEN COATING 4-Flute LEAD30 End Mill

Total 14 sizes

MG 4 30° Side Face

For various work materials. L/D=2.
Suitable for side milling with 4-flute



● L/D=2 and helix 30° standard type, applicable to any milling process.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00080-00100	1	2	12°	4	45
08-00080-00150	1.5	3	12°	4	45
08-00080-00200	2	4	12°	4	45
08-00080-00250	2.5	5	12°	4	45
08-00080-00300	3	6	12°	6	45
08-00080-00350	3.5	7	12°	6	45
08-00080-00400	4	8	12°	6	45
08-00080-00450	4.5	9	12°	6	50
08-00080-00500	5	10	12°	6	50
08-00080-00550	5.5	11	12°	6	50
08-00080-00600	6	12	–	6	50
08-00080-00800	8	16	–	8	65
08-00080-01000	10	20	–	10	75
08-00080-01200	12	24	–	12	80

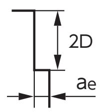
How to Order When you order, indicate MX430 (D). ※(γ) is reference value.

Recommended Milling Conditions

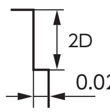
Work Material	Carbon Steels S50C		Alloy Steels SCM･SKD･SUS		Prehardened Steels HPM･NAK		Hardened Steels SKD61 (～52HRC)		Copper	
Cutting Speed	50～80m/min		50～70m/min		40～60m/min		20～40m/min		60～80m/min	
Dia.	Side Milling		Side Milling		Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,700	320	19,100	230	15,900	200	9,500	120	22,300	410
1.5	13,800	320	12,700	230	10,600	200	6,400	120	14,900	450
2	10,300	320	9,500	260	8,000	230	4,800	120	11,100	500
2.5	8,300	380	7,600	270	6,400	240	3,800	120	8,900	540
3	6,900	420	6,400	290	5,300	260	3,200	120	7,400	560
3.5	5,900	450	5,500	290	4,500	260	2,700	130	6,400	570
4	5,200	530	4,800	320	4,000	290	2,400	160	5,600	660
4.5	4,600	540	4,200	360	3,500	320	2,100	160	5,000	680
5	4,100	560	3,800	390	3,200	360	1,900	160	4,500	700
5.5	3,800	560	3,500	410	2,900	370	1,700	160	4,100	700
6	3,400	580	3,200	440	2,700	410	1,600	170	3,700	700
8	2,600	540	2,400	410	2,000	370	1,200	170	2,800	610
10	2,100	510	1,900	390	1,600	360	1,000	170	2,200	560
12	1,700	460	1,600	370	1,300	340	800	170	1,900	540

Depth of Cut (D : Dia.)

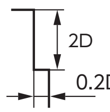
Side Milling



Side Milling



Side Milling



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

Regular Line
MUGEN COATING
Full Cutting Length Type

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Square Coating

MX435

Size ϕ 1 ～ ϕ 12

≦55 HRC

MX435

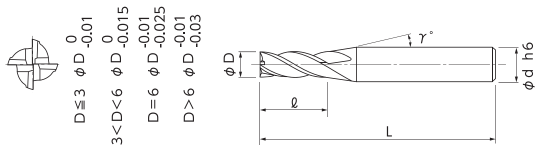
MUGEN COATING 4-Flute LEAD35 End Mill

Total 14 sizes

Recommended Milling Conditions

MG 4 35° Side Face

For various work materials. L/D=3.
Suitable for side milling with 4-flute



- L/D=3 and helix 35° for appropriate length of cut to avoid the inconveniences in size selection.

Unit : mm

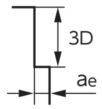
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00085-00100	1	3	12°	4	45
08-00085-00150	1.5	4.5	12°	4	45
08-00085-00200	2	6	12°	4	45
08-00085-00250	2.5	7.5	12°	4	45
08-00085-00300	3	9	12°	6	45
08-00085-00350	3.5	10.5	12°	6	45
08-00085-00400	4	12	12°	6	50
08-00085-00450	4.5	13.5	12°	6	50
08-00085-00500	5	15	12°	6	55
08-00085-00550	5.5	16.5	12°	6	60
08-00085-00600	6	18	–	6	60
08-00085-00800	8	24	–	8	65
08-00085-01000	10	30	–	10	75
08-00085-01200	12	36	–	12	80

How to Order　When you order, indicate MX435 (D).　※(γ) is reference value.

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (～52HRC)		Copper	
Cutting Speed	45～75m/min		45～65m/min		35～55m/min		15～35m/min		55～75m/min	
Dia.	Side Milling		Side Milling		Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	19,100	290	17,500	210	14,300	170	8,000	100	20,700	380
1.5	12,700	290	11,700	210	9,500	170	5,300	100	13,800	420
2	9,500	290	8,800	240	7,200	210	4,000	100	10,300	470
2.5	7,600	350	7,000	260	5,700	210	3,200	110	8,300	500
3	6,400	390	5,800	260	4,800	230	2,700	110	6,900	530
3.5	5,500	410	5,000	270	4,100	230	2,300	120	5,900	530
4	4,800	480	4,400	310	3,600	260	2,000	140	5,200	610
4.5	4,200	490	3,900	340	3,200	290	1,800	140	4,600	610
5	3,800	510	3,500	360	2,900	320	1,600	140	4,100	630
5.5	3,500	530	3,200	370	2,600	340	1,400	140	3,800	630
6	3,200	540	2,900	390	2,400	360	1,300	140	3,400	630
8	2,400	480	2,200	370	1,800	340	1,000	140	2,600	580
10	1,900	440	1,800	360	1,400	310	800	140	2,100	540
12	1,600	440	1,500	360	1,200	290	700	140	1,700	490

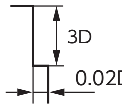
Depth of Cut (D：Dia.)

Side Milling

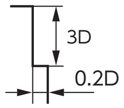


ae
ϕ1～2.5=0.05D
ϕ3～6=0.1D
ϕ8～12=0.15D

Side Milling



Side Milling



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MX440

Size φ1～φ12

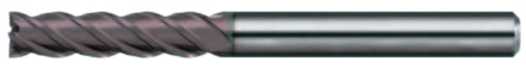
≦55 HRC

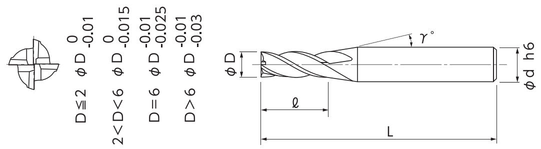
MUGEN COATING 4-Flute LEAD40 End Mill

Total 14 sizes

MG 4 40° Side Face

For various work materials. L/D=4.
Suitable for side milling with 4-flute





- L/D=4 and helix 40° is suitable for deep machining with minimum deflection of cutting up-right surface.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00090-00100	1	4	12°	4	45
08-00090-00150	1.5	6	12°	4	45
08-00090-00200	2	8	12°	4	45
08-00090-00250	2.5	10	12°	4	45
08-00090-00300	3	12	12°	6	50
08-00090-00350	3.5	14	12°	6	50
08-00090-00400	4	16	12°	6	55
08-00090-00450	4.5	18	12°	6	55
08-00090-00500	5	20	12°	6	60
08-00090-00550	5.5	22	12°	6	65
08-00090-00600	6	24	–	6	65
08-00090-00800	8	32	–	8	90
08-00090-01000	10	40	–	10	100
08-00090-01200	12	48	–	12	105

How to Order　When you order, indicate MX440 (D).　※(γ) is reference value.

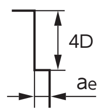
MX440

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Copper	
Cutting Speed	20～30m/min		15～25m/min		15～20m/min		20～40m/min	
Dia.	Side Milling		Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	8,000	120	6,400	80	5,600	70	9,500	170
1.5	5,300	120	4,200	80	3,700	70	6,400	200
2	4,000	120	3,200	90	2,800	75	4,800	210
2.5	3,200	150	2,500	90	2,200	85	3,800	230
3	2,700	170	2,100	90	1,900	90	3,200	240
3.5	2,300	180	1,800	90	1,600	90	2,700	260
4	2,000	200	1,600	110	1,400	100	2,400	290
4.5	1,800	220	1,400	120	1,200	110	2,100	290
5	1,600	220	1,300	140	1,100	120	1,900	290
5.5	1,400	220	1,200	150	1,000	140	1,700	310
6	1,300	220	1,100	150	900	140	1,600	310
8	1,000	200	800	140	700	130	1,200	270
10	800	190	600	120	600	130	1,000	260
12	700	190	500	120	500	130	800	240

Depth of Cut (D：Dia.)

Side Milling



ae
φ1～2.5=0.04D
φ3～6=0.08D
φ8～12=0.1D

Side Milling

Notes

※1 Use cutting fluid with smoke retardant.
※2 Adjust both spindle speed and feed at the same rate.
※3 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MX445

Size ϕ 1 ～ ϕ 12

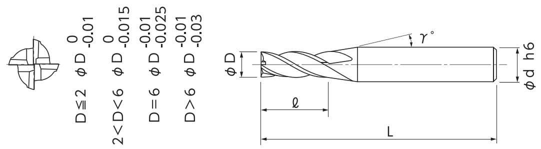
≦55 HRC

MUGEN COATING 4-Flute LEAD45 End Mill

Total 14 sizes

MG 4 45° Side Face

For various work materials. L/D=5.
Suitable for side milling with 4-flute



- L/D=5 and helix 45° to minimize the milling deflection even though the long cutting length design.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00095-00100	1	5	12°	4	45
08-00095-00150	1.5	7.5	12°	4	45
08-00095-00200	2	10	12°	4	50
08-00095-00250	2.5	12.5	12°	4	50
08-00095-00300	3	15	12°	6	55
08-00095-00350	3.5	17.5	12°	6	60
08-00095-00400	4	20	12°	6	60
08-00095-00450	4.5	22.5	12°	6	65
08-00095-00500	5	25	12°	6	65
08-00095-00550	5.5	27.5	12°	6	75
08-00095-00600	6	30	–	6	75
08-00095-00800	8	40	–	8	90
08-00095-01000	10	50	–	10	100
08-00095-01200	12	60	–	12	105

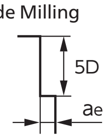
How to Order　When you order, indicate MX445 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Copper	
Cutting Speed	15～25m/min		10～20m/min		10～15m/min		15～35m/min	
Dia.	Side Milling		Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	6,400	100	4,800	60	4,000	55	8,000	150
1.5	4,200	100	3,200	60	2,700	55	5,300	170
2	3,200	100	2,400	70	2,000	60	4,000	190
2.5	2,500	120	1,900	70	1,600	60	3,200	200
3	2,100	130	1,600	75	1,300	70	2,700	210
3.5	1,800	140	1,400	75	1,100	70	2,300	210
4	1,600	160	1,200	90	1,000	80	2,000	240
4.5	1,400	170	1,100	90	900	85	1,800	240
5	1,300	170	1,000	100	800	90	1,600	240
5.5	1,200	170	900	100	700	95	1,400	240
6	1,100	190	800	110	700	100	1,300	240
8	800	160	600	100	500	90	1,000	220
10	600	150	500	100	400	85	800	200
12	500	140	400	90	300	80	700	200

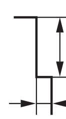
Depth of Cut (D：Dia.)

Side Milling



ae
ϕ1～2.5=0.03D
ϕ3～6=0.06D
ϕ8～12=0.08D

Side Milling



Notes

※1 Use cutting fluid with smoke retardant.
※2 Adjust both spindle speed and feed at the same rate.
※3 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MSE230SS

Size ϕ 0.1～ϕ 6

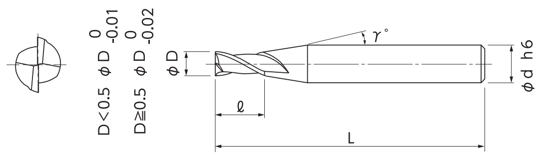
≦55 HRC

MUGEN COATING 2-Flute Super Short End Mill

Total 61 sizes

L/D=1. High rigidity with short length of cut.
Suitable for slotting process

MG Side Slot Face 2 30°



Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00103-00010	0.1	0.1	9°	4	45
08-00103-00015	0.15	0.15	9°	4	45
08-00103-00020	0.2	0.2	9°	4	45
08-00103-00030	0.3	0.3	9°	4	45
08-00103-00040	0.4	0.4	9°	4	45
08-00103-00050	0.5	0.5	9°	4	45
08-00103-00060	0.6	0.6	9°	4	45
08-00103-00070	0.7	0.7	9°	4	45
08-00103-00080	0.8	0.8	9°	4	45
08-00103-00090	0.9	0.9	9°	4	45
08-00103-00100	1	1	9°	4	45
08-00103-00110	1.1	1.1	9°	4	45
08-00103-00120	1.2	1.2	9°	4	45
08-00103-00130	1.3	1.3	9°	4	45
08-00103-00140	1.4	1.4	9°	4	45
08-00103-00150	1.5	1.5	9°	4	45
08-00103-00160	1.6	1.6	9°	4	45
08-00103-00170	1.7	1.7	9°	4	45
08-00103-00180	1.8	1.8	9°	4	45
08-00103-00190	1.9	1.9	9°	4	45
08-00103-00200	2	2	9°	4	45
08-00103-00210	2.1	2.1	9°	4	45
08-00103-00220	2.2	2.2	9°	4	45
08-00103-00230	2.3	2.3	9°	4	45
08-00103-00240	2.4	2.4	9°	4	45
08-00103-00250	2.5	2.5	9°	4	45
08-00103-00260	2.6	2.6	9°	4	45
08-00103-00270	2.7	2.7	9°	4	45
08-00103-00280	2.8	2.8	9°	4	45
08-00103-00290	2.9	2.9	9°	6	50
08-00103-00300	3	3	9°	6	50
08-00103-00310	3.1	3.1	9°	6	50
08-00103-00320	3.2	3.2	9°	6	50
08-00103-00330	3.3	3.3	9°	6	50
08-00103-00340	3.4	3.4	9°	6	50
08-00103-00350	3.5	3.5	9°	6	50
08-00103-00360	3.6	3.6	9°	6	50
08-00103-00370	3.7	3.7	9°	6	50
08-00103-00380	3.8	3.8	9°	6	50
08-00103-00390	3.9	3.9	9°	6	50
08-00103-00400	4	4	9°	6	50
08-00103-00410	4.1	4.1	9°	6	50
08-00103-00420	4.2	4.2	9°	6	50
08-00103-00430	4.3	4.3	9°	6	50
08-00103-00440	4.4	4.4	9°	6	50
08-00103-00450	4.5	4.5	9°	6	55
08-00103-00460	4.6	4.6	9°	6	55
08-00103-00470	4.7	4.7	9°	6	55
08-00103-00480	4.8	4.8	9°	6	55
08-00103-00490	4.9	4.9	9°	6	55
08-00103-00500	5	5	9°	6	55
08-00103-00510	5.1	5.1	9°	6	55
08-00103-00520	5.2	5.2	9°	6	55
08-00103-00530	5.3	5.3	9°	6	55
08-00103-00540	5.4	5.4	9°	6	55
08-00103-00550	5.5	5.5	9°	6	55
08-00103-00560	5.6	5.6	9°	6	55
08-00103-00570	5.7	5.7	9°	6	55
08-00103-00580	5.8	5.8	9°	6	55
08-00103-00590	5.9	5.9	9°	6	55
08-00103-00600	6	6	–	6	55

How to Order When you order, indicate MSE230SS (D). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

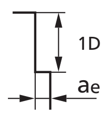
Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM・SKD・SUS			Prehardened Steels HPM・NAK		
Cutting Speed	50～80m/min			50～70m/min			40～60m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min	
		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting
0.1	50,000	–	25	50,000	–	15	50,000	–	20
0.15	50,000	–	30	50,000	–	20	50,000	–	20
0.2	50,000	–	40	50,000	–	25	50,000	–	30
0.3	50,000	100	50	50,000	90	35	50,000	85	40
0.4	50,000	150	75	47,700	130	50	39,800	110	55
0.5	41,400	170	85	38,200	130	50	31,800	110	55
0.6	34,500	180	90	33,300	130	50	26,500	120	55
0.7	29,600	200	100	28,600	130	55	22,700	120	55
0.8	25,900	210	100	23,900	150	55	19,900	130	65
0.9	23,000	210	100	21,200	150	55	17,700	130	65
1	20,700	210	100	19,100	150	55	16,000	130	65
1.1	18,800	210	100	17,400	150	55	14,500	130	65
1.2	17,300	210	100	15,900	150	55	13,300	130	65
1.3	16,000	210	100	14,700	150	55	12,200	130	65
1.4	14,800	210	100	13,600	150	55	11,400	130	65
1.5	13,800	210	100	12,700	150	55	10,600	130	65
1.6	13,000	210	100	11,900	150	55	10,000	140	65
1.7	12,200	210	100	11,200	150	55	9,400	140	65
1.8	11,500	210	100	10,600	160	60	8,800	140	75
1.9	10,900	210	100	10,100	160	60	8,400	150	75
2	10,400	210	100	9,600	170	60	8,000	150	75
2.1	9,900	220	100	9,100	170	60	7,600	150	75
2.2	9,400	220	100	8,700	170	60	7,200	150	75
2.3	9,000	230	120	8,300	170	65	6,900	150	80
2.4	8,600	240	120	8,000	180	65	6,600	160	80
2.5	8,300	250	120	7,600	180	65	6,400	160	80
2.6	8,000	250	120	7,300	180	65	6,100	160	80
2.7	7,700	260	120	7,100	180	65	5,900	160	80
2.8	7,400	260	140	6,800	180	70	5,700	170	85
2.9	7,100	270	140	6,600	190	70	5,500	170	85
3	6,900	280	140	6,400	190	70	5,300	170	85
3.1	6,700	280	140	6,200	190	70	5,100	170	85
3.2	6,500	280	140	6,000	190	70	5,000	170	85
3.3	6,300	290	150	5,800	190	70	4,800	170	85
3.4	6,100	290	150	5,600	190	70	4,700	170	85
3.5	5,900	300	150	5,500	190	70	4,500	170	85
3.6	5,800	300	150	5,300	190	70	4,400	170	85
3.7	5,600	300	150	5,200	190	70	4,300	170	85
3.8	5,400	300	160	5,000	190	70	4,200	170	85
3.9	5,300	310	160	4,900	190	70	4,100	170	85
4	5,200	310	160	4,800	190	70	4,000	170	85
4.1	5,000	310	160	4,700	200	70	3,900	180	85
4.2	4,900	310	160	4,500	200	70	3,800	180	85
4.3	4,800	310	160	4,400	200	70	3,700	180	85
4.4	4,700	310	160	4,300	210	70	3,600	190	85
4.5	4,600	320	160	4,200	210	70	3,500	190	85
4.6	4,500	320	160	4,200	210	70	3,500	190	85
4.7	4,400	320	160	4,100	220	75	3,400	200	85
4.8	4,300	320	160	4,000	220	75	3,300	200	110
4.9	4,200	320	160	3,900	230	75	3,200	200	110

Work Material	Carbon Steels S50C			Alloy Steels SCM・SKD・SUS			Prehardened Steels HPM・NAK		
Cutting Speed	50~80m/min			50~70m/min			40~60m/min		
Dia.	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting
5	4,100	330	160	3,800	230	75	3,200	210	110
5.1	4,100	330	160	3,700	230	75	3,100	210	110
5.2	4,000	330	160	3,700	230	75	3,100	210	110
5.3	3,900	330	160	3,600	240	75	3,000	220	110
5.4	3,800	330	160	3,500	240	75	2,900	220	110
5.5	3,800	330	160	3,500	240	75	2,900	220	110
5.6	3,700	330	160	3,400	240	75	2,800	230	110
5.7	3,600	330	160	3,400	250	85	2,800	230	110
5.8	3,600	330	170	3,300	250	85	2,700	230	120
5.9	3,500	340	170	3,200	250	85	2,700	240	120
6	3,400	340	170	3,200	260	85	2,700	240	120

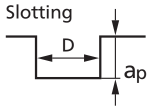
Depth of Cut (D：Dia.)

Side Milling



ae
φ0.3~0.9=0.05D
φ1~2.9=0.1D
φ3~6=0.2D

Slotting



ap
φ0.1~0.4=0.05D
φ0.5~1.4=0.2D
φ1.5~3.9=0.7D
φ4~6=1D

Notes

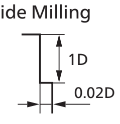
※1 Use cutting fluid with smoke retardant.
※2 Adjust both spindle speed and feed at the same rate.
※3 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

Work Material	Hardend Steels SKD61 (~52HRC)			Aluminium Alloy			Copper		
Cutting Speed	20~40m/min			100~200m/min			60~80m/min		
Dia.	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting
0.1	50,000	–	15	50,000	60	25	50,000	60	25
0.15	50,000	–	15	50,000	70	25	50,000	70	25
0.2	47,700	–	20	50,000	90	35	50,000	90	35
0.3	31,800	–	20	50,000	150	60	50,000	150	60
0.4	23,900	50	25	50,000	200	80	50,000	200	80
0.5	19,100	60	30	50,000	250	100	44,600	220	90
0.6	15,900	60	30	50,000	300	100	37,100	230	90
0.7	13,600	60	30	50,000	350	180	31,800	240	90
0.8	11,900	70	35	50,000	450	180	27,900	250	95
0.9	10,600	70	35	50,000	500	180	24,800	260	95
1	9,500	75	40	47,700	570	200	22,300	270	95
1.1	8,700	75	40	43,400	570	200	20,300	270	95
1.2	8,000	75	40	39,800	600	200	18,600	280	95
1.3	7,300	75	40	36,700	620	200	17,100	280	95
1.4	6,800	75	40	34,100	630	220	15,900	290	100
1.5	6,400	75	40	31,800	640	220	14,900	300	100
1.6	6,000	75	40	29,800	660	220	13,900	300	100
1.7	5,600	75	40	28,100	680	220	13,100	310	100
1.8	5,300	75	40	26,500	700	250	12,400	310	120
1.9	5,000	75	40	25,100	700	250	11,700	320	120

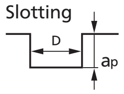
Work Material	Hardend Steels SKD61 (~52HRC)			Aluminium Alloy			Copper		
Cutting Speed	20~40m/min			100~200m/min			60~80m/min		
Dia.	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting
2	4,800	75	40	23,900	720	250	11,100	330	120
2.1	4,500	75	40	22,700	720	250	10,600	330	120
2.2	4,300	75	40	21,700	740	250	10,100	340	120
2.3	4,200	75	40	20,800	740	250	9,700	350	120
2.4	4,000	75	40	19,900	760	270	9,300	350	120
2.5	3,800	75	40	19,100	760	270	8,900	360	120
2.6	3,700	80	40	18,400	760	270	8,600	360	120
2.7	3,500	80	40	17,700	780	270	8,300	360	120
2.8	3,400	80	40	17,100	780	270	8,000	370	130
2.9	3,300	80	40	16,500	800	270	7,700	370	130
3	3,200	80	40	15,900	800	270	7,400	370	130
3.1	3,100	80	40	15,400	800	270	7,200	370	130
3.2	3,000	85	40	14,900	820	270	7,000	380	130
3.3	2,900	85	45	14,500	820	270	6,800	380	130
3.4	2,800	85	45	14,000	820	270	6,600	380	130
3.5	2,700	85	45	13,600	820	270	6,400	380	130
3.6	2,700	90	45	13,300	820	270	6,200	390	130
3.7	2,600	90	45	12,900	830	270	6,000	390	130
3.8	2,500	90	50	12,600	830	270	5,900	390	130
3.9	2,400	90	50	12,200	830	270	5,700	390	130
4	2,400	95	50	11,900	830	270	5,600	390	130
4.1	2,300	95	50	11,600	830	270	5,400	400	130
4.2	2,300	95	50	11,400	840	270	5,300	400	130
4.3	2,200	95	50	11,100	840	270	5,200	400	130
4.4	2,200	95	50	10,900	840	270	5,100	400	130
4.5	2,100	95	50	10,600	840	270	5,000	400	130
4.6	2,100	95	50	10,400	850	270	4,800	400	130
4.7	2,000	95	50	10,200	850	270	4,700	410	130
4.8	2,000	95	50	9,900	850	280	4,600	410	130
4.9	1,900	95	50	9,700	850	280	4,500	410	130
5	1,900	95	50	9,500	860	280	4,500	410	130
5.1	1,900	95	50	9,400	860	280	4,400	410	130
5.2	1,800	95	50	9,200	860	280	4,300	410	130
5.3	1,800	95	50	9,000	860	280	4,200	410	130
5.4	1,800	95	50	8,800	860	280	4,100	410	130
5.5	1,700	95	50	8,700	870	280	4,100	410	130
5.6	1,700	95	50	8,500	870	280	4,000	410	130
5.7	1,700	95	50	8,400	870	280	3,900	410	130
5.8	1,600	95	50	8,200	870	290	3,800	410	130
5.9	1,600	95	50	8,100	880	290	3,800	410	130
6	1,600	100	50	8,000	880	290	3,700	410	130

Depth of Cut (D：Dia.)

Hardend Steels — Side Milling

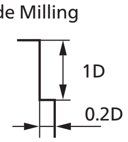


Slotting

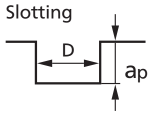


ap
φ0.1~0.4=0.05D
φ0.5~6=0.2D

Aluminium Alloy / Copper — Side Milling



Slotting



ap
φ0.1~0.4=0.1D
φ0.5~1.4=0.5D
φ1.5~6=1D

Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MSES230P

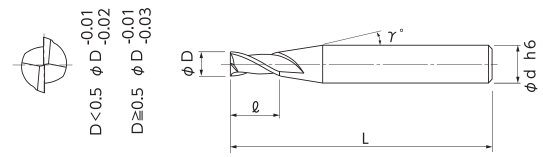
Size ϕ 0.1～ϕ 12

MUGEN COATING 2-Flute Sharp Edge Short End Mill

Total 26 sizes

Sharp edge type with 2-flute and helix angle 30°

MG 2 30° 90° Side Slot Face



- It is very suitable for high speed cutting due to the length of cut is short and rigid.
- Sharp edge profile guarantees high shearing ability.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00102-00010	0.1	0.15	9°	4	45
08-00102-00015	0.15	0.2	9°	4	45
08-00102-00020	0.2	0.3	9°	4	45
08-00102-00025	0.25	0.3	9°	4	45
08-00102-00030	0.3	0.4	9°	4	45
08-00102-00035	0.35	0.4	9°	4	45
08-00102-00040	0.4	0.6	9°	4	45
08-00102-00045	0.45	0.6	9°	4	45
08-00102-00050	0.5	0.7	9°	4	45
08-00102-00060	0.6	1	9°	4	45
08-00102-00070	0.7	1.2	9°	4	45
08-00102-00080	0.8	1.5	9°	4	45
08-00102-00100	1	2	9°	4	45
08-00102-00120	1.2	2.5	9°	4	45
08-00102-00150	1.5	3	9°	4	45
08-00102-00160	1.6	3	9°	4	45
08-00102-00180	1.8	3.5	9°	4	45
08-00102-00200	2	4	9°	4	45
08-00102-00250	2.5	5	9°	4	45
08-00102-00300	3	6	9°	4	50
08-00102-00400	4	8	–	4	50
08-00102-00500	5	10	9°	6	55
08-00102-00600	6	12	–	6	55
08-00102-00800	8	16	–	8	65
08-00102-01000	10	20	–	10	75
08-00102-01200	12	24	–	12	80

How to Order When you order, indicate MSES230P (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM･SKD･SUS			Prehardened Steels HPM･NAK			Hardened Steels SKD61 (～52HRC)			Aluminium Alloy			Copper		
Cutting Speed	50～80m/min			50～70m/min			40～60m/min			20～40m/min			100～200m/min			60～80m/min		
Dia.	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting	Spindle Speed min-1	Feed mm/min Side Milling	Feed mm/min Slotting
0.1	50,000	–	25	50,000	–	15	50,000	–	20	50,000	–	15	50,000	60	25	50,000	60	25
0.2	50,000	–	40	50,000	–	25	50,000	–	30	47,700	–	20	50,000	90	35	50,000	90	35
0.3	50,000	100	50	50,000	90	35	50,000	85	40	31,800	–	20	50,000	150	60	50,000	150	60
0.4	50,000	150	75	47,700	130	50	39,800	110	55	23,900	50	25	50,000	200	80	50,000	200	80
0.5	41,400	170	85	38,200	130	50	31,800	110	55	19,100	60	30	50,000	250	100	44,600	220	90
0.8	25,900	210	100	23,900	150	55	19,900	130	65	11,900	70	35	50,000	450	180	27,900	250	95
1	20,700	210	100	19,100	150	55	15,900	130	65	9,500	75	40	47,700	570	200	22,300	270	95
1.5	13,800	210	100	12,700	150	55	10,600	130	65	6,400	75	40	31,800	640	220	14,900	300	100
2	10,300	210	100	9,500	170	60	8,000	150	75	4,800	75	40	23,900	720	250	11,100	330	120
2.5	8,300	250	120	7,600	180	65	6,400	160	80	3,800	75	40	19,100	760	270	8,900	360	120
3	6,900	280	140	6,400	190	70	5,300	170	85	3,200	80	40	15,900	800	270	7,400	370	130
4	5,200	310	160	4,800	190	70	4,000	170	85	2,400	95	50	11,900	830	270	5,600	390	130
5	4,100	330	160	3,800	230	75	3,200	210	110	1,900	95	50	9,500	860	280	4,500	410	130
6	3,400	340	170	3,200	260	85	2,700	240	120	1,600	100	50	8,000	880	290	3,700	410	130
8	2,600	310	160	2,400	240	80	2,000	220	110	1,200	100	50	6,000	780	260	2,800	360	120
10	2,100	290	150	1,900	230	75	1,600	210	100	1,000	100	50	4,800	720	240	2,200	330	110
12	1,700	270	140	1,600	220	75	1,300	200	100	800	100	50	4,000	680	220	1,900	320	110

Depth of Cut (D:Dia.)

Carbon Steels, Alloy Steels, Prehardened Steels:

Side Milling
1.5D
ae
ae
ϕ0.3～0.95=0.05D
ϕ1～2.55=0.07D
ϕ2.6～6=0.1D
ϕ6.5～12=0.15D

Slotting
D
ap
ap
ϕ0.1～0.45=0.05D
ϕ0.5～1.45=0.1D
ϕ1.5～3.9=0.35D
ϕ4～12=0.5D

Hardened Steels:

Side Milling
1D
0.02D

Slotting
D
ap
ap
ϕ0.1～0.45=0.05D
ϕ0.5～12=0.1D

Aluminium Alloy, Copper:

Side Milling
1.5D
0.2D

Slotting
D
ap
ap
ϕ0.1～0.45=0.05D
ϕ0.5～1.45=0.3D
ϕ1.5～12=0.5D

Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MSE230

Size ϕ 0.1 ～ ϕ 12

≦55 HRC

MSE230

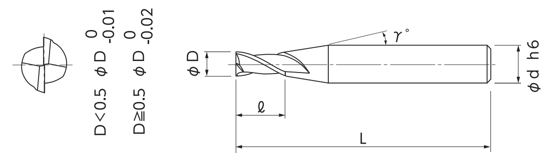
MUGEN COATING 2-Flute End Mill

Total 101 sizes

MUGEN COATING 2-Flute End Mill

MG Side Slot Face 2 30°

Standard type of 2-flute with helix angle 30°
For multi-purpose from roughing to finishing



- Our original MUGEN COATING has been put on 2-flute end mill.
- It covers all-round cutting from roughing to finishing.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00100-00010	0.1	0.15	9°	4	45
08-00100-00015	0.15	0.2	9°	4	45
08-00100-00020	0.2	0.4	9°	4	45
▌08-00100-00025	0.25	0.5	9°	4	45
08-00100-00030	0.3	0.6	9°	4	45
▌08-00100-00035	0.35	0.7	9°	4	45
08-00100-00040	0.4	0.8	9°	4	45
▌08-00100-00045	0.45	0.9	9°	4	45
08-00100-00050	0.5	1.25	9°	4	45
▌08-00100-00055	0.55	1.3	9°	4	45
08-00100-00060	0.6	1.5	9°	4	45
▌08-00100-00065	0.65	1.5	9°	4	45
08-00100-00070	0.7	1.8	9°	4	45
▌08-00100-00075	0.75	1.8	9°	4	45
08-00100-00080	0.8	2	9°	4	45
▌08-00100-00085	0.85	2	9°	4	45
08-00100-00090	0.9	2	9°	4	45
▌08-00100-00095	0.95	2	9°	4	45
08-00100-00100	1	2.5	9°	4	45
▌08-00100-00105	1.05	2.5	9°	4	45
08-00100-00110	1.1	2.5	9°	4	45
▌08-00100-00115	1.15	2.5	9°	4	45
08-00100-00120	1.2	3	9°	4	45
▌08-00100-00125	1.25	3	9°	4	45
08-00100-00130	1.3	3	9°	4	45
▌08-00100-00135	1.35	3	9°	4	45

How to Order When you order, indicate MSE230 (D). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00100-00140	1.4	3.5	9°	4	45
▌08-00100-00145	1.45	3.5	9°	4	45
08-00100-00150	1.5	4	9°	4	45
▌08-00100-00155	1.55	4	9°	4	45
08-00100-00160	1.6	4	9°	4	45
▌08-00100-00165	1.65	4	9°	4	45
08-00100-00170	1.7	4.5	9°	4	45
▌08-00100-00175	1.75	4.5	9°	4	45
08-00100-00180	1.8	4.5	9°	4	45
▌08-00100-00185	1.85	4.5	9°	4	45
08-00100-00190	1.9	5	9°	4	45
▌08-00100-00195	1.95	5	9°	4	45
08-00100-00200	2	5	9°	4	45
▌08-00100-00205	2.05	5	9°	4	45
08-00100-00210	2.1	5.5	9°	4	45
▌08-00100-00215	2.15	5.5	9°	4	45
08-00100-00220	2.2	5.5	9°	4	45
▌08-00100-00225	2.25	5.5	9°	4	45
08-00100-00230	2.3	6	9°	4	45
▌08-00100-00235	2.35	6	9°	4	45
08-00100-00240	2.4	6	9°	4	45
▌08-00100-00245	2.45	6	9°	4	45
08-00100-00250	2.5	7	9°	4	45
▌08-00100-00255	2.55	7	9°	4	45
08-00100-00260	2.6	7	9°	4	45
▌08-00100-00265	2.65	7	9°	4	45
08-00100-00270	2.7	7	9°	4	45
▌08-00100-00275	2.75	7	9°	4	45
08-00100-00280	2.8	7	9°	4	45
▌08-00100-00285	2.85	8	9°	4	50
08-00100-00290	2.9	8	9°	6	50
▌08-00100-00295	2.95	8	9°	4	50
08-00100-00300	3	8	9°	6	50
08-00100-00310	3.1	8	9°	6	50
08-00100-00320	3.2	8	9°	6	50
08-00100-00330	3.3	9	9°	6	50
08-00100-00340	3.4	9	9°	6	50
08-00100-00350	3.5	9	9°	6	50

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00100-00360	3.6	9	9°	6	50
08-00100-00370	3.7	10	9°	6	50
08-00100-00380	3.8	10	9°	6	50
08-00100-00390	3.9	10	9°	6	50
08-00100-00400	4	10	9°	6	50
08-00100-00410	4.1	11	9°	6	50
08-00100-00420	4.2	11	9°	6	50
08-00100-00430	4.3	11	9°	6	50
08-00100-00440	4.4	11	9°	6	50
08-00100-00450	4.5	12	9°	6	55
08-00100-00460	4.6	12	9°	6	55
08-00100-00470	4.7	12	9°	6	55
08-00100-00480	4.8	12	9°	6	55
08-00100-00490	4.9	13	9°	6	55
08-00100-00500	5	13	9°	6	55
08-00100-00510	5.1	13	9°	6	55
08-00100-00520	5.2	13	9°	6	55
08-00100-00530	5.3	14	9°	6	55
08-00100-00540	5.4	14	9°	6	55
08-00100-00550	5.5	14	9°	6	55
08-00100-00560	5.6	14	9°	6	55
08-00100-00570	5.7	15	9°	6	55
08-00100-00580	5.8	15	9°	6	55
08-00100-00590	5.9	15	9°	6	55
08-00100-00600	6	15	–	6	55
08-00100-00650	6.5	17	9°	8	60
08-00100-00700	7	18	9°	8	65
08-00100-00750	7.5	19	9°	8	65
08-00100-00800	8	20	–	8	65
08-00100-00850	8.5	22	9°	10	70
08-00100-00900	9	23	9°	10	70
08-00100-00950	9.5	24	9°	10	75
08-00100-01000	10	25	–	10	75
08-00100-01050	10.5	27	9°	12	80
08-00100-01100	11	28	9°	12	80
08-00100-01150	11.5	29	9°	12	80
08-00100-01200	12	30	–	12	80

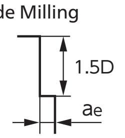
MSE230

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM･SKD･SUS			Prehardened Steels HPM･NAK		
Cutting Speed	50～80m/min			50～70m/min			40～60m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min⁻¹	mm/min		min⁻¹	mm/min		min⁻¹	mm/min	
		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting
0.1	50,000	–	25	50,000	–	15	50,000	–	20
0.2	50,000	–	40	50,000	–	25	50,000	–	30
0.3	50,000	100	50	50,000	90	35	50,000	85	40
0.4	50,000	150	75	47,700	130	50	39,800	110	55
0.5	41,400	170	85	38,200	130	50	31,800	110	55
0.8	25,900	210	100	23,900	150	55	19,900	130	65
1	20,700	210	100	19,100	150	55	15,900	130	65
1.5	13,800	210	100	12,700	150	55	10,600	130	65
2	10,300	210	100	9,500	170	60	8,000	150	75
2.5	8,300	250	120	7,600	180	65	6,400	160	80
3	6,900	280	140	6,400	190	70	5,300	170	85
3.5	5,900	300	150	5,500	190	70	4,500	170	85
4	5,200	310	160	4,800	190	70	4,000	170	85
5	4,100	330	160	3,800	230	75	3,200	210	110
6	3,400	340	170	3,200	260	85	2,700	240	120
7	3,000	330	170	2,700	240	80	2,300	230	120
8	2,600	310	160	2,400	240	80	2,000	220	110
9	2,300	300	150	2,100	230	80	1,800	220	110
10	2,100	290	150	1,900	230	75	1,600	210	100
11	1,900	290	140	1,700	220	75	1,400	200	100
12	1,700	270	140	1,600	220	75	1,300	200	100

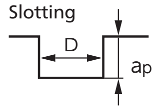
Depth of Cut (D: Dia.)

Side Milling



ae
φ0.3～0.95=0.05D
φ1～2.55=0.07D
φ2.6～6=0.1D
φ6.5～12=0.15D

Slotting



ap
φ0.1～0.45=0.05D
φ0.5～1.45=0.1D
φ1.5～3.9=0.35D
φ4～12=0.5D

Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

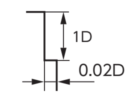
MSE230

Recommended Milling Conditions

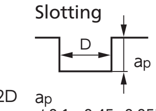
Work Material	Hardened Steels SKD61 (～52HRC)			Aluminium Alloy			Copper		
Cutting Speed	20～40m/min			100～200m/min			60～80m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min⁻¹	mm/min		min⁻¹	mm/min		min⁻¹	mm/min	
		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting
0.1	50,000	–	15	50,000	60	25	50,000	60	25
0.2	47,700	–	20	50,000	90	35	50,000	90	35
0.3	31,800	–	20	50,000	150	60	50,000	150	60
0.4	23,900	50	25	50,000	200	80	50,000	200	80
0.5	19,100	60	30	50,000	250	100	44,600	220	90
0.8	11,900	70	35	50,000	450	180	27,900	250	95
1	9,500	75	40	47,700	570	200	22,300	270	95
1.5	6,400	75	40	31,800	640	220	14,900	300	100
2	4,800	75	40	23,900	720	250	11,100	330	120
2.5	3,800	75	40	19,100	760	270	8,900	360	120
3	3,200	80	40	15,900	800	270	7,400	370	130
3.5	2,700	85	45	13,600	820	270	6,400	380	130
4	2,400	95	50	11,900	830	270	5,600	390	130
5	1,900	95	50	9,500	860	280	4,500	410	130
6	1,600	100	50	8,000	880	290	3,700	410	130
7	1,400	100	50	6,800	820	270	3,200	380	130
8	1,200	100	50	6,000	780	260	2,800	360	120
9	1,100	100	50	5,300	740	240	2,500	350	120
10	1,000	100	50	4,800	720	240	2,200	330	110
11	900	100	50	4,300	690	230	2,000	320	110
12	800	100	50	4,000	680	220	1,900	320	110

Depth of Cut (D: Dia.)

Side Milling

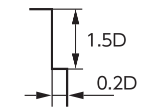


Slotting

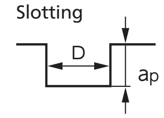


ap
φ0.1～0.45=0.05D
φ0.5～12=0.1D

Side Milling



Slotting



ap
φ0.1～0.45=0.05D
φ0.5～1.45=0.3D
φ1.5～12=0.5D

Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MSEM230

Size ϕ 0.5～ϕ 12

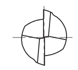
≦55 HRC

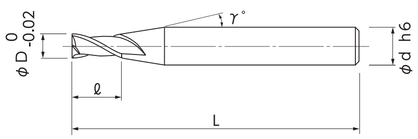
MUGEN COATING 2-Flute Medium End Mill

Total 14 sizes

Standard type of 2-flute with helix angle 30°. L/D=4

MG 2 30° Side Face





● L/D=4 and helix 30°.

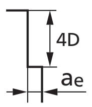
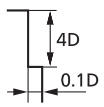
Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00101-00050	0.5	2	9°	4	50
08-00101-00060	0.6	2.4	9°	4	50
08-00101-00080	0.8	3.2	9°	4	50
08-00101-00100	1	4	9°	4	50
08-00101-00150	1.5	6	9°	4	50
08-00101-00200	2	8	9°	4	50
08-00101-00250	2.5	10	9°	4	50
08-00101-00300	3	12	9°	6	55
08-00101-00400	4	16	9°	6	60
08-00101-00500	5	20	9°	6	65
08-00101-00600	6	24	–	6	75
08-00101-00800	8	32	–	8	90
08-00101-01000	10	40	–	10	100
08-00101-01200	12	48	–	12	110

How to Order　When you order, indicate MSEM230 (D).　※(γ) is reference value.

MSEM230

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels･Prehardened Steels SCM･SKD･SUS･HPM･NAK		Copper	
Cutting Speed	20～30m/min		15～25m/min		20～40m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.5	16,000	65	12,800	45	19,100	100
0.6	13,500	75	10,800	45	16,000	100
0.8	10,000	80	8,000	50	12,000	100
1	8,000	80	6,400	50	9,600	110
1.5	5,350	80	4,300	50	6,400	130
2	4,000	80	3,200	60	4,800	140
2.5	3,200	100	2,600	60	3,850	150
3	2,700	110	2,200	60	3,200	160
4	2,000	120	1,600	65	2,400	170
5	1,600	130	1,300	80	1,950	170
6	1,350	130	1,100	90	1,600	180
8	1,000	120	800	80	1,200	160
10	800	110	650	70	960	150
12	670	110	550	70	800	140
Depth of Cut (D：Dia.)	Side Milling  ae ϕ0.5～0.8=0.03D ϕ1～2.9=0.04D ϕ3～12=0.08D				Side Milling 	
Notes	※1 Use cutting fluid with smoke retardant. ※2 Adjust both spindle speed and feed at the same rate. ※3 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.					

Regular Line
MUGEN COATING
Full Cutting Length Type
Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O
Square Coating

MSE230M

Size ϕ 0.1～ϕ 6

≦55 HRC

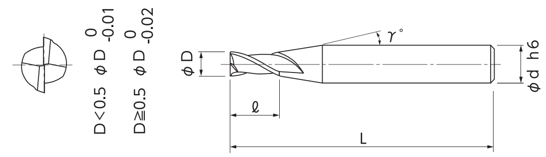
MUGEN COATING 2-Flute End Mill with Measured Diameter

Total 14 sizes

MG | 2 | 30°

Side | Slot | Face

Indicated actual measured diameter in micron on the label
Suitable for high accurate finishing



● Printed actual measurement of diameter in micron.

Actual diameter is indicated in 1 micron units on product label, and enables high precision machining.
※Micron units dimensions cannot be specified.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00105-00010	0.1	0.15	9°	4	45
08-00105-00020	0.2	0.4	9°	4	45
08-00105-00030	0.3	0.6	9°	4	45
08-00105-00040	0.4	0.8	9°	4	45
08-00105-00050	0.5	1.25	9°	4	45
08-00105-00080	0.8	2	9°	4	45
08-00105-00100	1	2.5	9°	4	45
08-00105-00150	1.5	4	9°	4	45
08-00105-00200	2	5	9°	4	45
08-00105-00250	2.5	7	9°	4	45
08-00105-00300	3	8	9°	6	50
08-00105-00400	4	10	9°	6	50
08-00105-00500	5	13	9°	6	55
08-00105-00600	6	15	–	6	55

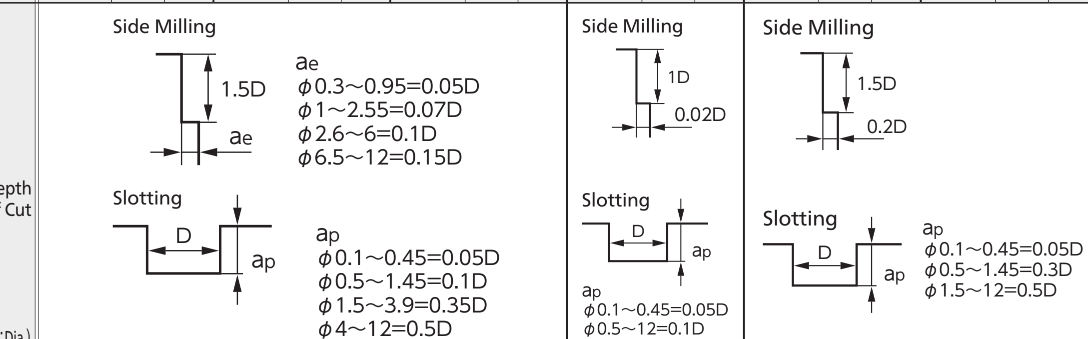
How to Order　When you order, indicate MSE230M (D).　※(γ) is reference value.

MSE230M

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM・SKD・SUS			Prehardened Steels HPM・NAK			Hardened Steels SKD61 (～52HRC)			Aluminium Alloy			Copper		
Cutting Speed	50～80m/min			50～70m/min			40～60m/min			20～40m/min			100～200m/min			60～80m/min		
Dia.	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting
0.1	50,000	–	25	50,000	–	15	50,000	–	20	50,000	–	15	50,000	60	25	50,000	60	25
0.2	50,000	–	40	50,000	–	25	50,000	–	30	47,700	–	20	50,000	90	35	50,000	90	35
0.3	50,000	100	50	50,000	90	35	50,000	85	40	31,800	–	20	50,000	150	60	50,000	150	60
0.4	50,000	150	75	47,700	130	50	39,800	110	55	23,900	50	25	50,000	200	80	50,000	200	80
0.5	41,400	170	85	38,200	130	50	31,800	110	55	19,100	60	30	50,000	250	100	44,600	220	90
0.8	25,900	210	100	23,900	150	55	19,900	130	65	11,900	70	35	50,000	450	180	27,900	250	95
1	20,700	210	100	19,100	150	55	15,900	130	65	9,500	75	40	47,700	570	200	22,300	270	95
1.5	13,800	210	100	12,700	150	55	10,600	130	65	6,400	75	40	31,800	640	220	14,900	300	100
2	10,300	210	100	9,500	170	60	8,000	150	75	4,800	75	40	23,900	720	250	11,100	330	120
2.5	8,300	250	120	7,600	180	65	6,400	160	80	3,800	75	40	19,100	760	270	8,900	360	120
3	6,900	280	140	6,400	190	70	5,300	170	85	3,200	80	40	15,900	800	270	7,400	370	130
4	5,200	310	160	4,800	190	70	4,000	170	85	2,400	95	50	11,900	830	270	5,600	390	130
5	4,100	330	160	3,800	230	75	3,200	210	110	1,900	95	50	9,500	860	280	4,500	410	130
6	3,400	340	170	3,200	260	85	2,700	240	120	1,600	100	50	8,000	880	290	3,700	410	130

Depth of Cut (D:Dia.)



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

Carbon Steel P ◎
Alloy Steel P ◎
Prehardened Steel P ◎
Hardened Steel ~55 HRC H ○
Stainless Steel M ○
Titanium Alloy Heat Resistant Alloy S ○
Aluminium Alloy N ○
Copper N ○
Resin O ○

MSE245

Size ϕ 2～ϕ 12

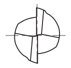
∞ ≤55 HRC

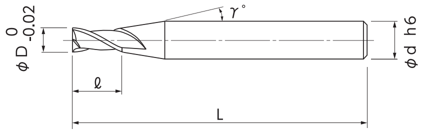
MUGEN COATING 2-Flute End Mill

Total 9 sizes

2-flute with high helix angle 45°. Applicable to tough work materials

MG 2 45° Side Slot Face





- Our original MUGEN COATING has been put on 2-flute end mill.
- Compared with 30° helix angle, it can be reduced cutting load.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00120-00200	2	5	9°	4	45
08-00120-00250	2.5	7	9°	4	45
08-00120-00300	3	8	9°	6	50
08-00120-00400	4	10	9°	6	50
08-00120-00500	5	13	9°	6	55
08-00120-00600	6	15	–	6	55
08-00120-00800	8	20	–	8	65
08-00120-01000	10	25	–	10	75
08-00120-01200	12	30	–	12	80

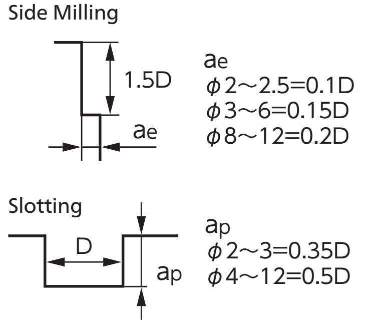
How to Order When you order, indicate MSE245 (D). ※(γ) is reference value.

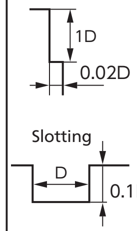
Square Coating

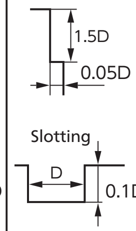
P Carbon Steel ◎
P Alloy Steel ◎
P Prehardened Steel ◎
H ~55 HRC Hardened Steel ○
M Stainless Steel ○
S Titanium Alloy Heat Resistant Alloy ○
N Aluminium Alloy ○
N Copper ○
O Resin ○

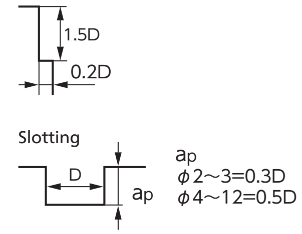
Side Milling	Carbon Steels S50C			Alloy Steels SCM・SKD・SUS			Prehardened Steels HPM・NAK			Hardened Steels SKD61 (～52HRC)			Heat Resistance Alloy			Aluminium Alloy			Copper		
Cutting Speed	60～100m/min			50～70m/min			40～60m/min			20～40m/min			15～25m/min			100～200m/min			80～150m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min	
		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting
2	12,700	330	160	9,600	250	80	8,000	130	65	4,800	100	50	3,200	60	30	31,800	1,300	450	24,000	1,200	400
2.5	10,200	400	200	7,600	250	80	6,400	130	65	3,800	100	50	2,500	60	30	25,400	1,300	450	19,000	1,200	400
3	8,500	440	220	6,400	300	100	5,300	170	85	3,200	130	65	2,100	70	35	21,200	1,300	450	16,000	1,200	400
4	6,400	500	250	4,800	300	100	4,000	170	85	2,400	130	65	1,600	70	35	16,000	1,300	450	12,000	1,200	400
5	5,100	530	260	3,800	360	120	3,200	220	110	1,900	150	75	1,300	80	40	12,700	1,300	450	9,600	1,200	400
6	4,200	550	270	3,200	360	120	2,700	220	110	1,600	150	75	1,100	80	40	10,600	1,300	450	8,000	1,200	400
8	3,200	500	250	2,400	360	120	2,000	220	110	1,200	150	75	800	80	40	8,000	1,100	380	6,000	1,200	400
10	2,500	460	230	1,900	360	120	1,600	220	110	1,000	150	75	600	80	40	6,300	1,000	350	4,800	1,200	400
12	2,100	440	220	1,600	360	120	1,300	220	110	800	150	75	500	80	40	5,300	1,000	350	4,000	1,200	400

Depth of Cut (D:Dia.)









Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

Square Coating

MSE345

Size ϕ 3～ϕ 20

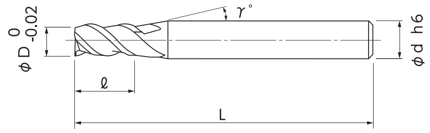
≤55 HRC

MUGEN COATING 3-Flute End Mill

Total 9 sizes

3-flute with high helix angle 45°. For high feed rate milling

MG 3 45°
Side Slot Face



- Our original MUGEN COATING has been put on 3-flute end mill.
- Compared with 30°helix angle, it can be reduced cutting load.

▲ Discontinued Products

Unit : mm

	Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
	08-00130-00300	3	8	9°	6	50
	08-00130-00400	4	10	9°	6	50
	08-00130-00500	5	13	9°	6	55
	08-00130-00600	6	15	—	6	55
	08-00130-00800	8	20	—	8	65
	08-00130-01000	10	25	—	10	75
	08-00130-01200	12	30	—	12	80
▲	08-00130-01600	16	40	—	16	110
▲	08-00130-02000	20	50	—	20	135

How to Order When you order, indicate MSE345 (D). ※(γ) is reference value.

▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

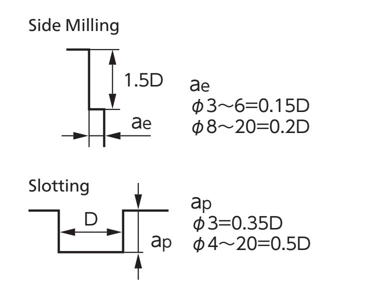
MSE345

Recommended Milling Conditions

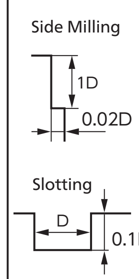
Side Milling	Carbon Steels S50C			Alloy Steels SCM･SKD･SUS			Prehardened Steels HPM･NAK			Hardened Steels SKD61 (～52HRC)			Heat Resistance Alloy			Aluminium Alloy			Copper		
Cutting Speed	60～100m/min			50～70m/min			40～60m/min			20～40m/min			15～25m/min			150～200m/min			80～150m/min		
Dia.	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting	Spindle Speed (min^{-1})	Feed (mm/min) Side Milling	Feed (mm/min) Slotting
3	8,500	510	250	6,400	340	110	5,300	220	100	3,200	190	85	2,100	80	40	21,200	1,900	650	15,900	1,500	500
4	6,400	690	340	4,800	340	110	4,000	220	100	2,400	190	85	1,600	80	40	16,000	1,900	650	11,900	1,500	500
5	5,100	730	360	3,800	410	140	3,200	250	115	1,900	220	110	1,300	100	50	12,700	1,900	650	9,600	1,500	500
6	4,200	750	370	3,200	410	140	2,700	250	115	1,600	220	110	1,100	100	50	10,600	1,900	650	8,000	1,500	500
8	3,200	690	340	2,400	410	140	2,000	250	115	1,200	220	110	800	100	50	8,000	1,700	600	6,000	1,500	500
10	2,500	630	310	1,900	410	140	1,600	250	115	1,000	220	110	600	100	50	6,300	1,500	520	4,800	1,500	500
12	2,100	600	300	1,600	410	140	1,300	250	115	800	220	110	500	100	50	5,300	1,400	500	4,000	1,500	500
16	1,600	570	280	1,200	340	110	1,000	220	100	600	190	85	400	80	40	4,000	1,200	420	3,000	1,500	500
20	1,300	560	280	1,000	340	110	800	220	100	500	190	85	300	80	40	3,200	1,200	420	2,400	1,500	500

Depth of Cut (D:Dia.)

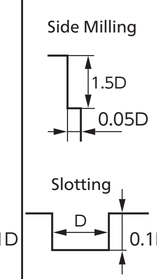
Carbon Steels / Alloy Steels / Prehardened Steels:



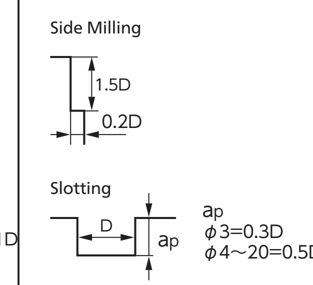
Hardened Steels:



Heat Resistance Alloy:



Aluminium Alloy / Copper:



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use rigid and precise machine and chuck holder.
※5 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MSE430P

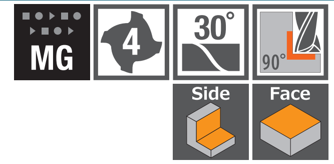
Size ϕ 1～ϕ 12

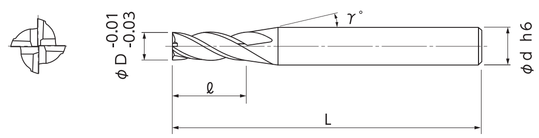
MSE430P

MUGEN COATING 4-Flute Sharp Edge End Mill

Total 11 sizes

4-flute sharp edge type with helix angle 30°





- It can be cut from nonferrous to steels due to the sharp edges.
- Minimize tool deflection for accurate finishing.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00112-00100	1	2.5	9°	4	45
08-00112-00150	1.5	4	9°	4	45
08-00112-00200	2	5	9°	4	45
08-00112-00250	2.5	7	9°	4	45
08-00112-00300	3	8	9°	4	50
08-00112-00400	4	10	–	4	50
08-00112-00500	5	13	9°	6	55
08-00112-00600	6	15	–	6	55
08-00112-00800	8	20	–	8	65
08-00112-01000	10	25	–	10	75
08-00112-01200	12	30	–	12	80

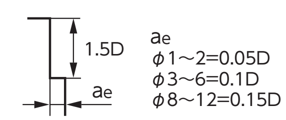
How to Order When you order, indicate MSE430P (D). ※(γ) is reference value.

Recommended Milling Conditions

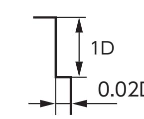
Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (～52HRC)	
Cutting Speed	60～100m/min		50～70m/min		35～60m/min		20～40m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,700	330	19,100	210	14,300	150	9,600	160
2	10,300	330	9,600	270	7,200	160	4,800	180
3	6,900	440	6,400	320	4,800	180	3,200	210
4	5,200	500	4,800	380	3,600	180	2,400	230
5	4,100	520	3,800	380	2,900	200	1,900	250
6	3,400	540	3,200	380	2,400	200	1,600	250
8	2,700	520	2,400	380	1,800	200	1,200	250
10	2,100	470	1,900	380	1,400	200	1,000	250
12	1,700	440	1,600	380	1,200	200	800	250

Depth of Cut (D : Dia.)

Side Milling (Carbon Steels, Alloy Steels, Prehardened Steels)



Side Milling (Hardened Steels)



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

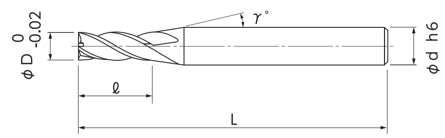
MSE430

Size ϕ 1～ϕ 20

MUGEN COATING 4-Flute End Mill — Total 25 sizes

MG / 4 / 30° / Side / Face / ≦55 HRC

4-flute standard type with helix angle 30°
For multi-purpose, from roughing to finishing



- Our original MUGEN COATING has been put on 4-flute end mill.
- It can be cut from non-hardened materials to hardened materials.

▲ Discontinued Products

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00110-00100	1	2.5	9°	4	45
08-00110-00150	1.5	4	9°	4	45
08-00110-00200	2	5	9°	4	45
08-00110-00250	2.5	7	9°	4	45
08-00110-00300	3	8	9°	6	50
08-00110-00350	3.5	9	9°	6	50
08-00110-00400	4	10	9°	6	50
08-00110-00450	4.5	12	9°	6	55
08-00110-00500	5	13	9°	6	55
08-00110-00550	5.5	14	9°	6	55
08-00110-00600	6	15	–	6	55
08-00110-00650	6.5	17	9°	8	60
08-00110-00700	7	18	9°	8	65
08-00110-00750	7.5	19	9°	8	65
08-00110-00800	8	20	–	8	65
08-00110-00850	8.5	22	9°	10	70
08-00110-00900	9	23	9°	10	70
08-00110-00950	9.5	24	9°	10	75
08-00110-01000	10	25	–	10	75
08-00110-01200	12	30	–	12	80
▲ 08-00110-01400	14	35	–	12	100
▲ 08-00110-01500	15	40	9°	16	110
▲ 08-00110-01600	16	40	–	16	110
▲ 08-00110-01800	18	45	–	16	120
▲ 08-00110-02000	20	50	–	20	135

How to Order — When you order, indicate MSE430 (D). ※(γ) is reference value.

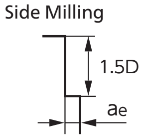
▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

MSE430 — Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM･SKD･SUS		Prehardened Steels HPM･NAK		Hardened Steels SKD61 (～52HRC)	
Cutting Speed	60～100m/min		50～70m/min		35～60m/min		20～40m/min	
Dia.	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min
1	20,700	330	19,100	210	14,300	150	9,600	160
2	10,300	330	9,600	270	7,200	160	4,800	180
3	6,900	440	6,400	320	4,800	180	3,200	210
4	5,200	500	4,800	380	3,600	180	2,400	230
5	4,100	520	3,800	380	2,900	200	1,900	250
6	3,400	540	3,200	380	2,400	200	1,600	250
7	3,000	530	2,700	380	2,000	200	1,400	250
8	2,700	520	2,400	380	1,800	200	1,200	250
9	2,300	480	2,100	380	1,600	200	1,100	250
10	2,100	470	1,900	380	1,400	200	1,000	250
12	1,700	440	1,600	380	1,200	200	800	250
14	1,500	430	1,400	360	1,000	190	700	230
15	1,400	430	1,300	350	1,000	180	600	210
16	1,300	420	1,200	330	900	160	600	200
18	1,150	400	1,100	330	800	160	500	200
20	1,050	400	1,000	330	700	160	500	200

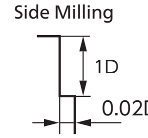
Depth of Cut (D: Dia.)

Side Milling (Carbon Steels / Alloy Steels / Prehardened Steels):



ae
ϕ1～2=0.05D
ϕ3～6=0.1D
ϕ7～20=0.15D

Side Milling (Hardened Steels):



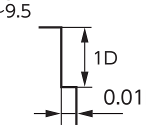
Recommended High Speed Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM･SKD･SUS		Prehardened Steels HPM･NAK		Hardened Steels SKD61 (～52HRC)	
Cutting Speed	250m/min		200m/min		160m/min		80m/min	
Dia.	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min
6	13,300	2,600	10,600	2,000	8,500	1,600	4,200	500
8	10,000	2,600	8,000	2,000	6,400	1,600	3,200	500
10	8,000	2,600	6,400	2,000	5,100	1,600	2,500	500
12	6,600	2,600	5,300	2,000	4,200	1,600	2,100	500
16	5,000	2,000	4,000	1,500	3,200	1,200	1,600	380
20	4,000	2,000	3,200	1,500	2,500	1,200	1,300	380

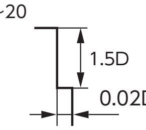
Depth of Cut (D: Dia.)

Side Milling (Carbon Steels / Alloy Steels / Prehardened Steels):

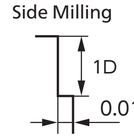
ϕ6～9.5



ϕ10～20



Side Milling (Hardened Steels):



Notes

※1 Use cutting fluid with smoke retardant.
※2 Recommend to use oil mist coolant for machining hardened steels.
※3 Adjust both spindle speed and feed at the same rate.
※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MSE445

Size φ 2～φ 20

≦55 HRC

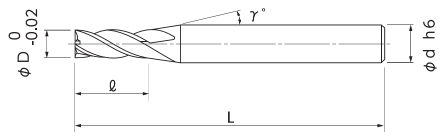
MSE445

MUGEN COATING 4-Flute End Mill

Total 11 sizes

MG 4 45° Side Face

4-flute with high helix angle 45°
Suitable for side milling of tough work materials



- Our original MUGEN COATING has been put on 4-flute end mill.
- Compared with 30° helix angle, it can be reduced cutting load.

▲ Discontinued Products

Unit : mm

	Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
	08-00140-00200	2	5	9°	4	45
	08-00140-00250	2.5	7	9°	4	45
	08-00140-00300	3	8	9°	6	50
	08-00140-00400	4	10	9°	6	50
	08-00140-00500	5	13	9°	6	55
	08-00140-00600	6	15	–	6	55
	08-00140-00800	8	20	–	8	65
	08-00140-01000	10	25	–	10	75
	08-00140-01200	12	30	–	12	80
▲	08-00140-01600	16	40	–	16	110
▲	08-00140-02000	20	50	–	20	135

How to Order When you order, indicate MSE445 (D). ※(γ) is reference value.

▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (～52HRC)		Heat Resistance Alloy	
Cutting Speed	60～100m/min		50～70m/min		40～60m/min		20～40m/min		15～25m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
2	12,700	560	9,600	325	8,000	220	4,800	210	3,200	100
2.5	10,200	670	7,600	325	6,400	220	3,800	210	2,500	100
3	8,500	750	6,400	390	5,300	240	3,200	260	2,100	130
4	6,400	840	4,800	390	4,000	240	2,400	260	1,600	130
5	5,100	900	3,800	470	3,200	260	1,900	300	1,300	150
6	4,200	920	3,200	470	2,700	260	1,600	300	1,100	150
8	3,200	840	2,400	470	2,000	260	1,200	300	800	150
10	2,500	770	1,900	470	1,600	260	1,000	300	600	150
12	2,100	740	1,600	470	1,300	260	800	300	500	150
16	1,600	700	1,200	390	1,000	220	600	260	400	130
20	1,300	690	1,000	390	800	220	500	260	300	130
Depth of Cut (D:Dia.)	Side Milling 1.5D ae; ae φ2～2.5=0.1D φ3～6=0.15D φ8～20=0.2D						Side Milling 1D 0.02D		Side Milling 1.5D 0.05D	

Recommended High Speed Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (～52HRC)	
Cutting Speed	250m/min		200m/min		160m/min		80m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
6	13,300	2,900	10,600	2,250	8,500	1,800	4,250	600
8	10,000	2,900	8,000	2,250	6,400	1,800	3,200	600
10	8,000	2,900	6,400	2,250	5,100	1,800	2,550	600
12	6,600	2,900	5,300	2,250	4,200	1,800	2,100	600
16	5,000	2,300	4,000	1,700	3,200	1,350	1,600	450
20	4,000	2,300	3,200	1,700	2,500	1,350	1,300	450
Depth of Cut (D:Dia.)	Side Milling φ6～8 1D 0.01D; φ10～20 1.5D 0.02D						Side Milling 1D 0.01D	
Notes	※1 Use cutting fluid with smoke retardant. ※2 Recommend to use oil mist coolant for machining hardened steels. ※3 Adjust both spindle speed and feed at the same rate. ※4 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.							

MSEM430

Size ϕ 1～ϕ 20

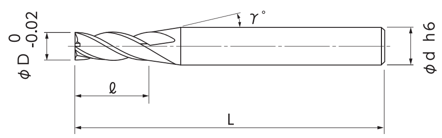
≦55 HRC

MUGEN COATING 4-Flute Medium End Mill

Total 13 sizes

4-flute with helix angle 30°. L/D=4

MG 4 30° Side Face



- L/D=4 and helix 30°.
- It is very suitable for finishing side milling.

▲ Discontinued Products

Unit : mm

	Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
	08-00111-00100	1	4	9°	4	50
	08-00111-00150	1.5	6	9°	4	50
	08-00111-00200	2	8	9°	4	50
	08-00111-00250	2.5	10	9°	4	50
	08-00111-00300	3	12	9°	6	55
	08-00111-00400	4	16	9°	6	60
	08-00111-00500	5	20	9°	6	65
	08-00111-00600	6	24	–	6	75
	08-00111-00800	8	32	–	8	90
	08-00111-01000	10	40	–	10	100
	08-00111-01200	12	48	–	12	110
▲	08-00111-01600	16	64	–	16	130
▲	08-00111-02000	20	80	–	20	140

How to Order　When you order, indicate MSEM430 (D).　※(γ) is reference value.

▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

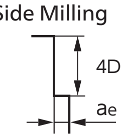
MSEM430

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM•SKD•SUS		Prehardened Steels HPM•NAK		Copper	
Cutting Speed	20～30m/min		15～25m/min		15～25m/min		20～40m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
1	8,000	120	6,400	80	6,400	80	9,500	170
1.5	5,300	120	4,300	80	4,300	80	6,400	200
2	4,000	120	3,200	90	3,200	90	4,800	210
2.5	3,200	150	2,600	90	2,600	90	3,800	230
3	2,700	170	2,200	90	2,200	90	3,200	240
4	2,000	200	1,600	110	1,600	110	2,400	290
5	1,600	220	1,300	140	1,300	140	1,900	290
6	1,300	220	1,100	150	1,100	150	1,600	310
8	1,000	200	800	140	800	140	1,200	270
10	800	190	650	120	650	120	1,000	260
12	650	190	550	120	550	120	800	240
16	500	160	400	120	400	120	600	240
20	400	140	320	100	320	100	480	200

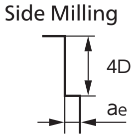
Depth of Cut (D:Dia.)

Side Milling (Carbon Steels, Alloy Steels, Prehardened Steels)



ae
ϕ1～2.5=0.04D
ϕ3～6=0.08D
ϕ8～12=0.1D
ϕ16～20=0.12D

Side Milling (Copper)



ae
ϕ1～12=0.1D
ϕ16～20=0.15D

Notes

※1 Use cutting fluid with smoke retardant.
※2 Adjust both spindle speed and feed at the same rate.
※3 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.

MHD445

Size ϕ 1〜ϕ 4

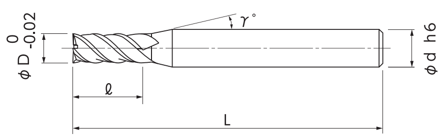
≦55 HRC

MUGEN COATING 4-Flute End Mill For Hardened Steel

Total 5 sizes

MG 4 45° Side Slot Face

4-flute with high helix angle. For finishing of prehardened steels and hardened steels (~55HRC)



- Machineable to high hardened steels (48〜55HRC).
- Realized high precision finishing without the deflection.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00400-00100	1	1.5	12°	6	60
08-00400-00150	1.5	2.5	12°	6	60
08-00400-00200	2	4	12°	6	60
08-00400-00300	3	6	12°	6	60
08-00400-00400	4	8	12°	6	60

How to Order When you order, indicate MHD445 (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Hardened Steels SKD61 (45〜50HRC)				Hardened Steels SKD61・STAVAX・HPM-38 (50〜55HRC)				Hardened Steels SKD11 (55HRC)			
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	6,400	280	3,200	140	5,400	240	2,700	120	4,800	200	2,400	100
1.5	4,200	300	2,100	150	3,600	230	1,800	120	3,200	180	1,600	90
2	3,200	320	1,600	160	2,700	230	1,400	120	2,400	180	1,200	90
3	3,700	520	1,900	260	3,200	380	1,600	140	2,600	260	1,300	130
4	2,800	450	1,400	230	2,400	360	1,200	180	2,000	260	1,000	130

Depth of Cut (D:Dia.)	SKD61 (45〜50HRC)	SKD61・STAVAX・HPM-38 (50〜55HRC)	SKD11 (55HRC)
Side Milling	ap ϕ1〜2=1D ϕ3〜4=1.5D; 0.02D		ap ϕ1〜2=1D ϕ3〜4=1.5D; 0.01D
Slotting	D; 0.05D	D; 0.03D	D; 0.01D

Recommended High Speed Milling Conditions

Work Material	Hardened Steels SKD61 (45〜50HRC)				Hardened Steels SKD61・STAVAX・HPM-38 (50〜55HRC)				Hardened Steels SKD11 (55HRC)			
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	950	10,000	480	17,500	770	8,800	390	12,700	510	6,400	260
1.5	13,800	1,000	6,900	500	11,700	750	5,900	380	8,500	480	4,300	240
2	10,400	1,000	5,200	500	8,700	730	4,400	370	6,400	460	3,200	230
3	10,600	1,500	5,300	750	9,500	1,100	4,800	550	7,400	740	3,700	370
4	8,000	1,300	4,000	650	7,200	1,100	3,600	550	5,600	740	2,800	370

Depth of Cut (D:Dia.)	SKD61 (45〜50HRC)	SKD61・STAVAX・HPM-38 (50〜55HRC)	SKD11 (55HRC)
Side Milling	ap ϕ1〜2=1D ϕ3〜4=1.5D; 0.02D		ap ϕ1〜2=1D ϕ3〜4=1.5D; 0.01D
Slotting	D; 0.05D	D; 0.03D	D; 0.01D

Notes

※1 Use a rigid and precise machine and chuck holder.
※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use oilmist coolant.

MHD645

Size ϕ 5～ϕ 12

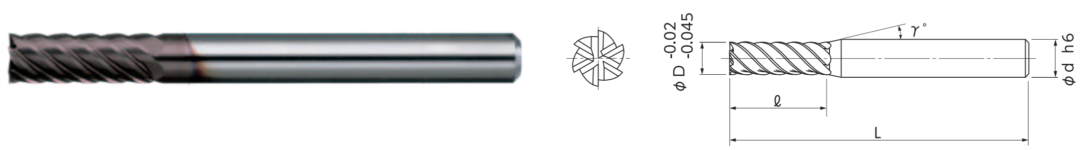
≦55 HRC

MUGEN COATING 6-Flute End Mill For Hardened Steel

Total 5 sizes

6-flute with high helix angle. For finishing of prehardened steels and hardened steels (~55HRC)

MG 6 45° Side Slot Face



- Machineable to high hardened steels (48～55HRC).
- Realized high precision finishing without the deflection.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00410-00500	5	10	12°	6	60
08-00410-00600	6	15	–	6	60
08-00410-00800	8	20	–	8	65
08-00410-01000	10	25	–	10	75
08-00410-01200	12	30	–	12	80

How to Order When you order, indicate MHD645 (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Hardened Steels SKD61 (45～50HRC)				Hardened Steels SKD61・STAVAX・HPM-38 (50～55HRC)				Hardened Steels SKD11 (55HRC)			
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
5	5,100	1,200	2,600	600	4,500	1,000	2,300	500	3,800	800	1,900	400
6	4,200	1,300	2,500	780	3,700	1,100	2,200	660	3,200	680	1,600	340
8	3,200	1,500	1,900	900	2,800	1,300	1,700	780	2,400	750	1,200	380
10	2,600	1,500	1,600	900	2,200	1,300	1,300	780	1,900	900	950	450
12	2,100	1,300	1,300	780	1,900	1,100	1,150	660	1,600	960	800	480
Depth of Cut (D:Dia.)	Side Milling: ap ϕ5～12=1.5D, 0.02D								Side Milling: ap ϕ5～12=1.5D, 0.01D			
	Slotting: D, 0.05D				Slotting: D, 0.03D				Slotting: D, 0.01D			

Recommended High Speed Milling Conditions

Work Material	Hardened Steels SKD61 (45～50HRC)				Hardened Steels SKD61・STAVAX・HPM-38 (50～55HRC)				Hardened Steels SKD11 (55HRC)			
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
5	8,900	2,100	4,500	1,100	7,600	1,800	3,800	900	5,100	1,100	2,600	550
6	7,400	2,200	4,500	1,320	6,400	1,900	3,900	1,150	5,300	1,100	2,700	550
8	5,600	2,600	3,400	1,560	4,800	2,200	2,900	1,320	4,000	1,300	2,000	650
10	4,500	2,600	2,700	1,560	3,800	2,200	2,300	1,320	3,200	1,500	1,600	750
12	3,700	2,200	2,200	1,320	3,200	1,900	2,000	1,150	2,600	1,600	1,300	800
Depth of Cut (D:Dia.)	Side Milling: ap ϕ5～12=1.5D, 0.02D								Side Milling: ap ϕ5～12=1.5D, 0.01D			
	Slotting: D, 0.05D				Slotting: D, 0.03D				Slotting: D, 0.01D			
Notes	※1 Use a rigid and precise machine and chuck holder. ※2 Adjust milling conditions according to the volume of Depth of Cut and rigidity of the machine. ※3 Adjust both spindle speed and feed at the same rate. ※4 Use oilmist coolant.											

MSB230

Size R0.05～R10

≦55 HRC

MUGEN COATING 2-Flute Ball End Mill

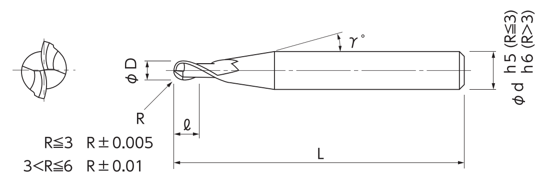
Total 87 sizes

MSB230

MUGEN COATING 2-Flute Ball End Mill

2-flute standard type with helix angle 30°
For multi-purpose, from roughing to finishing

MG | 2 | 30° | R ±0.005 (R≦3) | φd h5 (R≦3) | 3D



R≦3 R±0.005
3<R≦6 R±0.01
6<R R±0.02

● Suitable for precision three-dimensional cutting in the low to high speed range.

▲ Discontinued Products

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00501-00005	R0.05	0.1	0.1	15°	4	50
08-00500-00005	R0.05	0.1	0.1	15°	6	50
08-00501-00007	R0.075	0.15	0.15	15°	4	50
08-00500-00007	R0.075	0.15	0.15	15°	6	50
08-00501-00010	R0.1	0.2	0.2	15°	4	50
08-00500-00010	R0.1	0.2	0.2	15°	6	50
08-00501-00015	R0.15	0.3	0.3	15°	4	50
08-00500-00015	R0.15	0.3	0.3	15°	6	50
08-00501-00020	R0.2	0.6	0.4	15°	4	50
08-00500-00020	R0.2	0.6	0.4	15°	6	50
08-00501-00025	R0.25	0.8	0.5	15°	4	50
08-00500-00025	R0.25	0.8	0.5	15°	6	50
08-00501-00030	R0.3	0.9	0.6	15°	4	50
08-00500-00030	R0.3	0.9	0.6	15°	6	50
08-00500-00035	R0.35	1.1	0.7	15°	6	50
08-00501-00040	R0.4	1.2	0.8	15°	4	50
08-00500-00040	R0.4	1.2	0.8	15°	6	50
08-00500-00045	R0.45	1.4	0.9	15°	6	50
08-00501-00050	R0.5	1.5	1	15°	4	50
08-00500-00050	R0.5	1.5	1	15°	6	50
08-00500-00055	R0.55	1.7	1.1	15°	6	50
08-00501-00060	R0.6	1.8	1.2	15°	4	50
08-00500-00060	R0.6	1.8	1.2	15°	6	50
08-00500-00065	R0.65	2	1.3	15°	6	50
08-00501-00070	R0.7	2.1	1.4	15°	4	50
08-00500-00070	R0.7	2.1	1.4	15°	6	50

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00501-00075	R0.75	2.3	1.5	15°	4	50
08-00500-00075	R0.75	2.3	1.5	15°	6	50
08-00501-00080	R0.8	2.4	1.6	15°	4	50
08-00500-00080	R0.8	2.4	1.6	15°	6	50
08-00500-00085	R0.85	2.6	1.7	15°	6	50
08-00500-00090	R0.9	2.7	1.8	15°	6	50
08-00500-00095	R0.95	2.9	1.9	15°	6	50
08-00501-00100	R1	3	2	9°	4	60
08-00500-00100	R1	3	2	9°	6	60
08-00500-00105	R1.05	3.2	2.1	9°	6	60
08-00500-00110	R1.1	3.3	2.2	9°	6	60
08-00500-00115	R1.15	3.5	2.3	9°	6	60
08-00500-00120	R1.2	3.6	2.4	9°	6	60
08-00501-00125	R1.25	3.8	2.5	9°	4	60
08-00500-00125	R1.25	3.8	2.5	9°	6	60
08-00500-00130	R1.3	3.9	2.6	9°	6	60
08-00500-00135	R1.35	4.1	2.7	9°	6	60
08-00500-00140	R1.4	4.2	2.8	9°	6	60
08-00500-00145	R1.45	4.4	2.9	9°	6	60
08-00501-00150	R1.5	5	3	9°	4	60
08-00500-00150	R1.5	5	3	9°	6	60
08-00500-00155	R1.55	5	3.1	9°	6	60
08-00500-00160	R1.6	5	3.2	9°	6	60
08-00500-00165	R1.65	5	3.3	9°	6	60
08-00500-00170	R1.7	5.1	3.4	9°	6	60
08-00500-00175	R1.75	5.3	3.5	9°	6	60

How to Order When you order, indicate MSB230 (R)×(d). ※(γ) is reference value.

▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

▲ Discontinued Products

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00500-00180	R1.8	5.4	3.6	9°	6	60
08-00500-00185	R1.85	5.6	3.7	9°	6	60
08-00500-00190	R1.9	5.7	3.8	9°	6	60
08-00500-00195	R1.95	5.9	3.9	9°	6	60
08-00500-00200	R2	6	4	9°	6	70
08-00500-00205	R2.05	6.2	4.1	9°	6	70
08-00500-00210	R2.1	6.3	4.2	9°	6	70
08-00500-00215	R2.15	6.5	4.3	9°	6	70
08-00500-00220	R2.2	6.6	4.4	9°	6	70
08-00500-00225	R2.25	6.8	4.5	9°	6	70
08-00500-00230	R2.3	6.9	4.6	9°	6	70
08-00500-00235	R2.35	7.1	4.7	9°	6	70
08-00500-00240	R2.4	7.2	4.8	9°	6	70
08-00500-00245	R2.45	7.4	4.9	9°	6	70
08-00500-00250	R2.5	8	5	9°	6	70
08-00500-00255	R2.55	8	5.1	9°	6	70
08-00500-00260	R2.6	8	5.2	9°	6	70
08-00500-00265	R2.65	8	5.3	9°	6	70
08-00500-00270	R2.7	8.1	5.4	9°	6	70
08-00500-00275	R2.75	8.3	5.5	9°	6	70
08-00500-00280	R2.8	8.4	5.6	9°	6	70
08-00500-00285	R2.85	8.6	5.7	9°	6	70
08-00500-00290	R2.9	8.7	5.8	9°	6	70
08-00500-00295	R2.95	8.9	5.9	9°	6	70
08-00500-00300	R3	10	6	–	6	80
08-00500-00350	R3.5	10.5	7	–	6	80

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00500-00400	R4	12	8	–	8	90
08-00500-00450	R4.5	13.5	9	–	8	90
08-00500-00500	R5	15	10	–	10	100
08-00500-00550	R5.5	16.5	11	–	10	100
08-00500-00600	R6	20	12	–	12	110
▲ 08-00500-00700	R7	21	14	–	12	160
▲ 08-00500-00800	R8	25	16	–	16	160
▲ 08-00500-00900	R9	27	18	–	16	170
▲ 08-00500-01000	R10	30	20	–	20	170

How to Order When you order, indicate MSB230 (R)×(d). ※(γ) is reference value.

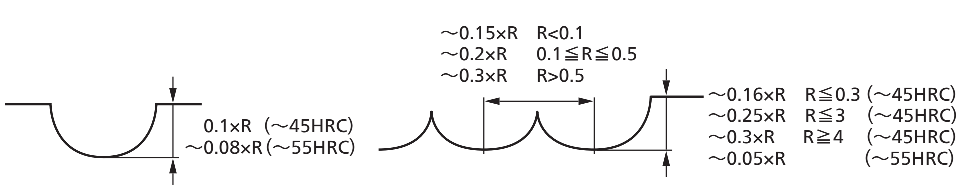
▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

MSB230

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels Prehardened Steels SCM・SKD・SUS・HPM・NAK		Hardened Steels SKD61 (∼52HRC)		Aluminium Alloy		Copper	
Cutting Speed	150m/min		120∼150m/min		80∼100m/min		150m/min∼		100∼150m/min	
Radius	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.05	50,000	200	50,000	150	50,000	100	50,000	250	50,000	250
0.1	50,000	400	50,000	340	50,000	200	50,000	500	50,000	500
0.2	50,000	630	50,000	600	50,000	630	50,000	600	50,000	600
0.3	50,000	930	50,000	940	48,000	900	50,000	750	50,000	750
0.4	50,000	1,200	48,000	1,200	36,000	900	50,000	1,000	50,000	1,000
0.5	48,000	1,430	38,000	1,200	29,000	900	50,000	1,250	48,000	1,000
0.6	40,000	1,430	32,000	1,200	24,000	810	50,000	1,480	40,000	1,080
0.8	30,000	1,270	24,000	1,000	18,000	670	50,000	1,900	30,000	1,160
1	24,000	1,160	19,000	800	14,300	600	48,000	2,400	24,000	1,200
1.5	16,000	930	13,000	600	9,600	460	32,000	2,400	16,000	1,200
2	12,000	930	10,000	570	7,200	450	24,000	2,400	12,000	1,200
2.5	9,600	930	8,000	560	5,700	450	19,000	2,400	9,600	1,200
3	8,000	930	6,400	540	4,800	450	16,000	2,400	8,000	1,200
4	6,000	900	4,800	540	3,600	450	12,000	2,400	6,000	1,200
5	4,800	900	3,800	540	2,900	450	9,600	2,300	4,800	1,150
6	4,000	900	3,200	540	2,400	450	8,000	2,100	4,000	1,050
7	3,400	900	2,750	540	2,050	450	6,800	2,000	3,400	1,000
8	3,000	900	2,400	540	1,800	450	6,000	2,000	3,000	1,000
9	2,650	900	2,100	520	1,600	450	5,300	2,000	2,650	1,000
10	2,400	900	1,900	520	1,450	450	4,800	2,000	2,400	1,000

Depth of Cut (R: Radius)



Notes

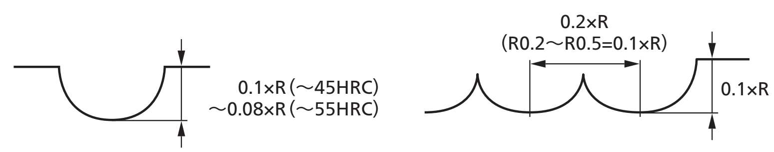
※1 When slotting, reduce the feed by 60% from the above values.
※2 Length of overhang is 4 times Dia. as standard. When it is longer than 4 times Dia., adjust the conditions listed above.
※3 Recommended oil mist or airblow.
※4 Adjust both spindle speed and feed at the same rate.

MSB230

Recommended High Speed Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (∼52HRC)	
Cutting Speed	250m/min		200m/min		180m/min		100m/min	
Radius	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.2	∼50,000	∼1,500	∼50,000	∼1,200	∼50,000	∼1,000	∼50,000	600
0.3	∼50,000	∼1,500	∼50,000	∼1,200	∼50,000	∼1,000	∼50,000	700
0.4	∼50,000	∼3,000	∼50,000	∼2,500	∼50,000	∼2,200	40,000	1,000
0.5	∼50,000	∼3,000	∼50,000	∼2,500	∼50,000	∼2,200	32,000	1,500
1	40,000	5,000	32,000	3,200	29,000	2,900	16,000	1,500
1.5	27,000	5,000	21,000	3,200	19,000	2,900	10,600	1,500
2	20,000	5,000	16,000	3,200	14,000	2,900	8,000	1,500
3	13,500	3,000	10,600	2,000	9,500	1,800	5,300	1,200
4	10,000	3,000	8,000	2,000	7,200	1,800	4,000	1,200
5	8,000	3,000	6,400	2,000	5,700	1,800	3,200	1,200
6	6,700	2,500	5,300	1,800	4,800	1,600	2,700	1,200
8	5,000	2,000	4,000	1,500	3,600	1,300	2,000	800
10	4,000	1,500	3,200	1,200	2,900	1,000	1,600	800

Depth of Cut (R: Radius)



Notes

※1 When slotting, reduce the feed by 60% from the above values.
※2 Recommended air blow or oil mist.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use a rigid machine and chuck holder.
※5 Adjust milling conditions according to the volume of depth of cut and rigidity of the machine.

MSB345

Size R0.5 ～ R6

≦55 HRC

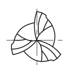
MSB345

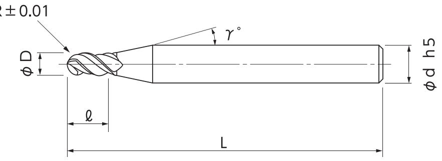
MUGEN COATING 3-Flute Ball End Mill

Total 56 sizes

MG 3 45° φd h5 3D

3-flute ball end mill. Realized to control chattering by unequal flute spacing





● Original 3-flute design and unequal flute spacing to suppress chattering realize high efficient machining.

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00600-00050	R0.5	1.5	1	12°	6	60
▌08-00600-00060	R0.6	2	1.2	12°	6	60
▌08-00600-00070	R0.7	3	1.4	12°	6	60
▌08-00600-00080	R0.8	3	1.6	12°	6	60
▌08-00600-00090	R0.9	3	1.8	12°	6	60
08-00600-00100	R1	3	2	12°	6	60
▌08-00600-00110	R1.1	3.5	2.2	12°	6	60
▌08-00600-00120	R1.2	4	2.4	12°	6	60
▌08-00600-00130	R1.3	4	2.6	12°	6	60
▌08-00600-00140	R1.4	5	2.8	12°	6	60
08-00600-00150	R1.5	5	3	12°	6	60
▌08-00600-00160	R1.6	5	3.2	12°	6	60
▌08-00600-00170	R1.7	6	3.4	12°	6	60
▌08-00600-00180	R1.8	6	3.6	12°	6	60
▌08-00600-00190	R1.9	6	3.8	12°	6	60
08-00600-00200	R2	6	4	12°	6	70
▌08-00600-00210	R2.1	7	4.2	12°	6	70
▌08-00600-00220	R2.2	7	4.4	12°	6	70
▌08-00600-00230	R2.3	7	4.6	12°	6	70
▌08-00600-00240	R2.4	8	4.8	12°	6	70
08-00600-00250	R2.5	8	5	12°	6	70
▌08-00600-00260	R2.6	8	5.2	12°	6	70
▌08-00600-00270	R2.7	9	5.4	12°	6	70
▌08-00600-00280	R2.8	9	5.6	12°	6	70
▌08-00600-00290	R2.9	9	5.8	12°	6	70
08-00600-00300	R3	10	6	–	6	80
▌08-00600-00310	R3.1	10	6.2	12°	8	90
▌08-00600-00320	R3.2	10	6.4	12°	8	90
▌08-00600-00330	R3.3	10	6.6	12°	8	90
▌08-00600-00340	R3.4	11	6.8	12°	8	90
▌08-00600-00350	R3.5	11	7	12°	8	90
▌08-00600-00360	R3.6	11	7.2	12°	8	90
▌08-00600-00370	R3.7	12	7.4	12°	8	90
▌08-00600-00380	R3.8	12	7.6	12°	8	90
▌08-00600-00390	R3.9	12	7.8	12°	8	90
08-00600-00400	R4	12	8	–	8	90
▌08-00600-00410	R4.1	13	8.2	12°	10	100
▌08-00600-00420	R4.2	13	8.4	12°	10	100
▌08-00600-00430	R4.3	13	8.6	12°	10	100
▌08-00600-00440	R4.4	14	8.8	12°	10	100
▌08-00600-00450	R4.5	14	9	12°	10	100
▌08-00600-00460	R4.6	14	9.2	12°	10	100
▌08-00600-00470	R4.7	15	9.4	12°	10	100
▌08-00600-00480	R4.8	15	9.6	12°	10	100
▌08-00600-00490	R4.9	15	9.8	12°	10	100
08-00600-00500	R5	15	10	–	10	100
▌08-00600-00510	R5.1	16	10.2	12°	12	110
▌08-00600-00520	R5.2	16	10.4	12°	12	110
▌08-00600-00530	R5.3	16	10.6	12°	12	110
▌08-00600-00540	R5.4	17	10.8	12°	12	110
▌08-00600-00550	R5.5	17	11	12°	12	110
▌08-00600-00560	R5.6	17	11.2	12°	12	110
▌08-00600-00570	R5.7	18	11.4	12°	12	110
▌08-00600-00580	R5.8	18	11.6	12°	12	110
▌08-00600-00590	R5.9	18	11.8	12°	12	110
08-00600-00600	R6	20	12	–	12	110

How to Order When you order, indicate MSB345 (R)×(d). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Recommended Milling Conditions

Work Material	Carbon Steels S50C				Alloy Steels・Prehardened Steels SKD・HPM・NAK				Hardened Steels STAVAX・SKD61 (～52HRC)			
Radius	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.5	0.1	0.3	4,000	40,000	0.1	0.3	3,500	40,000	0.1	0.3	2,500	30,000
1	0.2	0.6	4,500	30,000	0.2	0.6	4,000	30,000	0.2	0.6	3,000	20,000
1.5	0.3	1	4,500	24,000	0.3	1	4,000	24,000	0.2	1	3,000	18,000
2	0.4	1.5	4,500	20,000	0.4	1.5	4,000	20,000	0.3	1.5	3,000	15,000
2.5	0.5	1.7	4,500	16,000	0.5	1.7	4,000	16,000	0.3	2	3,000	12,000
3	0.6	2	4,500	10,000	0.6	2	4,000	10,000	0.4	2	3,000	9,000
4	0.8	2.5	4,500	8,000	0.8	2.5	4,000	8,000	0.5	2	3,000	7,000
5	1.2	3	4,500	6,500	1.2	3	4,000	6,500	0.7	2.5	3,000	5,500
6	1.5	4	4,500	5,000	1.5	4	4,000	5,000	1	3	3,000	4,000

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 Adjust both spindle speed and feed at the same rate.
※3 Adjust milling conditions according to the volume of depth of cut and rigidity of machine.
※4 Length of overhang is 4 to 5 times Dia. as standard. When it is longer than 4 to 5 times Dia., adjust the conditions listed above.

MSB230G2

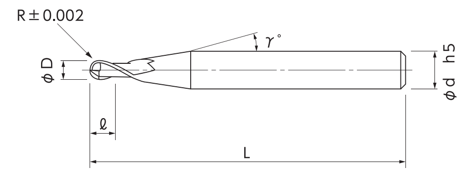
Size R0.05～R3 ≦55 HRC

MUGEN COATING Profit Ball End Mill

Total 14 sizes

Radius tolerance ±0.002mm. 2-flute high accurate end mill

MG 2 30° R ±0.002 φd h5 3D



- Utmost accuracy ! R-tolerance：±0.002mm
- Improved MUGEN COATING guarantees long-lasting machining.

Unit : mm

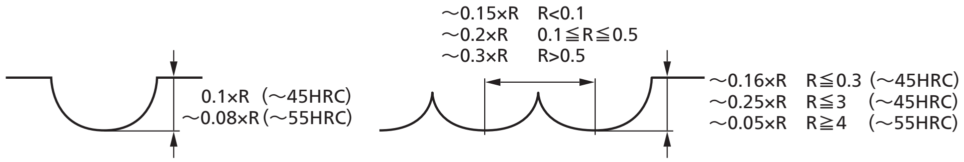
Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00505-00005	R0.05	0.1	0.1	15°	4	50
08-00505-00010	R0.1	0.2	0.2	15°	4	50
08-00505-00015	R0.15	0.3	0.3	15°	4	50
08-00505-00020	R0.2	0.6	0.4	15°	4	50
08-00505-00025	R0.25	0.8	0.5	15°	4	50
08-00505-00030	R0.3	0.9	0.6	15°	4	50
08-00505-00040	R0.4	1.2	0.8	15°	4	50
08-00505-00050	R0.5	1.5	1	15°	4	50
08-00505-00075	R0.75	2.3	1.5	15°	4	50
08-00505-00100	R1	3	2	9°	4	60
08-00505-00150	R1.5	5	3	9°	6	60
08-00505-00200	R2	6	4	9°	6	70
08-00505-00250	R2.5	8	5	9°	6	70
08-00505-00300	R3	10	6	–	6	80

How to Order When you order, indicate MSB230G2 (R). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels Prehardened Steels SCM•SKD•SUS•HPM•NAK		Hardened Steels SKD61 (～52HRC)		Aluminium Alloy		Copper	
Cutting Speed	150m/min		120～150m/min		80～100m/min		150m/min～		100～150m/min	
Radius	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min
0.05	50,000	200	50,000	150	50,000	100	50,000	250	50,000	250
0.1	50,000	400	50,000	340	50,000	200	50,000	500	50,000	500
0.2	50,000	630	50,000	600	50,000	630	50,000	600	50,000	600
0.3	50,000	930	50,000	940	48,000	900	50,000	750	50,000	750
0.4	50,000	1,200	48,000	1,200	36,000	900	50,000	1,000	50,000	1,000
0.5	48,000	1,430	38,000	1,200	29,000	900	50,000	1,250	48,000	1,000
1	24,000	1,160	19,000	800	14,300	600	48,000	2,400	24,000	1,200
1.5	16,000	930	13,000	600	9,600	460	32,000	2,400	16,000	1,200
2	12,000	930	10,000	570	7,200	450	24,000	2,400	12,000	1,200
2.5	9,600	930	8,000	560	5,700	450	19,000	2,400	9,600	1,200
3	8,000	930	6,400	540	4,800	450	16,000	2,400	8,000	1,200

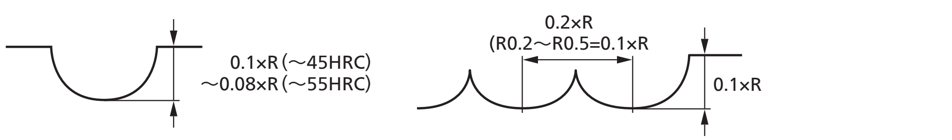
Depth of Cut (R:Radius)



Recommended High Speed Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM•SKD•SUS		Prehardened Steels HPM•NAK		Hardened Steels SKD61 (～52HRC)	
Cutting Spee	250m/min		200m/min		180m/min		100m/min	
Radius	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min
0.2	～50,000	～1,500	～50,000	～1,200	～50,000	～1,000	～50,000	600
0.3	～50,000	～1,500	～50,000	～1,200	～50,000	～1,000	～50,000	700
0.4	～50,000	～3,000	～50,000	～2,500	～50,000	～2,200	40,000	1,000
0.5	～50,000	～3,000	～50,000	～2,500	～50,000	～2,200	32,000	1,500
1	40,000	5,000	32,000	3,200	29,000	2,900	16,000	1,500
1.5	27,000	5,000	21,000	3,200	19,000	2,900	10,600	1,500
2	20,000	5,000	16,000	3,200	14,000	2,900	8,000	1,500
3	13,500	3,000	10,600	2,000	9,500	1,800	5,300	1,200

Depth of Cut (R:Radius)



Notes

※1 When slotting, reduce the feed by 60% from the above values.
※2 Recommended air blow or oil mist.
※3 Under normal speed milling condition, length of overhang is 4 times Dia. as standard. When it is longer than 4 times Dia., adjust the conditions listed above.
※4 Adjust both spindle speed and feed at the same rate.
※5 Under high speed milling condition, recommend to use a rigid machine and chuck holder.
※6 Adjust milling conditions according to the volume of depth of cut and rigidity of the machine.
※7 Use a rigid machine and chuck holder.

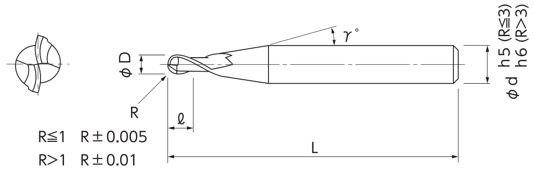
MSB230S

Size R0.1 ～ R6

MUGEN COATING 2-Flute Short Flute Ball End Mill

Total 24 sizes

2-flute standard type with helix angle 30°.
L/D=1 to increase rigidity



● High rigid design reduced chatter in high speed cutting.

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00530-00010	R0.1	0.2	0.2	9°	4	50
08-00530-00015	R0.15	0.3	0.3	9°	4	50
08-00530-00020	R0.2	0.4	0.4	9°	4	50
08-00530-00025	R0.25	0.5	0.5	9°	4	50
08-00530-00030	R0.3	0.6	0.6	9°	4	50
08-00530-00035	R0.35	0.7	0.7	9°	4	50
08-00530-00040	R0.4	0.8	0.8	9°	4	50
08-00530-00045	R0.45	0.9	0.9	9°	4	50
08-00530-00050	R0.5	1	1	9°	4	50
08-00530-00060	R0.6	1.2	1.2	9°	4	50
08-00530-00070	R0.7	1.4	1.4	9°	4	50
08-00530-00075	R0.75	1.5	1.5	9°	4	50
08-00530-00080	R0.8	1.6	1.6	9°	4	50
08-00530-00090	R0.9	1.8	1.8	9°	4	50
08-00530-00100	R1	2	2	9°	4	60
08-00530-00125	R1.25	2.5	2.5	9°	4	60
08-00530-00150	R1.5	3	3	9°	4	60
08-00530-00175	R1.75	3.5	3.5	9°	4	60
08-00530-00200	R2	4	4	9°	6	60
08-00530-00250	R2.5	5	5	9°	6	70
08-00530-00300	R3	6	6	–	6	80
08-00530-00400	R4	8	8	–	8	90
08-00530-00500	R5	10	10	–	10	100
08-00530-00600	R6	12	12	–	12	110

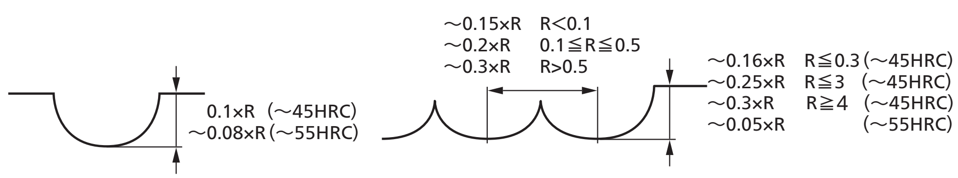
How to Order　When you order, indicate MSB230S (R).　※(γ) is reference value.

MSB230S

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels Prehardened Steels SCM・SKD・SUS・HPM・NAK		Hardened Steels SKD61 (～52HRC)		Aluminium Alloy		Copper	
Cutting Speed	150m/min		120～150m/min		80～100m/min		150m/min～		100～150m/min	
Radius	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.1	50,000	400	50,000	340	50,000	200	50,000	500	50,000	500
0.2	50,000	630	50,000	600	50,000	630	50,000	600	50,000	600
0.3	50,000	930	50,000	940	48,000	900	50,000	750	50,000	750
0.4	50,000	1,200	48,000	1,200	36,000	900	50,000	1,000	50,000	1,000
0.5	48,000	1,430	38,000	1,200	29,000	900	50,000	1,250	48,000	1,000
0.6	40,000	1,430	32,000	1,200	24,000	810	50,000	1,480	40,000	1,080
0.8	30,000	1,270	24,000	1,000	18,000	670	50,000	1,900	30,000	1,160
1	24,000	1,160	19,000	800	14,300	600	48,000	2,400	24,000	1,200
1.5	16,000	930	13,000	600	9,600	460	32,000	2,400	16,000	1,200
2	12,000	930	10,000	570	7,200	450	24,000	2,400	12,000	1,200
2.5	9,600	930	8,000	560	5,700	450	19,000	2,400	9,600	1,200
3	8,000	930	6,400	540	4,800	450	16,000	2,400	8,000	1,200
4	6,000	900	4,800	540	3,600	450	12,000	2,400	6,000	1,200
5	4,800	900	3,800	540	2,900	450	9,600	2,300	4,800	1,150
6	4,000	900	3,200	540	2,400	450	8,000	2,100	4,000	1,050

Depth of Cut (R:Radius)



Notes

※1 When slotting, reduce the feed by 60% from the above values.
※2 Length of overhang is 4 times Dia. as standard. When it is longer than 4 times Dia., adjust the conditions listed above.
※3 Recommended oil mistair or blow.
※4 Adjust both spindle speed and feed at the same rate.

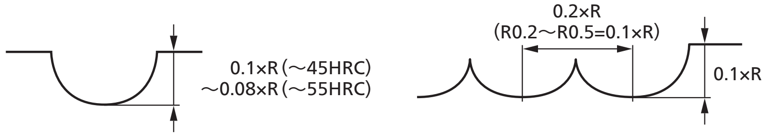
MSB230S

MSB230S

Recommended High Speed Milling Conditions

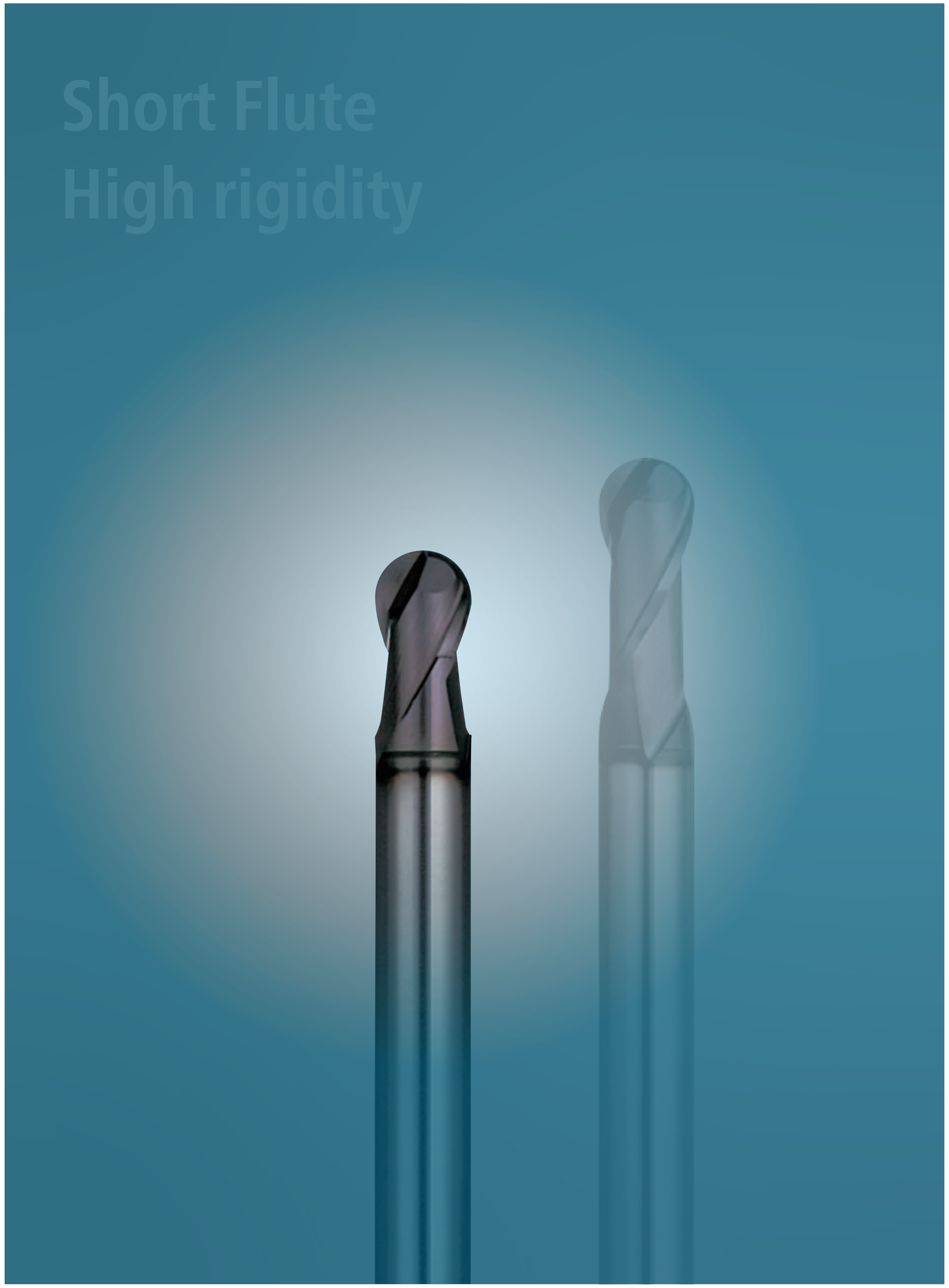
Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (~52HRC)	
Cutting Speed	250m/min		200m/min		180m/min		100m/min	
Radius	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.2	~50,000	~1,500	~50,000	~1,200	~50,000	~1,000	~50,000	600
0.3	~50,000	~1,500	~50,000	~1,200	~50,000	~1,000	~50,000	700
0.4	~50,000	~3,000	~50,000	~2,500	~50,000	~2,200	40,000	1,000
0.5	~50,000	~3,000	~50,000	~2,500	~50,000	~2,200	32,000	1,500
1	40,000	5,000	32,000	3,200	29,000	2,900	16,000	1,500
1.5	27,000	5,000	21,000	3,200	19,000	2,900	10,600	1,500
2	20,000	5,000	16,000	3,200	14,000	2,900	8,000	1,500
3	13,500	3,000	10,600	2,000	9,500	1,800	5,300	1,200
4	10,000	3,000	8,000	2,000	7,200	1,800	4,000	1,200
5	8,000	3,000	6,400	2,000	5,700	1,800	3,200	1,200
6	6,700	2,500	5,300	1,800	4,800	1,600	2,700	1,200

Depth of Cut (R:Radius)



Notes

※1 When slotting, reduce the feed by 60% from the above values.
※2 Recommended oil mist or air blow .
※3 Adjust both spindle speed and feed at the same rate.
※4 Use a rigid machine and chuck holder.
※5 Adjust milling conditions according to the volume of depth of cut and rigidity of the machine.



MSB230SF

Size R0.1 ~ R6

≦55 HRC

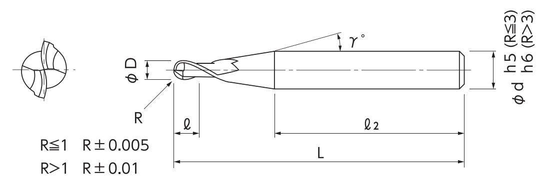
MSB230SF

MUGEN COATING 2-Flute Ball End Mill with Short Shank

Total 15 sizes

MG 2 30° R ±0.005 (R≦1) φd h5 (R≦3) 3D

2-flute standard type with helix angle 30°.
Suitable for shrink fit holder



- It fits for Shrink Chuck System.

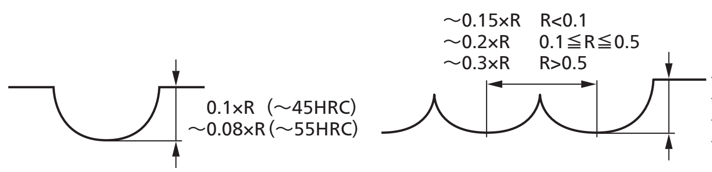
Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)
08-00504-00010	R0.1	0.2	0.2	15°	4	27.3	35
08-00504-00020	R0.2	0.4	0.4	15°	4	27.2	35
08-00504-00030	R0.3	0.6	0.6	15°	4	27.3	35
08-00504-00040	R0.4	0.8	0.8	15°	4	27.4	35
08-00504-00050	R0.5	1	1	15°	4	32.5	40
08-00504-00060	R0.6	1.2	1.2	15°	4	32.5	40
08-00504-00075	R0.75	1.5	1.5	15°	4	32.6	40
08-00504-00100	R1	2	2	9°	4	30.1	40
08-00504-00150	R1.5	3	3	9°	4	31.8	40
08-00504-00200	R2	4	4	9°	6	27.6	40
08-00504-00250	R2.5	5	5	9°	6	39.8	50
08-00504-00300	R3	6	6	–	6	34.9	50
08-00504-00400	R4	8	8	–	8	41.1	60
08-00504-00500	R5	10	10	–	10	36.6	60
08-00504-00600	R6	12	12	–	12	33.6	60

How to Order When you order, indicate MSB230SF (R). ※(γ) is reference value.

Work Material	Carbon Steels S50C		Alloy Steels Prehardened Steels SCM･SKD･SUS･HPM･NAK		Hardened Steels SKD61 (~52HRC)		Aluminium Alloy		Copper	
Cutting Speed	150m/min		120~150m/min		80~100m/min		150m/min~		100~150m/min	
Radius	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.1	50,000	400	50,000	340	50,000	200	50,000	500	50,000	500
0.2	50,000	630	50,000	600	50,000	630	50,000	600	50,000	600
0.3	50,000	930	50,000	940	48,000	900	50,000	750	50,000	750
0.4	50,000	1,200	48,000	1,200	36,000	900	50,000	1,000	50,000	1,000
0.5	48,000	1,430	38,000	1,200	29,000	900	50,000	1,250	48,000	1,000
0.6	40,000	1,430	32,000	1,200	24,000	810	50,000	1,480	40,000	1,080
1	24,000	1,160	19,000	800	14,300	600	48,000	2,400	24,000	1,200
1.5	16,000	930	13,000	600	9,600	460	32,000	2,400	16,000	1,200
2	12,000	930	10,000	570	7,200	450	24,000	2,400	12,000	1,200
2.5	9,600	930	8,000	560	5,700	450	19,000	2,400	9,600	1,200
3	8,000	930	6,400	540	4,800	450	16,000	2,400	8,000	1,200
4	6,000	900	4,800	540	3,600	450	12,000	2,400	6,000	1,200
5	4,800	900	3,800	540	2,900	450	9,600	2,300	4,800	1,150
6	4,000	900	3,200	540	2,400	450	8,000	2,100	4,000	1,050

Depth of Cut (R : Radius)



Notes

※1 When slotting, reduce the feed by 60% from the above values.
※2 Length of overhang is 4 times Dia. as standard. When it is longer than 4 times Dia., adjust the conditions listed above.
※3 Recommended oil mist or airblow.
※4 Adjust both spindle speed and feed at the same rate.

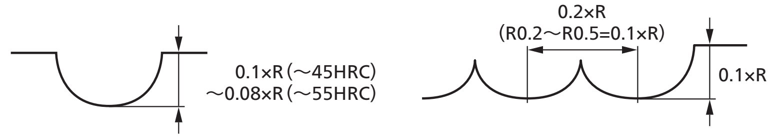
MSB230SF

Recommended High Speed Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (~52HRC)	
Cutting Speed	250m/min		200m/min		180m/min		100m/min	
Radius	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.2	~50,000	~1,500	~50,000	~1,200	~50,000	~1,000	~50,000	600
0.3	~50,000	~1,500	~50,000	~1,200	~50,000	~1,000	~50,000	700
0.4	~50,000	~3,000	~50,000	~2,500	~50,000	~2,200	40,000	1,000
0.5	~50,000	~3,000	~50,000	~2,500	~50,000	~2,200	32,000	1,500
1	40,000	5,000	32,000	3,200	29,000	2,900	16,000	1,500
1.5	27,000	5,000	21,000	3,200	19,000	2,900	10,600	1,500
2	20,000	5,000	16,000	3,200	14,000	2,900	8,000	1,500
3	13,500	3,000	10,600	2,000	9,500	1,800	5,300	1,200
4	10,000	3,000	8,000	2,000	7,200	1,800	4,000	1,200
5	8,000	3,000	6,400	2,000	5,700	1,800	3,200	1,200
6	6,700	2,500	5,300	1,800	4,800	1,600	2,700	1,200

Depth of Cut

(R:Radius)



Notes

※1 When slotting, reduce the feed by 60% from the above values.
※2 Recommended air blow or oil mist.
※3 Adjust both spindle speed and feed at the same rate.
※4 Use a rigid machine and chuck holder.
※5 Adjust milling conditions according to the volume of depth of cut and rigidity of the machine.

Regular Line
MUGEN COATING
Full Cutting Length Type

Material		
Carbon Steel	P	○
Alloy Steel	P	○
Aluminium Alloy	N	○
Copper	N	○
Resin	O	○

Ball Coating

MSBL230

Size R0.1 ~ R5

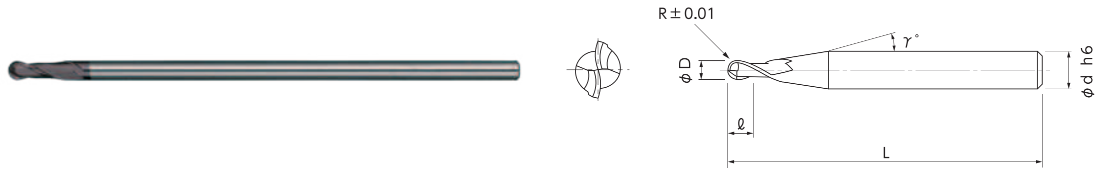
≦40 HRC

MUGEN COATING 2-Flute Long Ball End Mill

Total 42 sizes

2-flute long ball end mill. Overall length is 150mm at R3

MG 2 30° 3D



- Our original MUGEN COATING has been put on 2-flute long ball end mill.
- The available sizes are from radius 0.1 to 5.
- Take advantage of long shank feature.

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00510-00010	R0.1	0.5	0.2	9°	3	70
▌08-00510-00015	R0.15	0.75	0.3	9°	3	70
▌08-00510-00020	R0.2	1	0.4	9°	3	70
▌08-00510-00025	R0.25	1.25	0.5	9°	3	70
▌08-00510-00030	R0.3	1.5	0.6	9°	3	70
▌08-00510-00035	R0.35	1.75	0.7	9°	3	70
▌08-00510-00040	R0.4	2	0.8	9°	3	70
▌08-00510-00045	R0.45	2.25	0.9	9°	3	70
08-00510-00050	R0.5	2.5	1	9°	3	70
▌08-00510-00055	R0.55	2.75	1.1	9°	3	70
▌08-00510-00060	R0.6	3	1.2	9°	3	70
▌08-00510-00065	R0.65	3.25	1.3	9°	3	70
▌08-00510-00070	R0.7	3.5	1.4	9°	3	70
▌08-00510-00075	R0.75	3.75	1.5	9°	3	70
▌08-00510-00080	R0.8	4	1.6	9°	3	70
▌08-00510-00085	R0.85	4.25	1.7	9°	3	70
▌08-00510-00090	R0.9	4.5	1.8	9°	3	70
▌08-00510-00095	R0.95	4.75	1.9	9°	3	70
08-00510-00100	R1	5	2	9°	3	70
▌08-00510-00110	R1.1	5.5	2.2	9°	3	80
▌08-00510-00120	R1.2	6	2.4	9°	3	80
▌08-00510-00125	R1.25	6.25	2.5	9°	3	80
▌08-00510-00130	R1.3	6.5	2.6	9°	3	80
▌08-00510-00140	R1.4	7	2.8	9°	3	80
08-00510-00150	R1.5	7.5	3	–	3	80
▌08-00510-00160	R1.6	8	3.2	–	3	120
▌08-00510-00170	R1.7	8.5	3.4	–	3	120
▌08-00510-00180	R1.8	9	3.6	9°	4	120
▌08-00510-00190	R1.9	9.5	3.8	9°	4	120
08-00510-00200	R2	10	4	–	4	120
▌08-00510-00210	R2.1	10.5	4.2	–	4	150
▌08-00510-00220	R2.2	11	4.4	–	4	150
▌08-00510-00230	R2.3	11.5	4.6	9°	6	150
▌08-00510-00240	R2.4	12	4.8	9°	6	150
▌08-00510-00250	R2.5	12.5	5	9°	6	150
▌08-00510-00260	R2.6	13	5.2	9°	6	150
▌08-00510-00270	R2.7	13.5	5.4	9°	6	150
▌08-00510-00280	R2.8	14	5.6	9°	6	150
▌08-00510-00290	R2.9	14.5	5.8	9°	6	150
08-00510-00300	R3	15	6	–	6	150
08-00510-00400	R4	20	8	–	8	160
08-00510-00500	R5	25	10	–	10	200

How to Order When you order, indicate MSBL230 (R). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

MSBXL230

Size R0.5 ~ R5

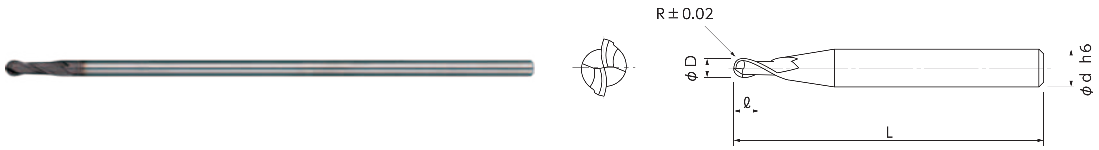
≦40 HRC

MUGEN COATING 2-Flute Extra Long Ball End Mill

Total 8 sizes

Long overall length allows deeper area milling

MG 2 30° 3D



Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Dia. (D)	Shank Dia. (d)	Overall Length (L)
▌08-00511-00050	R0.5	2.5	1	3	100
▌08-00511-00100	R1	5	2	3	100
▌08-00511-00150	R1.5	7.5	3	3	120
▌08-00511-00200	R2	10	4	4	150
▌08-00511-00250	R2.5	12.5	5	6	180
▌08-00511-00300	R3	15	6	6	180
▌08-00511-00400	R4	20	8	8	200
▌08-00511-00500	R5	25	10	10	250

How to Order When you order, indicate MSBXL230 (R). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Regular Line
MUGEN COATING
Full Cutting Length Type

MSRS230

Size ϕ1 × R0.1 ～ ϕ6 × R2

≦55 HRC

MSRS230

Regular Line
MUGEN COATING
Full Cutting Length Type

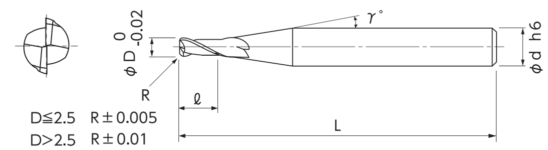
MUGEN COATING 2-Flute Radius End Mill

Total 38 sizes

MG 2 30° Corner R ±0.005 (D≦2.5)

Side Slot Face

2-flute standard type corner radius end mill with helix angle 30°
For multi-purpose from roughing to finishing



- New ϕ6 size of 2-Flute MUGEN COATING corner radius end mill.
- Total 38 sizes for suitable selection.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00700-01001	1	R0.1	2	9°	4	60
08-00700-01002		R0.2				
08-00700-01003		R0.3				
08-00700-01501	1.5	R0.1	3	9°	4	60
08-00700-01502		R0.2				
08-00700-01503		R0.3				
08-00700-01505		R0.5				
08-00700-02001	2	R0.1	4	9°	4	60
08-00700-02002		R0.2				
08-00700-02003		R0.3				
08-00700-02005		R0.5				
08-00700-02501	2.5	R0.1	5	9°	4	60
08-00700-02502		R0.2				
08-00700-02503		R0.3				
08-00700-02505		R0.5				
08-00700-03001	3	R0.1	6	9°	6	60
08-00700-03002		R0.2				
08-00700-03003		R0.3				
08-00700-03005		R0.5				
08-00700-03010		R1				
08-00700-04001	4	R0.1	8	9°	6	65
08-00700-04002		R0.2				
08-00700-04003		R0.3				
08-00700-04005		R0.5				
08-00700-04010		R1				
08-00700-05001	5	R0.1	10	9°	6	70
08-00700-05002		R0.2				
08-00700-05003		R0.3				
08-00700-05005		R0.5				
08-00700-05010		R1				
08-00700-05015		R1.5				
▌08-00700-06001	6	R0.1	12	–	6	80
▌08-00700-06002		R0.2				
▌08-00700-06003		R0.3				
▌08-00700-06005		R0.5				
▌08-00700-06010		R1				
▌08-00700-06015		R1.5				
▌08-00700-06020		R2				

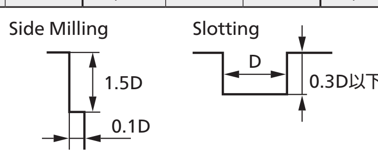
How to Order When you order, indicate MSRS230 (D)×(R). ※(γ) is reference value.

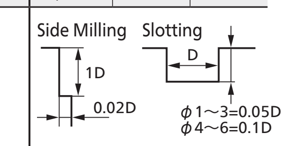
▌Semi-standard products, please inquire for price and delivery.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM･SKD･SUS			Prehardened Steels HPM･NAK			Hardened Steels SKD61 (～52HRC)		
Cutting Speed	60～80m/min			50～70m/min			30～50m/min			20～30m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
	min⁻¹	mm/min		min⁻¹	mm/min		min⁻¹	mm/min		min⁻¹	mm/min	
		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting		Side Milling	Slotting
1	25,500	200	100	19,200	130	50	12,800	80	40	6,400	60	30
1.5	17,100	340	120	12,800	180	60	8,500	90	45	4,200	70	35
2	12,800	400	150	9,600	210	70	6,400	110	55	3,200	80	40
2.5	10,200	400	150	7,700	210	70	5,100	110	55	2,500	80	40
3	8,500	450	160	6,400	250	80	4,300	120	60	2,100	100	50
4	6,400	450	160	4,800	250	80	3,200	120	60	1,600	100	50
5	5,100	600	200	3,800	300	90	2,600	150	75	1,300	120	60
6	4,300	600	220	3,200	300	100	2,200	150	90	1,100	130	70

Depth of Cut (D：Dia.)





Notes

※1 Adjust feed according to inclined angle.
※2 When corner machining, reduce the feed by approximately 50%～30%.
※3 Adjust spindle speed and feed at the same rate also reduce Depth of Cut, if the machine spindle speed insufficient.

MSRS430

Size ϕ1 × R0.1 ～ ϕ12 × R3

≤55 HRC

MSRS430

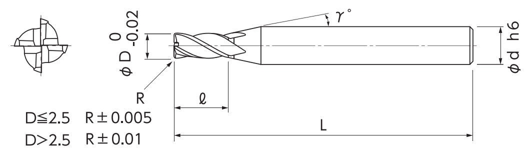
MUGEN COATING 4-Flute Radius End Mill

Total 64 sizes

4-flute standard type corner radius end mill with helix angle 30°
For multi-purpose from roughing to finishing

MG | 4 | 30° | Corner R ±0.005 (D≦2.5)

Side | Slot | Face



- Small diameter sizes of 4-Flute MUGEN COATING corner radius end mill are born.
- 64sizes Line up from ϕ1toϕ12 to achieve high efficient micro machining.
- Total 64 sizes for suitable selection.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00710-01001	1	R0.1	2	12°	4	60
▌08-00710-01002		R0.2				
▌08-00710-01003		R0.3				
▌08-00710-01501	1.5	R0.1	3	12°	4	60
▌08-00710-01502		R0.2				
▌08-00710-01503		R0.3				
▌08-00710-01505		R0.5				
▌08-00710-02001	2	R0.1	4	12°	4	60
▌08-00710-02002		R0.2				
▌08-00710-02003		R0.3				
▌08-00710-02005		R0.5				
▌08-00710-02501	2.5	R0.1	5	12°	4	60
▌08-00710-02502		R0.2				
▌08-00710-02503		R0.3				
▌08-00710-02505		R0.5				
▌08-00710-03001	3	R0.1	6	12°	6	60
▌08-00710-03002		R0.2				
▌08-00710-03003		R0.3				
▌08-00710-03005		R0.5				
▌08-00710-03010		R1				
▌08-00710-04001	4	R0.1	8	12°	6	65
▌08-00710-04002		R0.2				
▌08-00710-04003		R0.3				
▌08-00710-04005		R0.5				
▌08-00710-04010		R1				
▌08-00710-05001	5	R0.1	10	12°	6	70
▌08-00710-05002		R0.2				
▌08-00710-05003		R0.3				
▌08-00710-05005		R0.5				
▌08-00710-05010		R1				
▌08-00710-05015		R1.5				

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00710-06001	6	R0.1	12	–	6	80
08-00710-06002		R0.2				
08-00710-06003		R0.3				
08-00710-06005		R0.5				
08-00710-06010		R1				
08-00710-06015		R1.5				
08-00710-06020		R2				
08-00710-08001	8	R0.1	16	–	8	90
08-00710-08002		R0.2				
08-00710-08005		R0.5				
08-00710-08010		R1				
08-00710-08015		R1.5				
08-00710-08020		R2				
08-00710-08025		R2.5				
08-00710-08030		R3				
08-00710-10001	10	R0.1	20	–	10	100
08-00710-10002		R0.2				
08-00710-10003		R0.3				
08-00710-10005		R0.5				
08-00710-10010		R1				
08-00710-10015		R1.5				
08-00710-10020		R2				
08-00710-10025		R2.5				
08-00710-10030		R3				
08-00710-12001	12	R0.1	24	–	12	110
08-00710-12002		R0.2				
08-00710-12003		R0.3				
08-00710-12005		R0.5				
08-00710-12010		R1				
08-00710-12015		R1.5				
08-00710-12020		R2				
08-00710-12025		R2.5				
08-00710-12030		R3				

How to Order When you order, indicate MSRS430 (D)×(R).

▌Semi-standard products, please inquire for price and delivery.

Recommended Milling Conditions

Work Material	Carbon Steels S50C		Alloy Steels SCM・SKD・SUS		Prehardened Steels HPM・NAK		Hardened Steels SKD61 (～52HRC)	
Cutting Speed	60～80m/min		50～70m/min		30～50m/min		20～30m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
1	25,500	300	19,100	220	12,800	120	6,400	60
1.5	17,100	510	12,700	370	8,500	130	4,300	65
2	12,800	600	9,500	430	6,400	160	3,200	80
2.5	10,200	600	7,600	430	5,100	160	2,600	80
3	8,500	670	6,400	500	4,300	180	2,200	90
4	6,400	760	4,800	570	3,200	200	1,600	90
5	5,100	760	3,800	570	2,600	260	1,300	120
6	4,300	780	3,200	580	2,200	380	1,100	160
8	3,200	780	2,400	580	1,600	380	800	160
10	2,600	780	1,900	580	1,300	380	650	160
12	2,100	780	1,600	580	1,100	380	530	160
Depth of Cut (D:Dia.)	Side Milling 1.5D 0.1D						Side Milling 1D 0.05D	
Notes	※1 Adjust feed according to inclined angle. ※2 When corner machining, reduce the feed by approximately 50%～30%. ※3 Adjust spindle speed and feed at the same rate also reduce Depth of Cut, if the machine spindle speed insufficient.							

Regular Line
MUGEN COATING
Long Neck Type

MHR230

Size ϕ0.1 ~ ϕ6

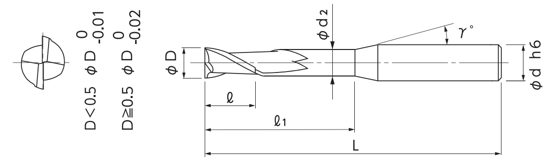
≦55 HRC

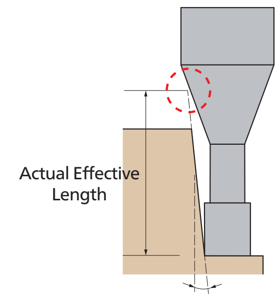
MUGEN COATING 2 -Flute Long Neck End Mill

Total 217 sizes

2-flute long neck square end mill. Maximum L/D=30

MG
Side Slot Face
30°





- MUGEN COATING has been put on our original end mill for deep rib.
- The Long Neck type is suitable for narrow and deep machining.

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O
Long Neck Square Coating

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00200-01003	0.1	0.3	0.15	0.085	12°	4	45	0.34	0.36	0.38	0.4	0.44
08-00200-01005		0.5					45	0.55	0.58	0.61	0.64	0.71
08-00200-01007		0.75					45	0.81	0.85	0.89	0.93	1.04
08-00200-01010		1					45	1.07	1.12	1.18	1.23	1.37
08-00200-01503	0.15	0.3	0.2	0.13	12°	4	45	0.36	0.37	0.39	0.41	0.46
08-00200-01505		0.5					45	0.57	0.59	0.62	0.65	0.72
08-00200-01507		0.75					45	0.83	0.86	0.9	0.95	1.05
08-00200-01510		1					45	1.09	1.14	1.19	1.25	1.38
08-00200-01515		1.5					45	1.61	1.68	1.76	1.85	2.05
08-00200-02005	0.2	0.5	0.3	0.18	12°	4	45	0.57	0.59	0.62	0.65	0.72
08-00200-02007		0.75					45	0.83	0.86	0.9	0.95	1.05
08-00200-02010		1					45	1.09	1.14	1.19	1.25	1.38
08-00200-02015		1.5					45	1.61	1.68	1.76	1.85	2.05
08-00200-02020		2					45	2.13	2.23	2.33	2.44	2.71
08-00200-02025		2.5					45	2.65	2.77	2.9	3.04	3.38
08-00200-02030		3					45	3.17	3.31	3.47	3.64	4.04
08-00200-02035		3.5					45	3.69	3.86	4.04	4.24	4.7
08-00200-02040		4					45	4.22	4.4	4.61	4.84	5.37
08-00200-03010	0.3	1	0.4	0.28	12°	4	45	1.09	1.14	1.19	1.25	1.38
08-00200-03015		1.5					45	1.61	1.68	1.76	1.85	2.05
08-00200-03020		2					45	2.13	2.23	2.33	2.44	2.71
08-00200-03025		2.5					45	2.65	2.77	2.9	3.04	3.38
08-00200-03030		3					45	3.17	3.31	3.47	3.64	4.04
08-00200-03040		4					45	4.22	4.4	4.61	4.84	5.37
08-00200-03050		5					45	5.26	5.49	5.75	6.03	6.69
08-00200-03060		6					45	6.3	6.58	6.89	7.23	8.02
08-00200-03090		9					45	9.43	9.85	10.31	10.82	12
08-00200-04010	0.4	1	0.6	0.37	12°	4	45	1.11	1.16	1.22	1.28	1.42
08-00200-04015		1.5					45	1.63	1.71	1.79	1.87	2.08
08-00200-04020		2					45	2.15	2.25	2.36	2.47	2.74
08-00200-04025		2.5					45	2.68	2.8	2.93	3.07	3.41
08-00200-04030		3					45	3.2	3.34	3.5	3.67	4.07

How to Order When you order, indicate MHR230 (D)×(ℓ1). ※(γ) is reference value.

MHR230

MUGEN COATING 2 -Flute Long Neck End Mill

Regular Line
MUGEN COATING
Long Neck Type

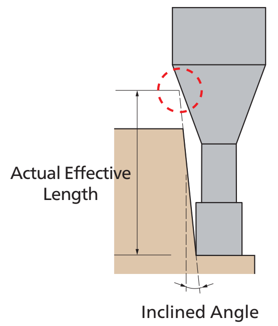
Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00200-04035	0.4	3.5	0.6	0.37	12°	4	45	3.72	3.89	4.07	4.27	4.73
08-00200-04040		4					45	4.24	4.43	4.64	4.87	5.4
08-00200-04050		5					45	5.28	5.52	5.78	6.06	6.72
08-00200-04060		6					45	6.33	6.61	6.92	7.26	8.05
08-00200-04070		7					45	7.37	7.7	8.06	8.46	9.38
08-00200-04080		8					45	8.41	8.79	9.2	9.65	10.71
08-00200-04090		9					45	9.45	9.88	10.34	10.85	12.03
08-00200-04100		10					45	10.5	10.97	11.48	12.05	13.36
08-00200-04120		12					45	12.58	13.15	13.76	14.44	16.02
08-00200-05010	0.5	1	0.7	0.46	12°	4	45	1.14	1.19	1.24	1.3	1.45
08-00200-05015		1.5					45	1.66	1.73	1.81	1.9	2.11
08-00200-05020		2					45	2.18	2.28	2.38	2.5	2.77
08-00200-05025		2.5					45	2.7	2.82	2.95	3.1	3.44
08-00200-05030		3					45	3.22	3.37	3.52	3.7	4.1
08-00200-05035		3.5					45	3.74	3.91	4.09	4.3	4.77
08-00200-05040		4					45	4.26	4.46	4.66	4.89	5.43
08-00200-05045		4.5					45	4.79	5	5.23	5.49	6.09
08-00200-05050		5					45	5.31	5.54	5.8	6.09	6.76
08-00200-05060		6					45	6.35	6.63	6.95	7.29	8.08
08-00200-05070		7					45	7.39	7.72	8.09	8.48	9.41
08-00200-05080		8					50	8.44	8.81	9.23	9.68	10.74
08-00200-05090		9					50	9.48	9.9	10.37	10.88	12.07
08-00200-05100		10					50	10.52	10.99	11.51	12.07	13.39
08-00200-05120		12					50	12.61	13.17	13.79	14.47	16.05
08-00200-05150		15					50	15.74	16.44	17.21	18.06	20.03
08-00200-06015	0.6	1.5	0.9	0.56	12°	4	45	1.66	1.73	1.81	1.9	2.11
08-00200-06020		2					45	2.18	2.28	2.38	2.5	2.77
08-00200-06030		3					45	3.22	3.37	3.52	3.7	4.1
08-00200-06040		4					45	4.26	4.46	4.66	4.89	5.43
08-00200-06050		5					45	5.31	5.54	5.8	6.09	6.76
08-00200-06060		6					45	6.35	6.63	6.95	7.29	8.08
08-00200-06070		7					45	7.39	7.72	8.09	8.48	9.41

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Square Coating

MHR230

MUGEN COATING 2 -Flute Long Neck End Mill



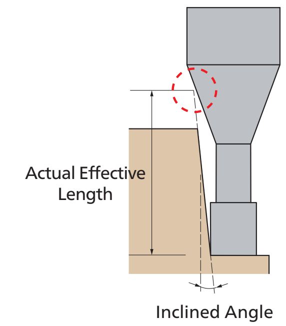
Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00200-06080	0.6	8	0.9	0.56	12°	4	50	8.44	8.81	9.23	9.68	10.74
08-00200-06090		9					50	9.48	9.9	10.37	10.88	12.07
08-00200-06100		10					50	10.52	10.99	11.51	12.07	13.39
08-00200-06120		12					50	12.61	13.17	13.79	14.47	16.05
08-00200-06150		15					50	15.74	16.44	17.21	18.06	20.03
08-00200-06180		18					50	18.86	19.71	20.63	21.65	24.01
08-00200-07020	0.7	2	1	0.66	12°	4	45	2.18	2.28	2.38	2.5	2.77
08-00200-07040		4					45	4.26	4.46	4.66	4.89	5.43
08-00200-07060		6					45	6.35	6.63	6.95	7.29	8.08
08-00200-07080		8					50	8.44	8.81	9.23	9.68	10.74
08-00200-07100		10					50	10.52	10.99	11.51	12.07	13.39
08-00200-08030	0.8	3	1.2	0.76	12°	4	45	3.22	3.37	3.52	3.7	4.1
08-00200-08040		4					45	4.26	4.46	4.66	4.89	5.43
08-00200-08050		5					45	5.31	5.54	5.8	6.09	6.76
08-00200-08060		6					45	6.35	6.63	6.95	7.29	8.08
08-00200-08080		8					50	8.44	8.81	9.23	9.68	10.74
08-00200-08100		10					50	10.52	10.99	11.51	12.07	13.39
08-00200-08120		12					50	12.61	13.17	13.79	14.47	16.05
08-00200-08140		14					50	14.69	15.35	16.07	16.86	18.7
08-00200-08160		16					50	16.78	17.53	18.35	19.25	21.36
08-00200-08200		20					60	20.95	21.89	22.91	24.04	26.66
08-00200-08240		24					60	25.12	26.24	27.47	28.83	Free
08-00200-09040	0.9	4	1.4	0.86	12°	4	45	4.26	4.46	4.66	4.89	5.43
08-00200-09060		6					45	6.35	6.63	6.95	7.29	8.08
08-00200-09080		8					50	8.44	8.81	9.23	9.68	10.74
08-00200-09100		10					50	10.52	10.99	11.51	12.07	13.39
08-00200-09120		12					50	12.61	13.17	13.79	14.47	16.05
08-00200-09150		15					60	15.74	16.44	17.21	18.06	20.03
08-00200-10020	1	2	1.5	0.95	12°	4	50	2.2	2.3	2.41	2.53	2.81
08-00200-10030		3					50	3.25	3.39	3.55	3.73	4.13
08-00200-10040		4					50	4.29	4.48	4.69	4.92	5.46
08-00200-10050		5					50	5.33	5.57	5.83	6.12	6.79

How to Order　When you order, indicate MHR230 (D)×(ℓ1).　※(γ) is reference value.

Regular Line
MUGEN COATING
Long Neck Type

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Square Coating

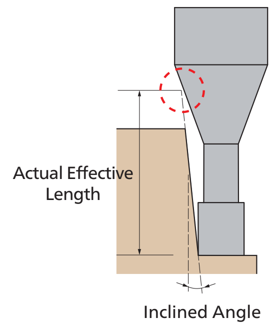


Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00200-10060	1	6	1.5	0.95	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00200-10070		7					50	7.42	7.75	8.11	8.51	9.44
08-00200-10080		8					50	8.46	8.84	9.25	9.71	10.77
08-00200-10090		9					50	9.5	9.93	10.39	10.91	12.1
08-00200-10100		10					50	10.55	11.02	11.53	12.1	13.42
08-00200-10120		12					50	12.63	13.2	13.82	14.49	16.08
08-00200-10140		14					50	14.72	15.38	16.1	16.89	18.73
08-00200-10160		16					60	16.8	17.55	18.38	19.28	21.39
08-00200-10180		18					60	18.89	19.73	20.66	21.67	24.04
08-00200-10200		20					60	20.97	21.91	22.94	24.07	26.7
08-00200-10220		22					60	23.06	24.09	25.22	26.46	Free
08-00200-10250		25					70	26.19	27.36	28.64	30.05	Free
08-00200-10300		30					70	31.4	32.81	34.34	36.03	Free
08-00200-12040	1.2	4	1.8	1.15	12°	4	50	4.29	4.48	4.69	4.92	5.46
08-00200-12060		6					50	6.37	6.66	6.97	7.32	8.11
08-00200-12080		8					50	8.46	8.84	9.25	9.71	10.77
08-00200-12100		10					50	10.55	11.02	11.53	12.1	13.42
08-00200-12120		12					50	12.63	13.2	13.82	14.49	16.08
08-00200-12160		16					60	16.8	17.55	18.38	19.28	21.39
08-00200-12200		20					60	20.97	21.91	22.94	24.07	26.7
08-00200-14060	1.4	6	2.1	1.35	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00200-14080		8					50	8.46	8.84	9.25	9.71	10.77
08-00200-14100		10					50	10.55	11.02	11.53	12.1	13.42
08-00200-14120		12					50	12.63	13.2	13.82	14.49	16.08
08-00200-14140		14					60	14.72	15.38	16.1	16.89	18.73
08-00200-14160		16					60	16.8	17.55	18.38	19.28	21.39
08-00200-14220		22					60	23.06	24.09	25.22	26.46	Free
08-00200-15040	1.5	4	2.3	1.45	12°	4	50	4.29	4.48	4.69	4.92	5.46
08-00200-15060		6					50	6.37	6.66	6.97	7.32	8.11
08-00200-15080		8					50	8.46	8.84	9.25	9.71	10.77
08-00200-15100		10					50	10.55	11.02	11.53	12.1	13.42
08-00200-15120		12					50	12.63	13.2	13.82	14.49	16.08

MHR230

MUGEN COATING 2 -Flute Long Neck End Mill



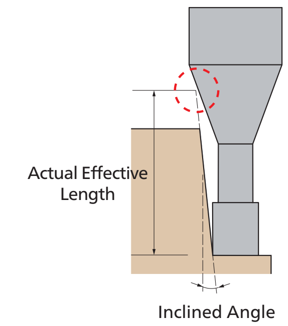
Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00200-15140	1.5	14	2.3	1.45	12°	4	60	14.72	15.38	16.1	16.89	18.73
08-00200-15160		16					60	16.8	17.55	18.38	19.28	21.39
08-00200-15180		18					60	18.89	19.73	20.66	21.67	Free
08-00200-15200		20					60	20.97	21.91	22.94	24.07	Free
08-00200-15250		25					70	26.19	27.36	28.64	30.05	Free
08-00200-15300		30					70	31.4	32.81	34.34	Free	Free
08-00200-15350		35					80	36.62	38.25	40.05	Free	Free
08-00200-15380		38					80	39.74	41.52	43.47	Free	Free
08-00200-15400		40					80	41.83	43.7	45.75	Free	Free
08-00200-15450		45					80	47.04	49.15	Free	Free	Free
08-00200-16060	1.6	6	2.4	1.55	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00200-16080		8					50	8.46	8.84	9.25	9.71	10.77
08-00200-16100		10					50	10.55	11.02	11.53	12.1	13.42
08-00200-16120		12					50	12.63	13.2	13.82	14.49	16.08
08-00200-16140		14					60	14.72	15.38	16.1	16.89	18.73
08-00200-16160		16					60	16.8	17.55	18.38	19.28	21.39
08-00200-16180		18					60	18.89	19.73	20.66	21.67	Free
08-00200-16200		20					60	20.97	21.91	22.94	24.07	Free
08-00200-16260		26					60	27.23	28.45	29.78	31.25	Free
08-00200-18060	1.8	6	2.7	1.75	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00200-18080		8					50	8.46	8.84	9.25	9.71	10.77
08-00200-18100		10					50	10.55	11.02	11.53	12.1	13.42
08-00200-18120		12					50	12.63	13.2	13.82	14.49	16.08
08-00200-18140		14					50	14.72	15.38	16.1	16.89	18.73
08-00200-18160		16					60	16.8	17.55	18.38	19.28	Free
08-00200-18180		18					60	18.89	19.73	20.66	21.67	Free
08-00200-18200		20					60	20.97	21.91	22.94	24.07	Free
08-00200-18250		25					70	26.19	27.36	28.64	30.05	Free
08-00200-20040	2	4	3	1.94	12°	4	50	4.31	4.51	4.72	4.95	5.49
08-00200-20060		6					50	6.4	6.69	7	7.34	8.15
08-00200-20080		8					50	8.48	8.86	9.28	9.74	10.8
08-00200-20100		10					50	10.57	11.04	11.56	12.13	13.45

How to Order When you order, indicate MHR230 (D)×(ℓ1). ※(γ) is reference value.

MHR230

MUGEN COATING 2 -Flute Long Neck End Mill

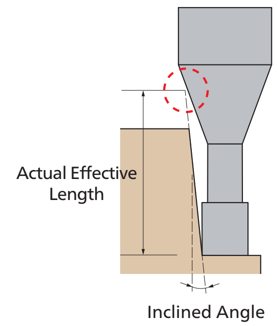


Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00200-20120	2	12	3	1.94	12°	4	50	12.66	13.22	13.84	14.52	16.11
08-00200-20140		14					60	14.74	15.4	16.12	16.92	18.76
08-00200-20160		16					60	16.83	17.58	18.4	19.31	Free
08-00200-20180		18					60	18.91	19.76	20.69	21.7	Free
08-00200-20200		20					60	21	21.94	22.97	24.1	Free
08-00200-20250		25					70	26.21	27.39	28.67	Free	Free
08-00200-20300		30					70	31.43	32.83	34.37	Free	Free
08-00200-20350		35					80	36.64	38.28	Free	Free	Free
08-00200-20400		40					90	41.85	43.73	Free	Free	Free
08-00200-20500		50					100	52.28	54.62	Free	Free	Free
08-00200-20600		60					110	62.71	Free	Free	Free	Free
08-00200-25080	2.5	8	3.7	2.4	12°	4	50	8.58	8.97	9.39	9.85	10.93
08-00200-25100		10					50	10.67	11.15	11.67	12.24	13.58
08-00200-25120		12					50	12.75	13.32	13.95	14.64	Free
08-00200-25140		14					50	14.84	15.5	16.23	17.03	Free
08-00200-25160		16					60	16.93	17.68	18.51	19.42	Free
08-00200-25180		18					60	19.01	19.86	20.79	Free	Free
08-00200-25200		20					60	21.1	22.04	23.07	Free	Free
08-00200-25250		25					70	26.31	27.49	Free	Free	Free
08-00200-25300		30					70	31.52	32.94	Free	Free	Free
08-00200-25400		40					90	41.95	Free	Free	Free	Free
08-00200-25500		50					100	52.38	Free	Free	Free	Free
08-00200-30080	3	8	4.5	2.85	12°	6	50	8.71	9.1	9.52	9.99	11.08
08-00200-30100		10					50	10.79	11.27	11.8	12.38	13.74
08-00200-30120		12					50	12.88	13.45	14.08	14.78	16.39
08-00200-30140		14					50	14.96	15.63	16.36	17.17	19.04
08-00200-30160		16					60	17.05	17.81	18.65	19.56	21.7
08-00200-30180		18					60	19.13	19.99	20.93	21.96	24.35
08-00200-30200		20					60	21.22	22.17	23.21	24.35	27.01
08-00200-30250		25					70	26.43	27.62	28.91	30.33	Free
08-00200-30300		30					70	31.65	33.06	34.61	36.31	Free
08-00200-30350		35					80	36.86	38.51	40.32	42.3	Free

MHR230

MUGEN COATING 2 -Flute Long Neck End Mill



Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00200-30400	3	40	4.5	2.85	12°	6	90	42.08	43.96	46.02	Free	Free
08-00200-30500		50					100	52.5	54.85	Free	Free	Free
08-00200-40120	4	12	6	3.8	12°	6	50	13	13.58	14.22	14.92	16.55
08-00200-40160		16					60	17.17	17.94	18.78	19.7	Free
08-00200-40200		20					60	21.34	22.3	23.34	24.49	Free
08-00200-40250		25					70	26.56	27.74	29.04	Free	Free
08-00200-40300		30					70	31.77	33.19	34.75	Free	Free
08-00200-40350		35					80	36.98	38.64	Free	Free	Free
08-00200-40400		40					90	42.2	44.09	Free	Free	Free
08-00200-40450		45					90	47.41	49.53	Free	Free	Free
08-00200-40500		50					100	52.63	54.98	Free	Free	Free
08-00200-40600		60					110	63.05	Free	Free	Free	Free
08-00200-50160	5	16	7.5	4.8	12°	6	60	17.17	17.94	18.78	Free	Free
08-00200-50200		20					60	21.34	22.3	Free	Free	Free
08-00200-50250		25					70	26.56	27.74	Free	Free	Free
08-00200-50300		30					80	31.77	Free	Free	Free	Free
08-00200-50350		35					80	36.98	Free	Free	Free	Free
08-00200-50400		40					90	42.2	Free	Free	Free	Free
08-00200-50500		50					110	52.63	Free	Free	Free	Free
08-00200-50600		60					120	Free	Free	Free	Free	Free
08-00200-60200	6	20	9	5.8	–	6	80	Free	Free	Free	Free	Free
08-00200-60300		30					90	Free	Free	Free	Free	Free
08-00200-60400		40					100	Free	Free	Free	Free	Free
08-00200-60500		50					110	Free	Free	Free	Free	Free
08-00200-60600		60					120	Free	Free	Free	Free	Free

How to Order When you order, indicate MHR230 (D)×(ℓ1). ※(γ) is reference value.

Recommended Milling Conditions

Work Material		Carbon Steels・Alloy Steels*1・Stainless Steels*1 S50C・SCM*1・SKD*1・SUS*1			Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			Copper・Aluminium Alloy		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
0.1	0.3	40,000	150	0.005	40,000	120	0.004	40,000	150	0.006
	0.5	40,000	100	0.004	40,000	75	0.003	40,000	100	0.005
	0.75	40,000	60	0.003	40,000	50	0.002	40,000	60	0.003
	1	40,000	40	0.002	40,000	30	0.002	40,000	40	0.002
0.15	0.3	40,000	200	0.005	40,000	150	0.004	40,000	200	0.008
	0.5	40,000	150	0.005	40,000	120	0.004	40,000	150	0.008
	0.75	40,000	100	0.004	40,000	90	0.003	40,000	100	0.006
	1	40,000	80	0.003	40,000	60	0.002	40,000	80	0.004
	1.5	40,000	50	0.002	35,000	40	0.002	40,000	50	0.003
0.2	0.5	40,000	330	0.01	40,000	250	0.007	40,000	330	0.012
	0.75	40,000	280	0.008	40,000	220	0.006	40,000	280	0.01
	1	40,000	250	0.007	40,000	180	0.005	40,000	250	0.008
	1.5	40,000	180	0.005	35,000	120	0.004	40,000	180	0.006
	2	40,000	100	0.003	35,000	65	0.002	40,000	100	0.004
	2.5	35,000	80	0.003	30,000	50	0.002	40,000	90	0.003
	3	30,000	60	0.002	25,000	40	0.002	35,000	70	0.002
	3.5	25,000	40	0.002	22,000	30	0.002	30,000	50	0.002
	4	23,000	30	0.001	20,000	20	0.001	25,000	35	0.001
0.3	1	40,000	400	0.02	35,000	260	0.015	40,000	400	0.024
	1.5	40,000	350	0.015	35,000	230	0.01	40,000	350	0.018
	2	35,000	300	0.01	30,000	180	0.007	40,000	320	0.012
	2.5	30,000	250	0.007	25,000	160	0.005	35,000	280	0.008
	3	30,000	200	0.005	25,000	130	0.004	35,000	250	0.006
	4	25,000	120	0.004	22,000	80	0.003	30,000	150	0.004
	5	22,000	80	0.003	20,000	55	0.002	25,000	90	0.003
	6	20,000	60	0.002	18,000	40	0.002	22,000	65	0.002
	9	18,000	30	0.001	16,000	20	0.001	20,000	35	0.001
0.4	1	35,000	500	0.025	30,000	330	0.018	40,000	600	0.03
	1.5	35,000	450	0.02	30,000	280	0.014	40,000	500	0.026
	2	35,000	400	0.02	30,000	260	0.014	40,000	450	0.024
	2.5	30,000	350	0.015	25,000	230	0.01	40,000	400	0.02
	3	30,000	300	0.015	25,000	190	0.01	35,000	350	0.018
	3.5	25,000	250	0.01	25,000	160	0.008	35,000	280	0.015
	4	25,000	200	0.01	22,000	140	0.007	30,000	240	0.012
	5	22,000	160	0.008	20,000	110	0.005	25,000	180	0.01
	6	20,000	120	0.005	18,000	80	0.003	22,000	130	0.006
	7	18,000	100	0.003	16,000	70	0.002	20,000	110	0.003
	8	18,000	80	0.002	16,000	60	0.002	20,000	85	0.002
	9	18,000	70	0.002	16,000	50	0.002	20,000	75	0.002
	10	18,000	60	0.002	16,000	40	0.002	20,000	65	0.002
	12	18,000	40	0.002	16,000	30	0.002	20,000	45	0.002
0.5	1	30,000	550	0.03	25,000	350	0.022	35,000	650	0.036
	1.5	30,000	520	0.028	25,000	330	0.02	35,000	630	0.033
	2	30,000	500	0.025	25,000	320	0.018	35,000	600	0.03
	2.5	30,000	470	0.023	25,000	290	0.016	35,000	580	0.027
	3	30,000	450	0.02	25,000	280	0.014	35,000	550	0.024
	3.5	30,000	420	0.018	22,000	250	0.012	30,000	500	0.021
	4	25,000	350	0.015	22,000	230	0.01	30,000	420	0.018
	4.5	25,000	320	0.013	20,000	200	0.008	30,000	380	0.015
	5	25,000	300	0.01	20,000	180	0.007	30,000	350	0.012

*1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.

MHR230

Recommended Milling Conditions

Work Material		Carbon Steels・Alloy Steels*1・Stainless Steels*1 S50C・SCM*1・SKD*1・SUS*1			Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			Copper・Aluminium Alloy		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min-1	mm/min	ap mm	min-1	mm/min	ap mm	min-1	mm/min	ap mm
0.5	6	20,000	200	0.008	18,000	140	0.005	25,000	250	0.01
	7	20,000	180	0.005	16,000	110	0.003	22,000	200	0.006
	8	18,000	150	0.003	14,000	90	0.002	20,000	160	0.003
	9	16,000	120	0.003	14,000	80	0.002	18,000	135	0.003
	10	16,000	100	0.002	14,000	65	0.002	18,000	110	0.002
	12	16,000	80	0.002	14,000	50	0.002	18,000	90	0.002
	15	16,000	50	0.002	14,000	35	0.002	18,000	55	0.002
0.6	1.5	30,000	600	0.035	25,000	400	0.025	35,000	700	0.04
	2	30,000	600	0.035	25,000	380	0.025	35,000	700	0.04
	3	30,000	550	0.03	25,000	350	0.02	35,000	650	0.035
	4	25,000	450	0.025	22,000	300	0.018	30,000	550	0.03
	5	25,000	400	0.02	20,000	240	0.014	30,000	480	0.024
	6	20,000	300	0.015	18,000	200	0.01	25,000	380	0.018
	7	20,000	250	0.012	16,000	150	0.008	22,000	280	0.014
	8	18,000	200	0.01	15,000	130	0.007	20,000	230	0.012
	9	18,000	180	0.008	15,000	110	0.005	20,000	200	0.009
	10	16,000	150	0.005	14,000	100	0.003	18,000	170	0.006
	12	14,000	120	0.003	12,000	80	0.002	16,000	130	0.003
	15	14,000	90	0.002	12,000	60	0.002	16,000	100	0.002
	18	14,000	60	0.002	12,000	40	0.002	16,000	70	0.002
0.7	2	30,000	650	0.04	25,000	400	0.03	35,000	750	0.05
	4	25,000	500	0.03	22,000	330	0.02	30,000	600	0.04
	6	20,000	350	0.02	18,000	240	0.015	25,000	450	0.03
	8	18,000	280	0.015	15,000	180	0.01	22,000	350	0.02
	10	16,000	220	0.008	14,000	150	0.005	20,000	280	0.01
0.8	3	25,000	700	0.05	22,000	500	0.03	35,000	850	0.06
	4	25,000	600	0.045	22,000	400	0.03	30,000	720	0.055
	5	22,000	500	0.035	20,000	350	0.025	30,000	650	0.05
	6	20,000	450	0.03	18,000	300	0.02	25,000	560	0.04
	8	18,000	350	0.02	15,000	240	0.015	22,000	430	0.025
	10	16,000	300	0.01	14,000	200	0.007	20,000	380	0.012
	12	14,000	250	0.008	12,000	170	0.005	16,000	290	0.01
	14	12,000	200	0.005	10,000	140	0.003	14,000	230	0.006
	16	12,000	150	0.003	10,000	110	0.002	14,000	170	0.003
	20	12,000	120	0.002	10,000	80	0.002	14,000	140	0.002
	24	12,000	80	0.002	10,000	50	0.002	14,000	90	0.002
0.9	4	25,000	900	0.05	22,000	600	0.035	30,000	1,000	0.06
	6	20,000	600	0.04	18,000	400	0.03	25,000	750	0.05
	8	18,000	500	0.03	16,000	330	0.02	22,000	620	0.04
	10	16,000	400	0.02	14,000	260	0.015	20,000	500	0.025
	12	14,000	300	0.01	12,000	200	0.008	16,000	400	0.015
	15	12,000	250	0.008	10,000	160	0.005	14,000	300	0.01
1	2	25,000	1,500	0.07	22,000	1,000	0.06	30,000	1,800	0.08
	3	25,000	1,200	0.06	22,000	800	0.05	30,000	1,500	0.07
	4	25,000	1,100	0.055	22,000	700	0.045	30,000	1,300	0.065
	5	22,000	900	0.05	20,000	600	0.04	27,000	1,100	0.06
	6	20,000	800	0.045	18,000	500	0.035	25,000	1,000	0.055
	7	20,000	800	0.04	18,000	500	0.03	25,000	1,000	0.05
	8	18,000	700	0.035	15,000	400	0.025	22,000	850	0.045
	9	18,000	700	0.03	15,000	400	0.02	22,000	850	0.04

*1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.

Regular Line
MUGEN COATING
Long Neck Type

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O
Long Neck Square Coating

MHR230

Recommended Milling Conditions

Work Material		Carbon Steels・Alloy Steels*1・Stainless Steels*1 S50C・SCM*1・SKD*1・SUS*1			Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			Copper・Aluminium Alloy		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min-1	mm/min	ap mm	min-1	mm/min	ap mm	min-1	mm/min	ap mm
1	10	16,000	600	0.025	14,000	350	0.018	20,000	750	0.03
	12	14,000	500	0.02	12,000	300	0.014	18,000	650	0.025
	14	13,000	400	0.015	11,000	250	0.01	15,000	450	0.018
	16	12,000	300	0.01	10,000	200	0.007	14,000	350	0.012
	18	12,000	250	0.008	10,000	150	0.005	14,000	300	0.01
	20	11,000	200	0.005	9,000	120	0.003	13,000	230	0.006
	22	11,000	160	0.003	9,000	100	0.002	13,000	190	0.003
	25	10,000	120	0.002	8,500	80	0.002	12,000	140	0.002
	30	10,000	80	0.002	8,500	50	0.002	12,000	100	0.002
1.2	4	23,000	1,200	0.06	20,000	800	0.05	27,000	1,400	0.07
	6	20,000	900	0.05	18,000	600	0.04	25,000	1,200	0.06
	8	18,000	800	0.04	15,000	500	0.03	22,000	1,000	0.05
	10	16,000	700	0.03	14,000	450	0.02	20,000	850	0.04
	12	14,000	600	0.025	12,000	350	0.018	17,000	700	0.03
	16	12,000	400	0.015	10,000	250	0.01	14,000	450	0.02
	20	10,000	300	0.01	8,000	180	0.007	12,000	360	0.012
1.4	6	20,000	1,200	0.07	16,000	720	0.06	24,000	1,500	0.08
	8	18,000	1,000	0.06	14,000	580	0.05	22,000	1,300	0.07
	10	16,000	850	0.05	13,000	520	0.04	20,000	1,100	0.06
	12	14,000	700	0.04	12,000	450	0.03	17,000	850	0.05
	14	13,000	600	0.035	11,000	350	0.025	15,000	700	0.04
	16	12,000	500	0.025	10,000	300	0.018	13,000	550	0.03
	22	10,000	350	0.015	8,000	210	0.01	10,000	350	0.012
1.5	4	22,000	1,400	0.09	18,000	860	0.08	26,000	1,700	0.1
	6	20,000	1,200	0.08	16,000	720	0.07	24,000	1,500	0.09
	8	18,000	1,000	0.07	14,000	580	0.06	22,000	1,300	0.08
	10	16,000	850	0.06	13,000	520	0.05	20,000	1,100	0.07
	12	14,000	700	0.05	12,000	450	0.04	17,000	850	0.06
	14	13,000	600	0.04	11,000	380	0.03	16,000	750	0.05
	16	12,000	500	0.035	10,000	320	0.025	15,000	650	0.04
	18	11,000	450	0.03	9,000	280	0.02	13,000	530	0.035
	20	10,000	400	0.02	8,000	240	0.014	12,000	480	0.025
	25	9,000	350	0.015	7,000	200	0.01	9,000	350	0.018
	30	8,000	300	0.008	6,000	170	0.005	8,000	300	0.01
	35	7,000	200	0.005	5,500	130	0.003	7,000	200	0.006
	38	6,700	170	0.003	5,200	110	0.002	6,700	170	0.003
	40	6,500	150	0.002	5,000	90	0.002	6,500	150	0.002
	45	6,000	100	0.002	4,500	60	0.002	6,000	100	0.002
1.6	6	20,000	1,200	0.09	16,000	720	0.08	24,000	1,500	0.1
	8	18,000	1,000	0.08	14,000	580	0.07	22,000	1,300	0.09
	10	16,000	850	0.07	13,000	520	0.06	20,000	1,100	0.08
	12	14,000	700	0.06	12,000	450	0.05	18,000	900	0.07
	14	13,000	600	0.05	11,000	380	0.04	16,000	750	0.06
	16	12,000	500	0.04	10,000	320	0.03	14,000	620	0.05
	18	11,000	450	0.03	9,000	280	0.025	13,000	530	0.035
	20	10,000	400	0.025	8,000	240	0.018	12,000	480	0.03
	26	9,000	350	0.02	7,000	200	0.014	9,000	350	0.025

*1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.

MHR230

Recommended Milling Conditions

Work Material		Carbon Steels・Alloy Steels※1・Stainless Steels※1 S50C・SCM※1・SKD※1・SUS※1			Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			Copper・Aluminium Alloy		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
1.8	6	18,000	1,300	0.1	14,000	760	0.09	22,000	1,600	0.12
	8	18,000	1,100	0.09	14,000	640	0.08	22,000	1,400	0.11
	10	16,000	900	0.08	13,000	550	0.07	20,000	1,200	0.1
	12	14,000	750	0.07	12,000	480	0.06	17,000	900	0.085
	14	13,000	650	0.06	11,000	420	0.05	16,000	800	0.07
	16	12,000	550	0.05	10,000	350	0.04	15,000	700	0.06
	18	11,000	500	0.04	9,000	310	0.03	13,000	600	0.05
	20	10,000	450	0.035	8,000	270	0.025	12,000	540	0.04
	25	9,000	400	0.025	7,000	230	0.018	11,000	480	0.03
2	4	16,000	1,500	0.13	13,000	900	0.12	20,000	1,850	0.15
	6	16,000	1,400	0.12	13,000	850	0.1	20,000	1,750	0.14
	8	16,000	1,300	0.11	13,000	800	0.09	20,000	1,650	0.13
	10	16,000	1,200	0.1	13,000	750	0.08	20,000	1,500	0.12
	12	14,000	1,000	0.09	12,000	650	0.07	17,000	1,200	0.11
	14	13,000	900	0.08	11,000	570	0.06	16,000	1,100	0.1
	16	12,000	800	0.07	10,000	500	0.05	15,000	1,000	0.085
	18	11,000	700	0.06	9,000	430	0.04	13,000	800	0.07
	20	10,000	600	0.05	8,000	360	0.035	12,000	720	0.06
	25	9,000	500	0.03	7,000	300	0.02	11,000	600	0.035
	30	8,000	400	0.02	6,000	220	0.014	9,000	450	0.025
	35	7,000	300	0.01	5,500	180	0.007	7,000	300	0.012
	40	6,000	200	0.005	5,000	140	0.003	6,000	200	0.006
	50	5,000	150	0.003	4,000	90	0.002	5,000	150	0.003
	60	4,500	100	0.002	3,500	60	0.002	4,500	100	0.002
2.5	8	13,000	1,400	0.15	11,000	900	0.12	16,000	1,700	0.18
	10	13,000	1,300	0.14	11,000	800	0.11	16,000	1,600	0.17
	12	13,000	1,200	0.13	11,000	750	0.1	16,000	1,500	0.16
	14	12,000	1,000	0.12	10,000	650	0.09	14,000	1,200	0.15
	16	11,000	900	0.1	9,000	550	0.07	13,000	1,100	0.12
	18	10,000	800	0.09	8,000	480	0.06	12,000	950	0.11
	20	9,000	700	0.08	7,000	400	0.05	11,000	850	0.1
	25	8,000	600	0.05	6,000	330	0.035	10,000	750	0.06
	30	7,000	500	0.03	5,500	280	0.02	8,500	600	0.035
	40	6,000	300	0.015	4,500	180	0.01	6,000	300	0.018
	50	5,000	200	0.01	4,000	120	0.007	5,000	200	0.012
3	8	11,000	1,500	0.2	9,000	1,000	0.16	13,000	1,800	0.24
	10	11,000	1,400	0.18	9,000	900	0.14	13,000	1,700	0.22
	12	11,000	1,300	0.16	9,000	800	0.12	13,000	1,600	0.2
	14	11,000	1,200	0.14	9,000	700	0.1	13,000	1,400	0.17
	16	10,000	1,000	0.12	8,000	600	0.09	12,000	1,200	0.15
	18	10,000	900	0.11	8,000	550	0.08	12,000	1,100	0.13
	20	9,000	800	0.1	7,000	450	0.07	11,000	1,000	0.12
	25	8,000	700	0.08	6,000	380	0.06	10,000	900	0.1
	30	7,000	600	0.06	5,000	300	0.045	8,500	730	0.07
	35	6,000	500	0.03	4,500	260	0.02	7,200	600	0.035
	40	5,000	400	0.025	4,000	220	0.018	6,000	480	0.03
	50	4,500	300	0.015	3,500	180	0.01	4,500	300	0.018

＊1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.

Work Material		Carbon Steels・Alloy Steels※1・Stainless Steels※1 S50C・SCM※1・SKD※1・SUS※1			Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			Copper・Aluminium Alloy		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
4	12	8,000	1,500	0.3	6,000	850	0.25	10,000	1,900	0.36
	16	8,000	1,400	0.25	6,000	800	0.2	10,000	1,800	0.3
	20	8,000	1,300	0.2	6,000	730	0.15	10,000	1,600	0.24
	25	7,000	1,100	0.15	5,000	600	0.1	8,500	1,300	0.18
	30	7,000	1,000	0.12	5,000	540	0.08	8,500	1,200	0.15
	35	6,000	800	0.1	4,500	450	0.07	7,200	1,000	0.12
	40	5,000	600	0.08	4,000	360	0.06	6,000	720	0.1
	45	4,500	500	0.06	3,500	300	0.04	5,400	600	0.07
	50	4,000	400	0.04	3,000	220	0.03	4,800	480	0.05
	60	3,500	300	0.02	2,500	160	0.014	4,200	360	0.025
5	16	6,000	1,400	0.35	4,500	800	0.3	7,200	1,700	0.42
	20	6,000	1,300	0.3	4,500	730	0.25	7,200	1,600	0.36
	25	6,000	1,200	0.25	4,500	680	0.2	7,200	1,500	0.3
	30	5,000	900	0.2	4,000	540	0.15	6,000	1,100	0.24
	35	5,000	800	0.15	3,500	420	0.1	6,000	1,000	0.18
	40	4,000	600	0.1	3,000	340	0.07	4,800	720	0.12
	50	3,500	450	0.07	2,500	240	0.05	4,200	540	0.085
	60	3,000	350	0.04	2,200	200	0.03	3,600	420	0.05
6	20	5,000	1,200	0.4	3,500	630	0.35	6,000	1,500	0.48
	30	4,000	900	0.35	3,000	500	0.3	4,800	1,100	0.42
	40	3,500	650	0.25	2,700	380	0.2	4,200	780	0.3
	50	3,000	500	0.15	2,200	280	0.1	3,600	600	0.18
	60	2,700	400	0.05	2,000	220	0.04	3,200	480	0.06

Notes

※1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.
※2 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
※3 ap:Axial Depth of Cut.
※4 Select a cutting fluid appropriate to work material, milling shape and machining content.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Recommend to apply ramping for approaching into axial direction.
※7 Recommend reciprocating cutting.
※8 Recommend guide slotting process with short neck tool before milling with L/D 5 times or longer neck tool.
※9 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※10 Major adjustment of milling conditions appropriately on milling profile, machine tool and etc. required for the tools smaller than Dia. 0.5mm, or L/D 15 times longer.
※11 Major adjustment of milling conditions, e.g. adjust spindle and feed speed at same rate, required on condition of a tool overhang length exceeding a shank diameter 5 times due to possible accuracy impact by chuck runout etc.

MHR430

Size ϕ1～ϕ10

≦55 HRC

MHR430

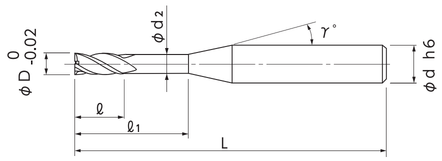
MUGEN COATING 4 -Flute Long Neck End Mill

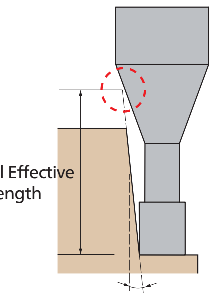
Total 103 sizes

MUGEN COATING 4 -Flute Long Neck End Mill

4-flute long neck sqaure end mill. Maximum L/D=20

MG Side / Slot / Face





- MUGEN COATING has been put on our original end mill for deep rib.
- The Long Neck type is suitable for narrow and deep machining.

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00210-01004	1	4	1.5	0.95	12°	4	50	4.29	4.48	4.69	4.92	5.46
08-00210-01006		6					50	6.37	6.66	6.97	7.32	8.11
08-00210-01008		8					50	8.46	8.84	9.25	9.71	10.77
08-00210-01010		10					50	10.55	11.02	11.53	12.10	13.42
08-00210-01012		12					50	12.63	13.20	13.82	14.49	16.08
08-00210-01016		16					50	16.80	17.55	18.38	19.28	21.39
08-00210-01106	1.1	6	1.7	1.05	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01110		10					50	10.55	11.02	11.53	12.10	13.42
08-00210-01116		16					60	16.80	17.55	18.38	19.28	21.39
08-00210-01206	1.2	6	1.8	1.15	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01208		8					50	8.46	8.84	9.25	9.71	10.77
08-00210-01210		10					50	10.55	11.02	11.53	12.10	13.42
08-00210-01212		12					50	12.63	13.20	13.82	14.49	16.08
08-00210-01216		16					60	16.80	17.55	18.38	19.28	21.39
08-00210-01306	1.3	6	1.9	1.25	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01312		12					50	12.63	13.20	13.82	14.49	16.08
08-00210-01318		18					60	18.89	19.73	20.66	21.67	24.04
08-00210-01406	1.4	6	2.1	1.35	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01408		8					50	8.46	8.84	9.25	9.71	10.77
08-00210-01410		10					50	10.55	11.02	11.53	12.10	13.42
08-00210-01412		12					50	12.63	13.20	13.82	14.49	16.08
08-00210-01414		14					60	14.72	15.38	16.10	16.89	18.73
08-00210-01416		16					60	16.80	17.55	18.38	19.28	21.39
08-00210-01422		22					60	23.06	24.09	25.22	26.46	Free
08-00210-01506	1.5	6	2.3	1.45	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01508		8					50	8.46	8.84	9.25	9.71	10.77
08-00210-01510		10					50	10.55	11.02	11.53	12.10	13.42
08-00210-01512		12					50	12.63	13.20	13.82	14.49	16.08
08-00210-01514		14					60	14.72	15.38	16.10	16.89	18.73
08-00210-01516		16					60	16.80	17.55	18.38	19.28	21.39
08-00210-01518		18					60	18.89	19.73	20.66	21.67	Free
08-00210-01520		20					60	20.97	21.91	22.94	24.07	Free

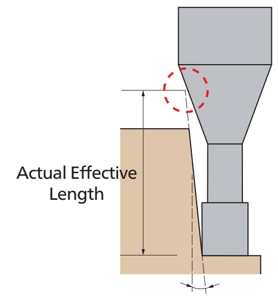
How to Order When you order, indicate MHR430 (D)×(ℓ1). ※(γ) is reference value.

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00210-01606	1.6	6	2.4	1.55	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01608		8					50	8.46	8.84	9.25	9.71	10.77
08-00210-01610		10					50	10.55	11.02	11.53	12.10	13.42
08-00210-01612		12					50	12.63	13.20	13.82	14.49	16.08
08-00210-01614		14					60	14.72	15.38	16.10	16.89	18.73
08-00210-01616		16					60	16.80	17.55	18.38	19.28	21.39
08-00210-01618		18					60	18.89	19.73	20.66	21.67	Free
08-00210-01620		20					60	20.97	21.91	22.94	24.07	Free
08-00210-01626		26					70	27.23	28.45	29.78	31.25	Free
08-00210-01706	1.7	6	2.5	1.65	12°	4	50	6.37	6.66	6.97	7.32	8.11
08-00210-01714		14					60	14.72	15.38	16.10	16.89	18.73
08-00210-01724		24					70	25.15	26.27	27.50	28.85	Free
08-00210-01806	1.8	6	2.7	1.74	12°	4	50	6.40	6.69	7.00	7.34	8.15
08-00210-01808		8					50	8.48	8.86	9.28	9.74	10.80
08-00210-01810		10					50	10.57	11.04	11.56	12.13	13.45
08-00210-01812		12					50	12.66	13.22	13.84	14.52	16.11
08-00210-01814		14					60	14.74	15.40	16.12	16.92	18.76
08-00210-01816		16					60	16.83	17.58	18.40	19.31	Free
08-00210-01818		18					60	18.91	19.76	20.69	21.70	Free
08-00210-01820		20					60	21.00	21.94	22.97	24.10	Free
08-00210-01825		25					70	26.21	27.39	28.67	30.08	Free
08-00210-01906	1.9	6	2.8	1.84	12°	4	50	6.40	6.69	7.00	7.34	8.15
08-00210-01916		16					60	16.83	17.58	18.40	19.31	Free
08-00210-01928		28					70	29.34	30.65	32.09	Free	Free
08-00210-02006	2	6	3	1.94	12°	4	50	6.40	6.69	7.00	7.34	8.15
08-00210-02008		8					50	8.48	8.86	9.28	9.74	10.80
08-00210-02010		10					50	10.57	11.04	11.56	12.13	13.45
08-00210-02012		12					50	12.66	13.22	13.84	14.52	16.11
08-00210-02014		14					60	14.74	15.40	16.12	16.92	18.76
08-00210-02016		16					60	16.83	17.58	18.40	19.31	Free
08-00210-02018		18					60	18.91	19.76	20.69	21.70	Free
08-00210-02020		20					60	21.00	21.94	22.97	24.10	Free

MHR430

MUGEN COATING 4 -Flute Long Neck End Mill



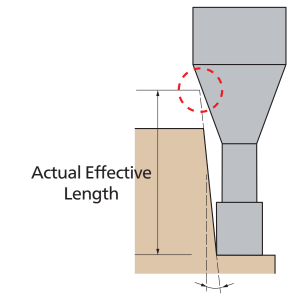
Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00210-02025	2	25	3	1.94	12°	4	70	26.21	27.39	28.67	Free	Free
08-00210-02030		30					70	31.43	32.83	34.37	Free	Free
08-00210-02508	2.5	8	3.7	2.4	12°	4	50	8.58	8.97	9.39	9.85	10.93
08-00210-02512		12					50	12.75	13.32	13.95	14.64	Free
08-00210-02516		16					60	16.93	17.68	18.51	19.42	Free
08-00210-02520		20					60	21.10	22.04	23.07	Free	Free
08-00210-02525		25					70	26.31	27.49	Free	Free	Free
08-00210-03008	3	8	4.5	2.85	12°	6	50	8.71	9.10	9.52	9.99	11.08
08-00210-03012		12					50	12.88	13.45	14.08	14.78	16.39
08-00210-03016		16					60	17.05	17.81	18.65	19.56	21.70
08-00210-03020		20					60	21.22	22.17	23.21	24.35	27.01
08-00210-03025		25					70	26.43	27.62	28.91	30.33	Free
08-00210-03030		30					70	31.65	33.06	34.61	36.31	Free
08-00210-03515	3.5	15	5.5	3.35	12°	6	60	16.01	16.72	17.50	18.37	20.37
08-00210-03525		25					70	26.43	27.62	28.91	30.33	Free
08-00210-03535		35					80	36.86	38.51	40.32	Free	Free
08-00210-04012	4	12	6	3.8	12°	6	50	13.00	13.58	14.22	14.92	16.55
08-00210-04016		16					60	17.17	17.94	18.78	19.70	Free
08-00210-04020		20					60	21.34	22.30	23.34	24.49	Free
08-00210-04025		25					70	26.56	27.74	29.04	Free	Free
08-00210-04030		30					70	31.77	33.19	34.75	Free	Free
08-00210-04035		35					80	36.98	38.64	Free	Free	Free
08-00210-04040		40					90	42.20	44.09	Free	Free	Free
08-00210-04045		45					90	47.41	49.53	Free	Free	Free
08-00210-04050		50					100	52.63	54.98	Free	Free	Free
08-00210-05016	5	16	7.5	4.8	12°	6	60	17.17	17.94	18.78	Free	Free
08-00210-05025		25					70	26.56	27.74	Free	Free	Free
08-00210-05035		35					80	36.98	Free	Free	Free	Free
08-00210-05050		50					110	52.63	Free	Free	Free	Free
08-00210-06020	6	20	9	5.8	–	6	80	Free	Free	Free	Free	Free
08-00210-06030		30					90	Free	Free	Free	Free	Free
08-00210-06040		40					100	Free	Free	Free	Free	Free

How to Order When you order, indicate MHR430 (D)×(ℓ1). ※(γ) is reference value.

MHR430

MUGEN COATING 4 -Flute Long Neck End Mill



Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
								30´	1°	1°30´	2°	3°
08-00210-06050	6	50	9	5.8	–	6	110	Free	Free	Free	Free	Free
08-00210-08030	8	30	12	7.8	–	8	100	Free	Free	Free	Free	Free
08-00210-08050		50					120	Free	Free	Free	Free	Free
08-00210-08060		60					130	Free	Free	Free	Free	Free
08-00210-10040	10	40	15	9.8	–	10	110	Free	Free	Free	Free	Free
08-00210-10060		60					130	Free	Free	Free	Free	Free
08-00210-10080		80					150	Free	Free	Free	Free	Free

Regular Line
MUGEN COATING
Long Neck Type

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Square Coating

Work Material		Carbon Steels・Alloy Steels*1・Stainless Steels*1 S50C・SCM*1・SKD*1・SUS*1				Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
1	4	25,000	1,700	0.055	0.6	22,000	1,100	0.045	0.6
	6	20,000	1,200	0.045	0.6	18,000	750	0.035	0.6
	8	18,000	1,050	0.035	0.6	15,000	600	0.025	0.6
	10	16,000	900	0.025	0.6	14,000	520	0.018	0.6
	12	14,000	750	0.02	0.6	12,000	450	0.014	0.6
	16	12,000	450	0.01	0.6	10,000	300	0.007	0.6
1.1	6	20,000	1,300	0.05	0.66	18,000	820	0.04	0.66
	10	16,000	1,000	0.03	0.66	14,000	600	0.02	0.66
	16	12,000	550	0.015	0.66	10,000	330	0.01	0.66
1.2	6	20,000	1,400	0.05	0.72	18,000	900	0.04	0.72
	8	18,000	1,200	0.04	0.72	15,000	750	0.03	0.72
	10	16,000	1,050	0.03	0.72	14,000	670	0.02	0.72
	12	14,000	900	0.025	0.72	12,000	530	0.018	0.72
	16	12,000	600	0.015	0.72	10,000	380	0.01	0.72
1.3	6	20,000	1,500	0.06	0.78	17,000	1,000	0.05	0.78
	12	14,000	1,000	0.03	0.78	12,000	600	0.025	0.78
	18	11,000	600	0.015	0.78	9,000	380	0.01	0.78
1.4	6	20,000	1,800	0.07	0.84	16,000	1,100	0.06	0.84
	8	18,000	1,500	0.06	0.84	14,000	900	0.05	0.84
	10	16,000	1,300	0.05	0.84	13,000	780	0.04	0.84
	12	14,000	1,050	0.04	0.84	12,000	670	0.03	0.84
	14	13,000	900	0.035	0.84	11,000	530	0.025	0.84
	16	12,000	750	0.025	0.84	10,000	450	0.018	0.84
	22	10,000	550	0.015	0.84	8,000	320	0.01	0.84
1.5	6	20,000	1,800	0.08	0.9	16,000	1,100	0.07	0.9
	8	18,000	1,500	0.07	0.9	14,000	900	0.06	0.9
	10	16,000	1,300	0.06	0.9	13,000	780	0.05	0.9
	12	14,000	1,050	0.05	0.9	12,000	670	0.04	0.9
	14	13,000	900	0.04	0.9	11,000	570	0.03	0.9
	16	12,000	750	0.035	0.9	10,000	480	0.025	0.9
	18	11,000	680	0.03	0.9	9,000	420	0.02	0.9
	20	10,000	600	0.02	0.9	8,000	360	0.014	0.9
1.6	6	20,000	1,800	0.09	0.96	16,000	1,100	0.08	0.96
	8	18,000	1,500	0.08	0.96	14,000	900	0.07	0.96
	10	16,000	1,300	0.07	0.96	13,000	780	0.06	0.96
	12	14,000	1,050	0.06	0.96	12,000	670	0.05	0.96
	14	13,000	900	0.05	0.96	11,000	570	0.04	0.96
	16	12,000	750	0.04	0.96	10,000	480	0.03	0.96
	18	11,000	680	0.03	0.96	9,000	420	0.025	0.96
	20	10,000	600	0.025	0.96	8,000	360	0.018	0.96
	26	9,000	530	0.02	0.96	7,000	300	0.014	0.96
1.7	6	19,000	1,900	0.095	1.02	15,000	1,150	0.085	1.02
	14	13,000	950	0.055	1.02	11,000	630	0.045	1.02
	24	9,000	550	0.025	1.02	7,000	330	0.018	1.02

*1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.

Work Material		Carbon Steels・Alloy Steels*1・Stainless Steels*1 S50C・SCM*1・SKD*1・SUS*1				Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
1.8	6	18,000	2,000	0.1	1.08	14,000	1,200	0.09	1.08
	8	18,000	1,700	0.09	1.08	14,000	1,000	0.08	1.08
	10	16,000	1,400	0.08	1.08	13,000	850	0.07	1.08
	12	14,000	1,100	0.07	1.08	12,000	720	0.06	1.08
	14	13,000	1,000	0.06	1.08	11,000	630	0.05	1.08
	16	12,000	850	0.05	1.08	10,000	530	0.04	1.08
	18	11,000	750	0.04	1.08	9,000	470	0.03	1.08
	20	10,000	680	0.035	1.08	8,000	400	0.025	1.08
	25	9,000	600	0.025	1.08	7,000	340	0.018	1.08
1.9	6	17,000	2,100	0.11	1.14	14,000	1,250	0.095	1.14
	16	12,000	1,000	0.06	1.14	10,000	630	0.045	1.14
	28	8,000	550	0.02	1.14	6,000	300	0.014	1.14
2	6	16,000	2,100	0.12	1.2	13,000	1,300	0.1	1.2
	8	16,000	2,000	0.11	1.2	13,000	1,200	0.09	1.2
	10	16,000	1,800	0.1	1.2	13,000	1,100	0.08	1.2
	12	14,000	1,500	0.09	1.2	12,000	1,000	0.07	1.2
	14	13,000	1,350	0.08	1.2	11,000	850	0.06	1.2
	16	12,000	1,200	0.07	1.2	10,000	750	0.05	1.2
	18	11,000	1,000	0.06	1.2	9,000	650	0.04	1.2
	20	10,000	900	0.05	1.2	8,000	550	0.035	1.2
	25	9,000	750	0.03	1.2	7,000	450	0.02	1.2
	30	8,000	600	0.02	1.2	6,000	330	0.014	1.2
2.5	8	13,000	2,100	0.15	1.5	11,000	1,400	0.12	1.5
	12	13,000	1,800	0.13	1.5	11,000	1,100	0.1	1.5
	16	11,000	1,400	0.1	1.5	9,000	850	0.07	1.5
	20	9,000	1,100	0.08	1.5	7,000	600	0.05	1.5
	25	8,000	900	0.05	1.5	6,000	500	0.035	1.5
3	8	11,000	2,300	0.2	1.8	9,000	1,500	0.16	1.8
	12	11,000	2,000	0.16	1.8	9,000	1,200	0.12	1.8
	16	10,000	1,500	0.12	1.8	8,000	900	0.09	1.8
	20	9,000	1,200	0.1	1.8	7,000	680	0.07	1.8
	25	8,000	1,050	0.08	1.8	6,000	570	0.06	1.8
	30	7,000	900	0.06	1.8	5,000	450	0.045	1.8
3.5	15	9,000	2,000	0.18	2.1	7,000	1,200	0.15	2.1
	25	7,500	1,500	0.12	2.1	6,000	850	0.08	2.1
	35	6,000	1,000	0.07	2.1	4,500	520	0.05	2.1
4	12	8,000	2,200	0.3	2.4	6,000	1,300	0.25	2.4
	16	8,000	2,100	0.25	2.4	6,000	1,200	0.2	2.4
	20	8,000	2,000	0.2	2.4	6,000	1,100	0.15	2.4
	25	7,000	1,700	0.15	2.4	5,000	900	0.1	2.4
	30	7,000	1,500	0.12	2.4	5,000	800	0.08	2.4
	35	6,000	1,200	0.1	2.4	4,500	670	0.07	2.4
	40	5,000	900	0.08	2.4	4,000	540	0.06	2.4
	45	4,500	750	0.06	2.4	3,500	450	0.04	2.4
	50	4,000	600	0.04	2.4	3,000	330	0.03	2.4
5	16	6,000	2,100	0.35	3	4,500	1,200	0.3	3
	25	6,000	1,800	0.25	3	4,500	1,000	0.2	3
	35	5,000	1,200	0.15	3	3,500	630	0.1	3
	50	3,500	680	0.07	3	2,500	360	0.05	3

*1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.

MHR430

MHR430

Recommended Milling Conditions

Work Material		Carbon Steels・Alloy Steels※1・Stainless Steels※1 S50C・SCM※1・SKD※1・SUS※1				Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
6	20	5,000	1,800	0.4	3.6	3,500	1,000	0.35	3.6
	30	4,000	1,400	0.35	3.6	3,000	750	0.3	3.6
	40	3,500	1,000	0.25	3.6	2,700	570	0.2	3.6
	50	3,000	750	0.15	3.6	2,200	420	0.1	3.6
8	30	3,800	1,400	0.6	4.8	2,800	900	0.45	4.8
	50	2,800	820	0.4	4.8	2,100	600	0.3	4.8
	60	2,400	680	0.3	4.8	1,800	450	0.2	4.8
10	40	3,000	1,200	0.8	6	2,200	750	0.55	6
	60	2,200	750	0.6	6	1,600	520	0.45	6
	80	1,800	520	0.4	6	1,300	360	0.3	6

Notes

※1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.
※2 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
※3 ap:Axial Depth of Cut, ae:Radial Depth of Cut.
※4 Select a cutting fluid appropriate to work material, milling shape and machining content.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Recommend to apply herical or ramping for approaching into axial direction.
※7 Reduction of feed and Depth of Cut to reduce machining load around side wall.
※8 For slotting, recommend reciprocating milling by adjusting feed at 80% of recommended milling conditions as a reference value.
Recommend guide slotting process with short neck tool before milling with L/D 5 time or longer neck tool.
※9 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※10 Major adjustment of milling conditions, e.g. adjust spindle and feed speed at same rate, required on condition of a tool overhang length exceeding a shank diameter 5 times due to possible accuracy impact by chuck runout etc.

Regular Line
MUGEN COATING
Long Neck Type

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Square Coating

MHRLN230-6

Size ϕ0.3 ~ ϕ2

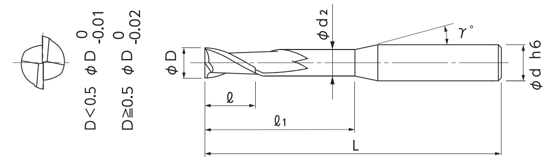
≦55 HRC

MUGEN COATING 2-Flute Long Neck End Mill (Shank Dia. 6)

Total 19 sizes

2-flute long neck square end mill. Shank Dia.6mm

MG 2 30°
Side Slot Face



Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00202-03030	0.3	3	0.4	0.28	15°	6	60
▌08-00202-04030	0.4	3	0.6	0.37	15°	6	60
▌08-00202-04040		4	0.6	0.37	15°	6	60
▌08-00202-04050		5	0.6	0.37	15°	6	60
▌08-00202-05040	0.5	4	0.7	0.46	15°	6	60
▌08-00202-05050		5	0.7	0.46	15°	6	60
▌08-00202-05060		6	0.7	0.46	15°	6	60
▌08-00202-06040	0.6	4	0.9	0.56	15°	6	60
▌08-00202-06060		6	0.9	0.56	15°	6	60
▌08-00202-08080	0.8	8	1.2	0.76	15°	6	60
▌08-00202-10030	1	3	1.5	0.95	15°	6	60
▌08-00202-10060		6	1.5	0.95	15°	6	60
▌08-00202-10080		8	1.5	0.95	15°	6	60
▌08-00202-10100		10	1.5	0.95	15°	6	60
▌08-00202-15030	1.5	3	2.3	1.45	15°	6	60
▌08-00202-15050		5	2.3	1.45	15°	6	60
▌08-00202-15100		10	2.3	1.45	15°	6	60
▌08-00202-15150		15	2.3	1.45	15°	6	60
▌08-00202-20200	2	20	3	1.94	15°	6	60

How to Order When you order, indicate MHRLN230-6 (D)×(ℓ1). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Work Material		Carbon Steels・Alloy Steels※1 ・Stainless Steels※1 S50C・SCM※1・SKD※1・SUS※1			Prehardened Steels NAK55・NAK80・HPM1 (~43HRC)			Copper・Aluminium Alloy		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
0.3	3	30,000	200	0.005	25,000	130	0.004	35,000	250	0.006
0.4	3	30,000	300	0.015	25,000	190	0.01	35,000	350	0.018
	4	25,000	200	0.01	22,000	140	0.007	30,000	240	0.012
	5	22,000	160	0.008	20,000	110	0.005	25,000	180	0.01
0.5	4	25,000	350	0.015	22,000	230	0.01	30,000	420	0.018
	5	25,000	300	0.01	20,000	180	0.007	30,000	350	0.012
	6	20,000	200	0.008	18,000	140	0.005	25,000	250	0.01
0.6	4	25,000	450	0.025	22,000	300	0.018	30,000	550	0.03
	6	20,000	300	0.015	18,000	200	0.01	25,000	380	0.018
0.8	8	18,000	350	0.02	15,000	240	0.015	22,000	430	0.025
1	3	25,000	1,200	0.06	22,000	800	0.05	30,000	1,500	0.07
	6	20,000	800	0.045	18,000	500	0.035	25,000	1,000	0.055
	8	18,000	700	0.035	15,000	400	0.025	22,000	850	0.045
	10	16,000	600	0.025	14,000	350	0.018	20,000	750	0.03
1.5	3	22,000	1,400	0.09	18,000	860	0.08	26,000	1,700	0.1
	5	20,000	1,200	0.08	16,000	720	0.07	24,000	1,500	0.09
	10	16,000	850	0.06	13,000	520	0.05	20,000	1,100	0.07
	15	12,000	500	0.035	10,000	320	0.025	15,000	650	0.04
2	20	10,000	600	0.05	8,000	360	0.035	12,000	720	0.06

Notes

※1 Reference value for Alloy and Stainless Steels are 80% of recommended cutting conditions.
※2 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
※3 ap:Axial Depth of Cut.
※4 Select a cutting fluid appropriate to work material, milling shape and machining content.
※5 Coolant supply and chip disposal in the deep portion are very important.
※6 Recommend to apply ramping for approaching into axial direction.
※7 Recommend reciprocating cutting.
※8 Recommend guide slotting process with short neck tool before milling with L/D 5 time or longer neck tool.
※9 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※10 Major adjustment of milling conditions appropriately on milling profile, machine tool and etc. required for the tools smaller than Dia. 0.5mm.
※11 Major adjustment of milling conditions, e.g. adjust spindle and feed speed at same rate, required on condition of a tool overhang length exceeding a shank diameter 5 times due to possible accuracy impact by chuck runout etc.

MRB230

Size R0.05 ～ R3

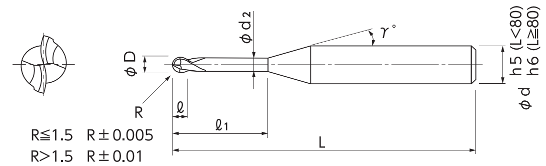
MUGEN COATING 2-Flute Long Neck Ball End Mill

Total 282 sizes

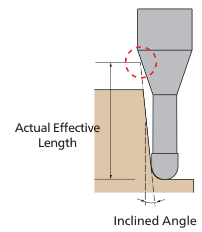
≦55 HRC

Standard type long neck ball end mill. Sufficient variations with 282 sizes

MG　2　30°　R ±0.005 (R≦1.5)　φd h5 (L<80)　3D



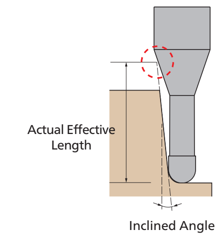
- The Long Neck type is suitable for narrow and deep machining.
- It is possible to have deep and precision three-dimensional cutting in the low to high speed range.



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00520-20051	R0.05	0.3	0.07	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
08-00520-20052		0.5	0.07	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
08-00520-40075	R0.075	0.3	0.1	0.15	0.13	12°	4	45	0.35	0.37	0.38	0.40	0.43
08-00520-40076		0.5	0.1	0.15	0.13	12°	4	45	0.56	0.58	0.61	0.64	0.70
08-00520-40077		1	0.1	0.15	0.13	12°	4	45	1.08	1.13	1.18	1.23	1.36
08-00520-00101	R0.1	0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
08-00521-00101		0.5	0.15	0.2	0.18	12°	6	50	0.56	0.58	0.61	0.63	0.69
08-00520-10101		0.75	0.15	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
08-00520-00102		1	0.15	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
08-00521-00102		1	0.15	0.2	0.18	12°	6	50	1.08	1.13	1.18	1.23	1.35
08-00520-10102		1.25	0.15	0.2	0.18	12°	4	45	1.34	1.40	1.46	1.53	1.68
08-00520-00103		1.5	0.15	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
08-00521-00103		1.5	0.15	0.2	0.18	12°	6	50	1.60	1.67	1.75	1.83	2.02
08-00520-10103		1.75	0.15	0.2	0.18	12°	4	45	1.86	1.94	2.03	2.13	2.35
08-00520-00104		2	0.15	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68
08-00521-00104		2	0.15	0.2	0.18	12°	6	50	2.13	2.22	2.32	2.43	2.68
08-00520-00105		2.5	0.15	0.2	0.18	12°	4	45	2.65	2.76	2.89	3.02	3.34
08-00520-00106		3	0.15	0.2	0.18	12°	4	45	3.17	3.31	3.46	3.62	4.01
08-00520-40151	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67
08-00520-10151		0.6	0.2	0.3	0.28	12°	4	45	0.66	0.69	0.71	0.74	0.81
08-00520-40152		0.75	0.2	0.3	0.28	12°	4	45	0.82	0.85	0.88	0.92	1.01
08-00520-00151		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
08-00521-00151		1	0.2	0.3	0.28	12°	6	50	1.08	1.12	1.17	1.22	1.34
08-00520-30153		1.25	0.2	0.3	0.28	12°	4	45	1.34	1.39	1.45	1.52	1.67
08-00520-10152		1.5	0.2	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00
08-00521-00152		1.5	0.2	0.3	0.28	12°	6	50	1.60	1.67	1.74	1.82	2.00
08-00520-30154		1.75	0.2	0.3	0.28	12°	4	45	1.86	1.94	2.02	2.12	2.33
08-00520-00152		2	0.2	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66
08-00521-00153		2	0.2	0.3	0.28	12°	6	50	2.12	2.21	2.31	2.42	2.66
08-00520-30155		2.25	0.2	0.3	0.28	12°	4	45	2.38	2.48	2.59	2.71	3.00
08-00520-10153		2.5	0.2	0.3	0.28	12°	4	45	2.64	2.76	2.88	3.01	3.33
08-00520-30156		2.75	0.2	0.3	0.28	12°	4	45	2.91	3.03	3.16	3.31	3.66

How to Order　When you order, indicate MRB230 (R)×(ℓ1)×(d).　※(γ) is reference value.

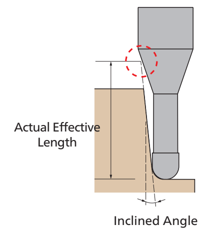


Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30′	1°	1°30′	2°	3°
08-00520-10154	R0.15	3	0.2	0.3	0.28	12°	4	45	3.17	3.30	3.45	3.61	3.99
08-00520-30157		3.5	0.2	0.3	0.28	12°	4	45	3.69	3.85	4.02	4.21	4.65
08-00520-20151		4	0.2	0.3	0.28	12°	4	45	4.21	4.39	4.59	4.81	5.32
08-00520-30158		4.5	0.2	0.3	0.28	12°	4	45	4.73	4.94	5.16	5.41	5.98
08-00520-20152		5	0.2	0.3	0.28	12°	4	45	5.25	5.48	5.73	6.01	6.65
08-00520-40201	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69
08-00520-10201		0.75	0.3	0.4	0.37	12°	4	45	0.84	0.87	0.90	0.94	1.02
08-00520-00201		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35
08-00521-00201		1	0.3	0.4	0.37	12°	6	50	1.10	1.14	1.19	1.24	1.35
08-00520-00204		1.5	0.3	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02
08-00521-00202		1.5	0.3	0.4	0.37	12°	6	50	1.62	1.69	1.76	1.84	2.02
08-00520-00202		2	0.3	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68
08-00521-00203		2	0.3	0.4	0.37	12°	6	50	2.15	2.23	2.33	2.43	2.68
08-00520-00205		2.5	0.3	0.4	0.37	12°	4	45	2.67	2.78	2.90	3.03	3.34
08-00521-00204		2.5	0.3	0.4	0.37	12°	6	50	2.67	2.78	2.90	3.03	3.34
08-00520-00203		3	0.3	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01
08-00521-00205		3	0.3	0.4	0.37	12°	6	50	3.19	3.32	3.47	3.63	4.01
08-00520-10202		3.5	0.3	0.4	0.37	12°	4	45	3.71	3.87	4.04	4.23	4.67
08-00520-00206		4	0.3	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33
08-00520-10203		4.5	0.3	0.4	0.37	12°	4	45	4.75	4.96	5.18	5.43	6.00
08-00520-00207		5	0.3	0.4	0.37	12°	4	45	5.27	5.50	5.75	6.02	6.66
08-00520-10204		5.5	0.3	0.4	0.37	12°	4	45	5.80	6.05	6.32	6.62	7.32
08-00520-10205		6	0.3	0.4	0.37	12°	4	45	6.32	6.59	6.89	7.22	7.99
08-00520-30251	R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
08-00520-10251		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
08-00521-00251		1.5	0.35	0.5	0.46	12°	6	50	1.65	1.71	1.78	1.85	2.03
08-00520-00251		2	0.35	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69
08-00521-00252		2	0.35	0.5	0.46	12°	6	50	2.17	2.25	2.35	2.45	2.69
08-00520-10252		2.5	0.35	0.5	0.46	12°	4	45	2.69	2.80	2.92	3.05	3.36
08-00520-10253		3	0.35	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02
08-00520-10254		3.5	0.35	0.5	0.46	12°	4	45	3.73	3.89	4.06	4.25	4.69
08-00520-00252		4	0.35	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35
08-00521-00253		4	0.35	0.5	0.46	12°	6	50	4.25	4.43	4.63	4.85	5.35
08-00520-10255		4.5	0.35	0.5	0.46	12°	4	45	4.78	4.98	5.20	5.44	6.01
08-00520-00255		5	0.35	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68
08-00521-00254		5	0.35	0.5	0.46	12°	6	50	5.30	5.52	5.77	6.04	6.68
08-00520-10256		5.5	0.35	0.5	0.46	12°	4	45	5.82	6.07	6.34	6.64	7.34
08-00520-00253		6	0.35	0.5	0.46	12°	4	45	6.34	6.61	6.91	7.24	8.00
08-00521-00255		6	0.35	0.5	0.46	12°	6	50	6.34	6.61	6.91	7.24	8.00
08-00520-10257		7	0.35	0.5	0.46	12°	4	45	7.38	7.70	8.05	8.44	9.33
08-00520-00254		8	0.35	0.5	0.46	12°	4	45	8.42	8.79	9.19	9.63	10.66
08-00521-00256		8	0.35	0.5	0.46	12°	6	50	8.42	8.79	9.19	9.63	10.66
08-00521-30251		9	0.35	0.5	0.46	12°	6	55	9.47	9.88	10.33	10.83	11.99
08-00521-30252		10	0.35	0.5	0.46	12°	6	55	10.51	10.97	11.47	12.03	13.31

MRB230

MUGEN COATING 2-Flute Long Neck Ball End Mill



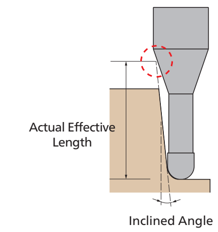
Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00520-40301		1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
08-00520-10301		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
08-00520-00301		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
08-00521-00301		2	0.45	0.6	0.56	12°	6	50	2.17	2.25	2.34	2.44	2.68
08-00520-10302		2.5	0.45	0.6	0.56	12°	4	45	2.69	2.79	2.91	3.04	3.34
08-00520-00305		3	0.45	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01
08-00521-00302		3	0.45	0.6	0.56	12°	6	50	3.21	3.34	3.48	3.64	4.01
08-00520-10303		3.5	0.45	0.6	0.56	12°	4	45	3.73	3.88	4.05	4.24	4.67
08-00520-00302		4	0.45	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33
08-00521-00303		4	0.45	0.6	0.56	12°	6	50	4.25	4.43	4.62	4.84	5.33
08-00520-10304		4.5	0.45	0.6	0.56	12°	4	45	4.77	4.97	5.19	5.43	6.00
08-00520-00306		5	0.45	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66
08-00520-10305		5.5	0.45	0.6	0.56	12°	4	45	5.82	6.06	6.33	6.63	7.32
08-00520-00303	R0.3	6	0.45	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99
08-00521-00304		6	0.45	0.6	0.56	12°	6	50	6.34	6.61	6.90	7.23	7.99
08-00520-10306		6.5	0.45	0.6	0.56	12°	4	45	6.86	7.15	7.47	7.83	8.65
08-00520-00307		7	0.45	0.6	0.56	12°	4	45	7.38	7.70	8.04	8.43	9.31
08-00520-10307		7.5	0.45	0.6	0.56	12°	4	45	7.90	8.24	8.61	9.02	9.98
08-00520-00304		8	0.45	0.6	0.56	12°	4	45	8.42	8.79	9.18	9.62	10.64
08-00521-00305		8	0.45	0.6	0.56	12°	6	50	8.42	8.79	9.18	9.62	10.64
08-00520-10308		8.5	0.45	0.6	0.56	12°	4	45	8.94	9.33	9.76	10.22	11.31
08-00520-10309		9	0.45	0.6	0.56	12°	4	45	9.47	9.88	10.33	10.82	11.97
08-00520-10310		9.5	0.45	0.6	0.56	12°	4	45	9.99	10.42	10.90	11.42	12.63
08-00520-10311		10	0.45	0.6	0.56	12°	4	45	10.51	10.97	11.47	12.02	13.30
08-00521-00306		10	0.45	0.6	0.56	12°	6	50	10.51	10.97	11.47	12.02	13.30
08-00520-10312		11	0.45	0.6	0.56	12°	4	45	11.55	12.06	12.61	13.21	14.62
08-00520-10313		12	0.45	0.6	0.56	12°	4	45	12.59	13.14	13.75	14.41	15.95
08-00520-40351		2	0.5	0.7	0.66	12°	4	45	2.16	2.25	2.33	2.43	2.66
08-00520-40352	R0.35	4	0.5	0.7	0.66	12°	4	45	4.25	4.42	4.62	4.83	5.32
08-00520-40353		6	0.5	0.7	0.66	12°	4	45	6.34	6.60	6.90	7.22	7.97
08-00520-40354		8	0.5	0.7	0.66	12°	4	45	8.42	8.78	9.18	9.61	10.63
08-00520-00400		2	0.6	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65
08-00521-00401		2	0.6	0.8	0.76	12°	6	50	2.16	2.24	2.33	2.42	2.65
08-00520-10401		3	0.6	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97
08-00521-00402		3	0.6	0.8	0.76	12°	6	50	3.20	3.33	3.47	3.62	3.97
08-00520-00401		4	0.6	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30
08-00521-00403		4	0.6	0.8	0.76	12°	6	50	4.25	4.42	4.61	4.82	5.30
08-00520-00405	R0.4	5	0.6	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63
08-00520-00402		6	0.6	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96
08-00521-00404		6	0.6	0.8	0.76	12°	6	50	6.33	6.60	6.89	7.21	7.96
08-00520-00406		7	0.6	0.8	0.76	12°	4	45	7.38	7.69	8.03	8.41	9.28
08-00520-00403		8	0.6	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61
08-00521-00405		8	0.6	0.8	0.76	12°	6	50	8.42	8.78	9.17	9.60	10.61
08-00520-30401		9	0.6	0.8	0.76	12°	4	45	9.46	9.87	10.31	10.80	11.94

How to Order　When you order, indicate MRB230 (R)×(ℓ1)×(d).　※(γ) is reference value.

Carbon Steel P ◎
Alloy Steel P ◎
Prehardened Steel P ◎
Hardened Steel ~55 HRC H ○
Stainless Steel M ○
Aluminium Alloy N ○
Copper N ○
Resin O ○
Long Neck Ball Coating

MUGEN COATING 2-Flute Long Neck Ball End Mill



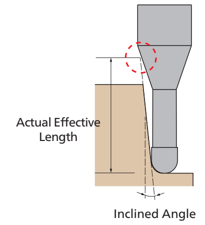
Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00520-00404		10	0.6	0.8	0.76	12°	4	45	10.50	10.96	11.45	12.00	13.26
08-00521-00406	R0.4	10	0.6	0.8	0.76	12°	6	50	10.50	10.96	11.45	12.00	13.26
08-00520-20401		12	0.6	0.8	0.76	12°	4	45	12.59	13.14	13.73	14.39	15.92
08-00520-40451		2	0.65	0.9	0.86	12°	4	45	2.16	2.24	2.32	2.41	2.63
08-00520-40452	R0.45	4	0.65	0.9	0.86	12°	4	45	4.25	4.42	4.60	4.81	5.29
08-00520-40453		6	0.65	0.9	0.86	12°	4	45	6.33	6.59	6.88	7.20	7.94
08-00520-40454		8	0.65	0.9	0.86	12°	4	45	8.42	8.77	9.16	9.59	10.59
08-00520-40501		2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
08-00520-40502		2.5	0.75	1	0.95	12°	4	45	2.70	2.80	2.91	3.03	3.31
08-00520-00505		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
08-00521-00501		3	0.75	1	0.95	12°	6	50	3.22	3.35	3.48	3.63	3.97
08-00520-00506		4	0.75	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30
08-00521-00502		4	0.75	1	0.95	12°	6	50	4.27	4.44	4.62	4.83	5.30
08-00520-00510		5	0.75	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63
08-00521-00503		5	0.75	1	0.95	12°	6	50	5.31	5.53	5.76	6.02	6.63
08-00520-00501		6	0.75	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96
08-00521-00504		6	0.75	1	0.95	12°	6	50	6.35	6.62	6.90	7.22	7.96
08-00520-00511		7	0.75	1	0.95	12°	4	45	7.40	7.71	8.04	8.42	9.28
08-00520-00502		8	0.75	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61
08-00521-00505		8	0.75	1	0.95	12°	6	50	8.44	8.79	9.18	9.61	10.61
08-00520-00512	R0.5	9	0.75	1	0.95	12°	4	45	9.48	9.88	10.32	10.81	11.94
08-00520-00507		10	0.75	1	0.95	12°	4	45	10.52	10.97	11.46	12.01	13.26
08-00521-00506		10	0.75	1	0.95	12°	6	50	10.52	10.97	11.46	12.01	13.26
08-00520-00504		12	0.75	1	0.95	12°	4	45	12.61	13.15	13.75	14.40	15.92
08-00521-00507		12	0.75	1	0.95	12°	6	50	12.61	13.15	13.75	14.40	15.92
08-00520-40503		13	0.75	1	0.95	12°	4	45	13.65	14.24	14.89	15.59	17.25
08-00520-00513		14	0.75	1	0.95	12°	4	50	14.70	15.33	16.03	16.79	18.57
08-00520-00508		16	0.75	1	0.95	12°	4	50	16.78	17.51	18.31	19.18	21.23
08-00521-00508		16	0.75	1	0.95	12°	6	60	16.78	17.51	18.31	19.18	21.23
08-00520-00514		18	0.75	1	0.95	12°	4	55	18.87	19.69	20.59	21.58	23.88
08-00520-00509		20	0.75	1	0.95	12°	4	55	20.95	21.87	22.87	23.97	26.54
08-00521-00509		20	0.75	1	0.95	12°	6	60	20.95	21.87	22.87	23.97	26.54
08-00521-00510		22	0.75	1	0.95	12°	6	60	23.04	24.05	25.15	26.36	29.19
08-00520-40601		2.4	0.9	1.2	1.15	12°	4	45	2.59	2.68	2.78	2.89	3.15
08-00520-20601		4	0.9	1.2	1.15	12°	4	45	4.26	4.43	4.61	4.81	5.27
08-00520-00600		6	0.9	1.2	1.15	12°	4	45	6.35	6.61	6.89	7.20	7.92
08-00521-00601		6	0.9	1.2	1.15	12°	6	50	6.35	6.61	6.89	7.20	7.92
08-00520-00601		8	0.9	1.2	1.15	12°	4	45	8.43	8.79	9.17	9.59	10.58
08-00521-00602	R0.6	8	0.9	1.2	1.15	12°	6	50	8.43	8.79	9.17	9.59	10.58
08-00520-00602		10	0.9	1.2	1.15	12°	4	45	10.52	10.96	11.45	11.99	13.23
08-00521-00603		10	0.9	1.2	1.15	12°	6	50	10.52	10.96	11.45	11.99	13.23
08-00520-00603		12	0.9	1.2	1.15	12°	4	45	12.61	13.14	13.73	14.38	15.89
08-00521-00604		12	0.9	1.2	1.15	12°	6	50	12.61	13.14	13.73	14.38	15.89
08-00520-10601		14	0.9	1.2	1.15	12°	4	50	14.69	15.32	16.01	16.77	18.54

P Carbon Steel ◎
P Alloy Steel ◎
P Prehardened Steel ◎
H ~55 HRC Hardened Steel ○
M Stainless Steel ○
N Aluminium Alloy ○
N Copper ○
O Resin ○
Long Neck Ball Coating

MRB230

MUGEN COATING 2-Flute Long Neck Ball End Mill



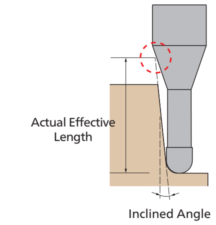
Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00520-10602	R0.6	16	0.9	1.2	1.15	12°	4	50	16.78	17.50	18.29	19.17	21.20
08-00521-00605		16	0.9	1.2	1.15	12°	6	60	16.78	17.50	18.29	19.17	21.20
08-00520-20602		18	0.9	1.2	1.15	12°	4	55	18.86	19.68	20.58	21.56	23.85
08-00520-30601		20	0.9	1.2	1.15	12°	4	55	20.95	21.86	22.86	23.95	26.50
08-00520-20603		24	0.9	1.2	1.15	12°	4	60	25.12	26.22	27.42	28.74	Free
08-00520-30701	R0.7	8	1	1.4	1.35	12°	4	45	8.43	8.78	9.16	9.57	10.55
08-00520-30702		12	1	1.4	1.35	12°	4	50	12.60	13.13	13.72	14.36	15.85
08-00520-30703		16	1	1.4	1.35	12°	4	50	16.77	17.49	18.28	19.15	21.16
08-00520-30751	R0.75	3	1.1	1.5	1.45	12°	4	45	3.21	3.33	3.45	3.58	3.89
08-00520-20751		4	1.1	1.5	1.45	12°	4	45	4.26	4.41	4.59	4.78	5.22
08-00520-20752		6	1.1	1.5	1.45	12°	4	45	6.34	6.59	6.87	7.17	7.88
08-00520-00751		8	1.1	1.5	1.45	12°	4	45	8.43	8.77	9.15	9.56	10.53
08-00521-00751		8	1.1	1.5	1.45	12°	6	50	8.43	8.77	9.15	9.56	10.53
08-00520-00752		10	1.1	1.5	1.45	12°	4	45	10.51	10.95	11.43	11.96	13.18
08-00520-00753		12	1.1	1.5	1.45	12°	4	45	12.60	13.13	13.71	14.35	15.84
08-00521-00752		12	1.1	1.5	1.45	12°	6	50	12.60	13.13	13.71	14.35	15.84
08-00520-00754		14	1.1	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
08-00520-00755		16	1.1	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15
08-00521-00755		16	1.1	1.5	1.45	12°	6	60	16.77	17.49	18.27	19.14	21.15
08-00520-00756		18	1.1	1.5	1.45	12°	4	55	18.86	19.67	20.55	21.53	23.80
08-00520-00757		20	1.1	1.5	1.45	12°	4	55	20.94	21.85	22.84	23.92	Free
08-00521-00757		20	1.1	1.5	1.45	12°	6	60	20.94	21.85	22.84	23.92	26.46
08-00520-10751		22	1.1	1.5	1.45	12°	4	55	23.03	24.02	25.12	26.32	Free
08-00520-20753		30	1.1	1.5	1.45	12°	4	70	31.37	32.74	34.24	35.89	Free
08-00520-20801	R0.8	4	1.2	1.6	1.55	12°	4	45	4.25	4.41	4.58	4.77	5.21
08-00520-00801		8	1.2	1.6	1.55	12°	4	45	8.43	8.77	9.14	9.55	10.51
08-00520-00803		12	1.2	1.6	1.55	12°	4	45	12.60	13.13	13.70	14.34	15.82
08-00520-00805		16	1.2	1.6	1.55	12°	4	50	16.77	17.48	18.27	19.13	21.13
08-00520-00807		20	1.2	1.6	1.55	12°	4	55	20.94	21.84	22.83	23.91	Free
08-00520-30901	R0.9	8	1.3	1.8	1.75	12°	4	45	8.42	8.76	9.13	9.53	10.48
08-00520-30902		12	1.3	1.8	1.75	12°	4	45	12.59	13.12	13.69	14.32	15.79
08-00520-30903		16	1.3	1.8	1.75	12°	4	50	16.76	17.47	18.25	19.11	21.10
08-00520-30904		20	1.3	1.8	1.75	12°	4	55	20.94	21.83	22.81	23.89	Free
08-00520-31001	R1	3	1.5	2	1.94	12°	4	45	3.23	3.33	3.44	3.56	3.85
08-00520-01000		4	1.5	2	1.94	12°	4	45	4.27	4.42	4.58	4.76	5.17
08-00521-01000		4	1.5	2	1.94	12°	6	50	4.27	4.42	4.58	4.76	5.17
08-00520-01001		6	1.5	2	1.94	12°	4	45	6.36	6.60	6.86	7.15	7.83
08-00521-01001		6	1.5	2	1.94	12°	6	50	6.36	6.60	6.86	7.15	7.83
08-00520-01002		8	1.5	2	1.94	12°	4	45	8.44	8.78	9.14	9.54	10.48
08-00521-01002		8	1.5	2	1.94	12°	6	50	8.44	8.78	9.14	9.54	10.48
08-00520-01003		10	1.5	2	1.94	12°	4	45	10.53	10.95	11.42	11.94	13.14
08-00521-01003		10	1.5	2	1.94	12°	6	50	10.53	10.95	11.42	11.94	13.14
08-00520-01004		12	1.5	2	1.94	12°	4	45	12.61	13.13	13.70	14.33	15.79
08-00521-01004		12	1.5	2	1.94	12°	6	50	12.61	13.13	13.70	14.33	15.79

How to Order When you order, indicate MRB230 (R)×(ℓ1)×(d). ※(γ) is reference value.

MRB230

MUGEN COATING 2-Flute Long Neck Ball End Mill

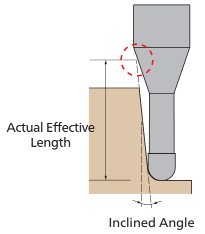


Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00520-41001	R1	13	1.5	2	1.94	12°	4	45	13.66	14.22	14.84	15.53	17.12
08-00520-01005		14	1.5	2	1.94	12°	4	50	14.70	15.31	15.98	16.72	18.45
08-00520-01006		16	1.5	2	1.94	12°	4	50	16.78	17.49	18.27	19.12	Free
08-00521-01005		16	1.5	2	1.94	12°	6	60	16.78	17.49	18.27	19.12	21.10
08-00520-01007		18	1.5	2	1.94	12°	4	55	18.87	19.67	20.55	21.51	Free
08-00520-01008		20	1.5	2	1.94	12°	4	55	20.96	21.85	22.83	23.90	Free
08-00521-01008		20	1.5	2	1.94	12°	6	60	20.96	21.85	22.83	23.90	26.41
08-00520-01009		22	1.5	2	1.94	12°	4	60	23.04	24.03	25.11	26.30	Free
08-00520-01010		25	1.5	2	1.94	12°	4	65	26.17	27.30	28.53	Free	Free
08-00521-01010		25	1.5	2	1.94	12°	6	80	26.17	27.30	28.53	29.89	33.04
08-00520-01011		30	1.5	2	1.94	12°	4	70	31.38	32.74	34.23	Free	Free
08-00521-01012		30	1.5	2	1.94	12°	6	80	31.38	32.74	34.23	35.87	Free
08-00520-11001		35	1.5	2	1.94	12°	4	70	36.60	38.19	Free	Free	Free
08-00521-01014		35	1.5	2	1.94	12°	6	80	36.60	38.19	39.93	41.85	Free
08-00520-31002		40	1.5	2	1.94	12°	4	90	41.81	43.64	Free	Free	Free
08-00521-01015		40	1.5	2	1.94	12°	6	90	41.81	43.64	45.64	47.83	Free
08-00520-21251	R1.25	6	2.3	2.5	2.4	12°	4	45	6.44	6.68	6.93	7.21	7.87
08-00520-11251		10	2.3	2.5	2.4	12°	4	45	10.62	11.04	11.49	12.00	13.18
08-00520-11252		15	2.3	2.5	2.4	12°	4	50	15.83	16.48	17.20	17.98	Free
08-00520-11253		20	2.3	2.5	2.4	12°	4	55	21.04	21.93	22.90	Free	Free
08-00520-11254		25	2.3	2.5	2.4	12°	4	65	26.26	27.38	28.60	Free	Free
08-00520-11255		30	2.3	2.5	2.4	12°	4	70	31.47	32.82	Free	Free	Free
08-00520-21252		35	2.3	2.5	2.4	12°	4	70	36.69	38.27	Free	Free	Free
08-00520-31502	R1.5	6	2.5	3	2.85	12°	4	60	6.56	6.78	7.03	7.31	7.95
08-00520-31503		6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
08-00520-01500		8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
08-00520-01501		10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
08-00520-31504		12	2.5	3	2.85	12°	6	60	12.81	13.32	13.88	14.49	15.91
08-00520-31505		14	2.5	3	2.85	12°	6	60	14.90	15.50	16.16	16.88	18.57
08-00520-01503		15	2.5	3	2.85	12°	6	60	15.94	16.59	17.30	18.08	19.89
08-00520-31506		16	2.5	3	2.85	12°	6	60	16.98	17.68	18.44	19.27	21.22
08-00520-01505		20	2.5	3	2.85	12°	6	65	21.16	22.04	23.00	24.06	26.53
08-00520-01506		25	2.5	3	2.85	12°	6	65	26.37	27.48	28.70	30.04	Free
08-00520-01507		30	2.5	3	2.85	12°	6	70	31.58	32.93	34.40	36.03	Free
08-00520-01508		35	2.5	3	2.85	12°	6	80	36.80	38.38	40.11	42.01	Free
08-00520-11501		40	2.5	3	2.85	12°	6	90	42.01	43.83	45.81	Free	Free
08-00520-11751	R1.75	10	2.8	3.5	3.35	12°	6	60	10.72	11.12	11.56	12.05	13.18
08-00520-11752		15	2.8	3.5	3.35	12°	6	60	15.93	16.57	17.26	18.03	19.81
08-00520-11753		20	2.8	3.5	3.35	12°	6	65	21.14	22.01	22.96	24.01	Free
08-00520-11754		25	2.8	3.5	3.35	12°	6	65	26.36	27.46	28.67	29.99	Free
08-00520-11755		30	2.8	3.5	3.35	12°	6	70	31.57	32.91	34.37	35.98	Free
08-00520-11756		35	2.8	3.5	3.35	12°	6	80	36.79	38.36	40.07	Free	Free
08-00520-11757		40	2.8	3.5	3.35	12°	6	90	42.00	43.80	45.77	Free	Free
08-00520-11758		45	2.8	3.5	3.35	12°	6	90	47.22	49.25	Free	Free	Free

MRB230

MUGEN COATING 2-Flute Long Neck Ball End Mill



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00520-02000	R2	10	3	4	3.8	12°	6	65	10.83	11.22	11.66	12.14	13.25
08-00520-32001		12	3	4	3.8	12°	6	65	12.91	13.40	13.94	14.53	15.91
08-00520-32002		14	3	4	3.8	12°	6	65	15.00	15.58	16.22	16.92	18.56
08-00520-02001		15	3	4	3.8	12°	6	65	16.04	16.67	17.36	18.12	19.89
08-00520-32003		16	3	4	3.8	12°	6	65	17.09	17.76	18.50	19.32	Free
08-00520-02003		20	3	4	3.8	12°	6	65	21.26	22.12	23.06	24.10	Free
08-00520-02004		25	3	4	3.8	12°	6	70	26.47	27.57	28.77	30.09	Free
08-00520-02005		30	3	4	3.8	12°	6	70	31.68	33.01	34.47	Free	Free
08-00520-02006		35	3	4	3.8	12°	6	80	36.90	38.46	Free	Free	Free
08-00520-02007		40	3	4	3.8	12°	6	85	42.11	43.91	Free	Free	Free
08-00520-02008		45	3	4	3.8	12°	6	90	47.33	49.36	Free	Free	Free
08-00520-02009		50	3	4	3.8	12°	6	100	52.54	54.80	Free	Free	Free
08-00520-32501	R2.5	10	3.5	5	4.8	12°	6	70	10.81	11.18	11.59	12.04	Free
08-00520-12501		15	3.5	5	4.8	12°	6	70	16.02	16.63	17.29	Free	Free
08-00520-02501		20	3.5	5	4.8	12°	6	70	21.24	22.08	Free	Free	Free
08-00520-02502		25	3.5	5	4.8	12°	6	70	26.45	27.52	Free	Free	Free
08-00520-02503		30	3.5	5	4.8	12°	6	80	31.66	Free	Free	Free	Free
08-00520-02504		35	3.5	5	4.8	12°	6	80	36.88	Free	Free	Free	Free
08-00520-12502		40	3.5	5	4.8	12°	6	90	42.09	Free	Free	Free	Free
08-00520-12503		45	3.5	5	4.8	12°	6	100	47.31	Free	Free	Free	Free
08-00520-12504		50	3.5	5	4.8	12°	6	100	52.52	Free	Free	Free	Free
08-00520-33001	R3	10	6	6	5.8	–	6	70	Free	Free	Free	Free	Free
08-00520-43001		15	6	6	5.8	–	6	70	Free	Free	Free	Free	Free
08-00520-13001		20	6	6	5.8	–	6	70	Free	Free	Free	Free	Free
08-00520-13002		25	6	6	5.8	–	6	70	Free	Free	Free	Free	Free
08-00520-03001		30	6	6	5.8	–	6	80	Free	Free	Free	Free	Free
08-00520-13003		35	6	6	5.8	–	6	80	Free	Free	Free	Free	Free
08-00520-13004		40	6	6	5.8	–	6	90	Free	Free	Free	Free	Free
08-00520-13005		45	6	6	5.8	–	6	100	Free	Free	Free	Free	Free
08-00520-03003		50	6	6	5.8	–	6	120	Free	Free	Free	Free	Free

How to Order When you order, indicate MRB230 (R)×(ℓ1)×(d). ※(γ) is reference value.

MRB230

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (~45HRC)				Hardened Steels SKD・STAVAX・HPM38 (~55HRC)				Copper			
Radius	Under Neck Length	L/D	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min^{-1}	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min^{-1}	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min^{-1}
0.05	0.3	3	0.005	0.005	80	20,000~50,000	0.003	0.003	60	20,000~50,000	0.005	0.005	80	20,000~50,000
	0.5	5	0.003	0.003	70	20,000~50,000	0.003	0.003	40	20,000~50,000	0.005	0.005	70	20,000~50,000
0.075	0.3	2	0.005	0.015	150	20,000~50,000	0.003	0.005	120	20,000~50,000	0.008	0.01	150	20,000~50,000
	0.5	3.33	0.004	0.007	150	20,000~50,000	0.003	0.005	120	20,000~50,000	0.007	0.008	150	20,000~50,000
	1	6.67	0.003	0.005	100	20,000~50,000	0.002	0.003	70	20,000~50,000	0.005	0.007	100	20,000~50,000
0.1	0.5	2.5	0.01	0.02	250	20,000~50,000	0.01	0.01	210	20,000~50,000	0.01	0.02	250	20,000~50,000
	0.75	3.75	0.007	0.01	250	20,000~50,000	0.005	0.01	210	20,000~50,000	0.01	0.015	250	20,000~50,000
	1	5	0.005	0.01	250	20,000~50,000	0.003	0.005	210	20,000~50,000	0.008	0.015	250	20,000~50,000
	1.25	6.25	0.003	0.01	150	20,000~50,000	0.003	0.005	120	20,000~50,000	0.005	0.015	150	20,000~50,000
	1.5	7.5	0.003	0.01	150	20,000~50,000	0.003	0.005	120	20,000~50,000	0.005	0.015	150	20,000~50,000
	1.75	8.75	0.003	0.007	150	20,000~50,000	0.002	0.005	120	20,000~50,000	0.005	0.01	150	20,000~50,000
	2	10	0.003	0.005	100	20,000~50,000	0.002	0.003	80	20,000~50,000	0.005	0.007	100	20,000~50,000
	2.5	12.5	0.003	0.005	100	20,000~50,000	0.002	0.003	80	20,000~50,000	0.005	0.007	100	20,000~50,000
	3	15	0.002	0.003	80	20,000~50,000	0.002	0.002	60	20,000~50,000	0.003	0.004	80	20,000~50,000
0.15	0.5	1.7	0.01	0.02	250	20,000~50,000	0.01	0.015	210	20,000~50,000	0.012	0.025	250	20,000~50,000
	0.6	2	0.01	0.02	250	20,000~50,000	0.01	0.015	210	20,000~50,000	0.012	0.025	250	20,000~50,000
	0.75	2.5	0.008	0.015	250	20,000~50,000	0.007	0.01	210	20,000~50,000	0.01	0.02	250	20,000~50,000
	1	3.3	0.007	0.01	250	20,000~50,000	0.005	0.01	210	20,000~50,000	0.01	0.02	250	20,000~50,000
	1.25	4.2	0.005	0.01	250	20,000~50,000	0.005	0.005	210	20,000~50,000	0.008	0.015	250	20,000~50,000
	1.5	5	0.005	0.01	200	20,000~50,000	0.005	0.005	170	20,000~50,000	0.008	0.015	200	20,000~50,000
	1.75	5.8	0.005	0.01	200	20,000~50,000	0.005	0.005	170	20,000~50,000	0.008	0.015	200	20,000~50,000
	2	6.7	0.003	0.01	150	20,000~50,000	0.003	0.005	120	20,000~50,000	0.005	0.012	150	20,000~50,000
	2.25	7.5	0.003	0.01	150	20,000~50,000	0.003	0.005	120	20,000~50,000	0.005	0.012	150	20,000~50,000
	2.5	8.3	0.003	0.007	150	20,000~50,000	0.003	0.003	120	20,000~50,000	0.005	0.01	150	20,000~50,000
	2.75	9.2	0.003	0.007	150	20,000~50,000	0.003	0.003	120	20,000~50,000	0.005	0.01	150	20,000~50,000
	3	10	0.003	0.005	150	20,000~50,000	0.003	0.003	120	20,000~50,000	0.005	0.007	150	20,000~50,000
	3.5	11.7	0.003	0.005	100	20,000~50,000	0.003	0.003	80	20,000~50,000	0.005	0.007	100	20,000~50,000
	4	13.3	0.003	0.005	100	20,000~50,000	0.003	0.003	80	20,000~50,000	0.005	0.007	100	20,000~50,000
	4.5	15	0.003	0.003	80	20,000~50,000	0.003	0.003	80	20,000~50,000	0.005	0.005	80	20,000~50,000
	5	16.7	0.003	0.003	80	20,000~50,000	0.003	0.003	80	20,000~50,000	0.005	0.005	80	20,000~50,000
0.2	0.5	1.25	0.02	0.05	800	20,000~50,000	0.02	0.03	650	20,000~50,000	0.03	0.07	800	20,000~50,000
	0.75	1.9	0.02	0.05	800	20,000~50,000	0.02	0.03	650	20,000~50,000	0.03	0.07	800	20,000~50,000
	1	2.5	0.02	0.05	800	20,000~50,000	0.02	0.03	650	20,000~50,000	0.03	0.07	800	20,000~50,000
	1.5	3.8	0.02	0.03	700	20,000~50,000	0.01	0.02	600	20,000~50,000	0.03	0.05	700	20,000~50,000
	2	5	0.015	0.02	600	20,000~50,000	0.01	0.015	500	20,000~50,000	0.02	0.03	600	20,000~50,000
	2.5	6.3	0.015	0.02	450	20,000~50,000	0.01	0.015	380	20,000~50,000	0.02	0.03	450	20,000~50,000
	3	7.5	0.01	0.02	400	20,000~30,000	0.01	0.01	340	20,000~30,000	0.015	0.03	400	20,000~30,000
	3.5	8.8	0.01	0.015	350	20,000~30,000	0.01	0.01	300	20,000~30,000	0.015	0.02	350	20,000~30,000
	4	10	0.005	0.01	250	20,000~30,000	0.005	0.007	210	20,000~30,000	0.008	0.015	250	20,000~30,000
	4.5	11.3	0.005	0.007	200	20,000~30,000	0.005	0.005	170	20,000~30,000	0.008	0.01	200	20,000~30,000
	5	12.5	0.003	0.005	150	20,000~30,000	0.003	0.005	120	20,000~30,000	0.005	0.007	150	20,000~30,000
	5.5	13.8	0.003	0.005	100	20,000~30,000	0.003	0.005	80	20,000~30,000	0.005	0.007	100	20,000~30,000
	6	15	0.003	0.003	80	20,000~30,000	0.003	0.003	60	20,000~30,000	0.005	0.005	80	20,000~30,000
0.25	1	2	0.03	0.05	800	20,000~50,000	0.02	0.05	680	20,000~50,000	0.045	0.07	800	20,000~50,000
	1.5	3	0.03	0.05	700	20,000~50,000	0.02	0.04	600	20,000~50,000	0.04	0.07	700	20,000~50,000
	2	4	0.02	0.04	600	20,000~50,000	0.02	0.03	510	20,000~50,000	0.03	0.06	600	20,000~50,000
	2.5	5	0.015	0.04	600	20,000~50,000	0.01	0.03	510	20,000~50,000	0.02	0.06	600	20,000~50,000
	3	6	0.015	0.035	500	20,000~50,000	0.01	0.025	420	20,000~50,000	0.02	0.05	500	20,000~50,000
	3.5	7	0.015	0.03	400	20,000~50,000	0.01	0.02	340	20,000~50,000	0.02	0.045	400	20,000~50,000

MRB230

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (~45HRC)				Hardened Steels SKD・STAVAX・HPM38 (~55HRC)				Copper			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.25	4	8	0.012	0.02	400	20,000~50,000	0.005	0.01	340	20,000~50,000	0.018	0.03	400	20,000~50,000
	4.5	9	0.008	0.01	320	20,000~50,000	0.005	0.005	270	20,000~50,000	0.012	0.015	320	20,000~50,000
	5	10	0.005	0.01	250	20,000~30,000	0.005	0.005	210	20,000~30,000	0.008	0.015	250	20,000~30,000
	5.5	11	0.005	0.007	200	20,000~30,000	0.003	0.003	170	20,000~30,000	0.008	0.01	200	20,000~30,000
	6	12	0.005	0.005	150	20,000~30,000	0.003	0.003	120	20,000~30,000	0.008	0.008	150	20,000~30,000
	7	14	0.003	0.005	120	20,000~30,000	0.003	0.003	100	20,000~30,000	0.005	0.008	120	20,000~30,000
	8	16	0.003	0.003	120	20,000~30,000	0.002	0.002	100	20,000~30,000	0.005	0.005	120	20,000~30,000
	9	18	0.002	0.002	100	18,000~24,000	0.002	0.002	80	18,000~24,000	0.003	0.003	100	18,000~24,000
	10	20	0.002	0.002	80	18,000~24,000	0.002	0.002	60	18,000~24,000	0.003	0.003	80	18,000~24,000
0.3	1	1.7	0.05	0.1	1,200	20,000~50,000	0.05	0.07	1,000	20,000~50,000	0.07	0.12	1,200	20,000~50,000
	1.5	2.5	0.05	0.1	1,200	20,000~50,000	0.05	0.07	1,000	20,000~50,000	0.07	0.12	1,200	20,000~50,000
	2	3.3	0.05	0.1	1,200	20,000~50,000	0.04	0.07	1,000	20,000~50,000	0.07	0.12	1,200	20,000~50,000
	2.5	4.2	0.035	0.1	1,200	20,000~50,000	0.03	0.06	1,000	20,000~50,000	0.05	0.12	1,200	20,000~50,000
	3	5	0.025	0.1	1,000	20,000~50,000	0.03	0.05	850	20,000~50,000	0.04	0.1	1,000	20,000~50,000
	3.5	5.8	0.025	0.08	1,000	20,000~50,000	0.02	0.05	850	20,000~50,000	0.04	0.1	1,000	20,000~50,000
	4	6.7	0.025	0.05	800	20,000~50,000	0.02	0.04	680	20,000~50,000	0.035	0.08	800	20,000~50,000
	4.5	7.5	0.025	0.05	750	20,000~50,000	0.01	0.03	630	20,000~50,000	0.035	0.08	750	20,000~50,000
	5	8.3	0.02	0.04	500	20,000~30,000	0.01	0.02	420	20,000~30,000	0.03	0.06	500	20,000~30,000
	5.5	9.2	0.013	0.02	500	20,000~30,000	0.01	0.01	420	20,000~30,000	0.02	0.03	500	20,000~30,000
	6	10	0.01	0.02	450	20,000~30,000	0.005	0.01	380	20,000~30,000	0.015	0.03	450	20,000~30,000
	6.5	10.8	0.008	0.02	450	20,000~30,000	0.005	0.005	380	20,000~30,000	0.012	0.03	450	20,000~30,000
	7	11.7	0.008	0.02	400	20,000~30,000	0.005	0.005	340	20,000~30,000	0.012	0.03	400	20,000~30,000
	7.5	12.5	0.005	0.02	350	20,000~30,000	0.003	0.005	300	20,000~30,000	0.008	0.03	350	20,000~30,000
	8	13.3	0.005	0.01	300	18,000~24,000	0.003	0.005	250	18,000~24,000	0.008	0.015	300	18,000~24,000
	8.5	14.2	0.005	0.01	250	18,000~24,000	0.003	0.003	210	18,000~24,000	0.008	0.015	250	18,000~24,000
	9	15	0.005	0.01	250	18,000~24,000	0.003	0.003	210	18,000~24,000	0.007	0.015	250	18,000~24,000
	9.5	15.8	0.005	0.005	200	18,000~24,000	0.003	0.003	170	18,000~24,000	0.007	0.008	200	18,000~24,000
	10	16.7	0.003	0.005	150	18,000~24,000	0.002	0.003	120	18,000~24,000	0.005	0.008	150	18,000~24,000
	11	18.3	0.003	0.003	110	16,000~20,000	0.002	0.002	90	16,000~20,000	0.005	0.005	110	16,000~20,000
	12	20	0.003	0.003	80	16,000~20,000	0.002	0.002	60	16,000~20,000	0.005	0.005	80	16,000~20,000
0.35	2	2.9	0.08	0.12	1,800	20,000~50,000	0.07	0.08	1,300	20,000~50,000	0.1	0.15	1,500	20,000~30,000
	4	5.7	0.05	0.11	1,300	20,000~50,000	0.03	0.06	1,100	20,000~50,000	0.06	0.12	1,200	20,000~30,000
	6	8.6	0.03	0.05	700	20,000~30,000	0.01	0.02	600	20,000~30,000	0.04	0.07	600	20,000~30,000
	8	11.4	0.005	0.01	400	18,000~24,000	0.003	0.005	330	18,000~24,000	0.008	0.01	400	18,000~24,000
0.4	2	2.5	0.1	0.15	2,000	20,000~50,000	0.1	0.12	1,700	20,000~50,000	0.15	0.2	2,000	20,000~50,000
	3	3.8	0.07	0.15	1,800	20,000~50,000	0.07	0.1	1,500	20,000~50,000	0.12	0.2	1,800	20,000~50,000
	4	5	0.05	0.12	1,500	20,000~50,000	0.05	0.08	1,300	20,000~50,000	0.1	0.2	1,500	20,000~50,000
	5	6.3	0.05	0.1	1,200	20,000~50,000	0.04	0.07	1,000	20,000~50,000	0.08	0.15	1,200	20,000~50,000
	6	7.5	0.05	0.08	900	20,000~30,000	0.03	0.05	750	20,000~30,000	0.07	0.12	900	20,000~30,000
	7	8.8	0.03	0.05	700	20,000~30,000	0.02	0.03	600	20,000~30,000	0.05	0.08	700	20,000~30,000
	8	10	0.015	0.03	500	18,000~24,000	0.01	0.01	420	18,000~24,000	0.02	0.05	500	18,000~24,000
	9	11.3	0.005	0.01	400	18,000~24,000	0.003	0.005	340	18,000~24,000	0.008	0.01	400	18,000~24,000
	10	12.5	0.005	0.01	350	18,000~24,000	0.003	0.005	300	18,000~24,000	0.008	0.008	350	18,000~24,000
	12	15	0.005	0.005	250	16,000~20,000	0.003	0.003	210	16,000~20,000	0.008	0.008	250	16,000~20,000
0.45	2	2.2	0.15	0.2	2,500	20,000~50,000	0.1	0.2	2,000	20,000~50,000	0.2	0.3	2,800	20,000~50,000
	4	4.4	0.1	0.2	2,000	20,000~50,000	0.05	0.12	1,500	20,000~50,000	0.15	0.25	2,000	20,000~50,000
	6	6.7	0.07	0.15	1,300	20,000~30,000	0.035	0.05	1,000	20,000~30,000	0.1	0.2	1,300	20,000~30,000
	8	8.9	0.035	0.05	800	20,000~30,000	0.025	0.04	700	20,000~30,000	0.055	0.08	800	18,000~24,000

Regular Line
MUGEN COATING
Long Neck Type

MRB230

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (~45HRC)				Hardened Steels SKD・STAVAX・HPM38 (~55HRC)				Copper			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	2	2	0.25	0.35	3,200	20,000~50,000	0.12	0.3	2,500	20,000~50,000	0.25	0.4	3,500	20,000~50,000
	2.5	2.5	0.25	0.3	3,000	20,000~50,000	0.12	0.3	2,500	20,000~50,000	0.25	0.4	3,200	20,000~50,000
	3	3	0.2	0.3	3,000	20,000~50,000	0.12	0.3	2,500	20,000~50,000	0.25	0.4	3,000	20,000~50,000
	4	4	0.15	0.25	2,500	20,000~50,000	0.1	0.2	2,100	20,000~50,000	0.2	0.4	2,500	20,000~50,000
	5	5	0.1	0.25	2,000	20,000~50,000	0.08	0.17	1,700	20,000~50,000	0.15	0.35	2,000	20,000~50,000
	6	6	0.1	0.2	1,500	20,000~50,000	0.07	0.12	1,200	20,000~50,000	0.15	0.3	1,500	20,000~50,000
	7	7	0.08	0.2	1,300	20,000~30,000	0.06	0.1	1,100	20,000~30,000	0.12	0.3	1,300	20,000~30,000
	8	8	0.05	0.1	1,200	20,000~30,000	0.05	0.08	1,000	20,000~30,000	0.08	0.15	1,200	20,000~30,000
	9	9	0.04	0.06	1,000	20,000~30,000	0.05	0.05	850	20,000~30,000	0.06	0.1	1,000	20,000~30,000
	10	10	0.03	0.05	800	20,000~30,000	0.03	0.05	680	20,000~30,000	0.05	0.08	800	20,000~30,000
	12	12	0.015	0.025	600	16,000~20,000	0.01	0.03	510	16,000~20,000	0.02	0.04	600	16,000~20,000
	13	13	0.012	0.025	600	16,000~20,000	0.007	0.02	450	16,000~20,000	0.015	0.03	600	16,000~20,000
	14	14	0.01	0.02	500	16,000~20,000	0.005	0.01	420	16,000~20,000	0.015	0.03	500	16,000~20,000
	16	16	0.005	0.01	250	12,000~16,000	0.005	0.01	210	12,000~16,000	0.01	0.015	250	12,000~16,000
	18	18	0.005	0.005	150	12,000~16,000	0.003	0.003	120	12,000~16,000	0.008	0.01	150	12,000~16,000
	20	20	0.005	0.005	100	12,000~16,000	0.003	0.003	80	12,000~16,000	0.008	0.008	100	12,000~16,000
	22	22	0.003	0.005	80	12,000~16,000	0.002	0.003	60	12,000~16,000	0.005	0.008	80	12,000~16,000
0.6	2.4	2	0.25	0.35	3,400	20,000~30,000	0.12	0.3	2,500	20,000~30,000	0.3	0.45	3,400	20,000~30,000
	4	3.3	0.2	0.3	3,000	20,000~30,000	0.12	0.3	2,500	20,000~30,000	0.28	0.45	3,000	20,000~30,000
	6	5	0.1	0.25	2,000	20,000~30,000	0.08	0.17	1,700	20,000~30,000	0.15	0.4	2,000	20,000~30,000
	8	6.7	0.08	0.2	1,300	20,000~30,000	0.06	0.15	1,100	20,000~30,000	0.12	0.3	1,300	20,000~30,000
	10	8.3	0.05	0.1	1,200	14,000~20,000	0.03	0.08	1,000	14,000~20,000	0.08	0.15	1,200	14,000~20,000
	12	10	0.03	0.05	800	14,000~20,000	0.02	0.04	680	14,000~20,000	0.05	0.08	800	14,000~20,000
	14	11.7	0.015	0.025	600	14,000~20,000	0.01	0.02	510	14,000~20,000	0.02	0.04	600	14,000~20,000
	16	13.3	0.01	0.02	400	14,000~20,000	0.01	0.01	340	14,000~20,000	0.015	0.03	400	14,000~20,000
	18	15	0.005	0.01	250	12,000~18,000	0.005	0.01	210	12,000~18,000	0.012	0.015	250	12,000~18,000
	20	16.7	0.005	0.007	200	12,000~18,000	0.005	0.005	170	12,000~18,000	0.01	0.01	200	12,000~18,000
	24	20	0.005	0.005	100	12,000~18,000	0.003	0.003	80	12,000~18,000	0.008	0.01	100	12,000~18,000
0.7	8	5.7	0.1	0.3	2,500	20,000~30,000	0.1	0.2	2,100	20,000~30,000	0.15	0.45	2,500	20,000~30,000
	12	8.6	0.07	0.12	1,200	14,000~20,000	0.05	0.1	1,000	14,000~20,000	0.1	0.18	1,200	14,000~20,000
	16	11.4	0.03	0.05	600	14,000~20,000	0.015	0.03	510	14,000~20,000	0.05	0.08	600	14,000~20,000
0.75	3	2	0.2	0.35	4,000	20,000~30,000	0.15	0.3	3,400	20,000~30,000	0.3	0.5	4,000	20,000~30,000
	4	2.7	0.2	0.3	4,000	20,000~30,000	0.15	0.25	3,400	20,000~30,000	0.3	0.45	4,000	20,000~30,000
	6	4	0.15	0.3	3,000	20,000~30,000	0.12	0.2	2,500	20,000~30,000	0.2	0.45	3,000	20,000~30,000
	8	5.3	0.1	0.25	2,400	20,000~30,000	0.08	0.18	2,000	20,000~30,000	0.15	0.4	2,400	20,000~30,000
	10	6.7	0.08	0.2	1,800	20,000~30,000	0.06	0.12	1,500	20,000~30,000	0.12	0.3	1,800	20,000~30,000
	12	8	0.07	0.13	1,200	18,000~24,000	0.05	0.09	1,000	18,000~24,000	0.1	0.2	1,200	18,000~24,000
	14	9.3	0.06	0.1	1,200	18,000~24,000	0.04	0.07	1,000	18,000~24,000	0.1	0.15	1,200	18,000~24,000
	16	10.7	0.05	0.08	800	12,000~18,000	0.035	0.06	680	12,000~18,000	0.07	0.12	800	12,000~18,000
	18	12	0.03	0.05	500	12,000~18,000	0.02	0.04	420	12,000~18,000	0.05	0.08	500	12,000~18,000
	20	13.3	0.02	0.04	400	12,000~18,000	0.015	0.03	340	12,000~18,000	0.03	0.06	400	12,000~18,000
	22	14.7	0.01	0.02	250	10,000~14,000	0.005	0.005	210	10,000~14,000	0.02	0.03	250	10,000~14,000
	30	20	0.005	0.005	100	10,000~14,000	0.003	0.005	80	10,000~14,000	0.01	0.008	100	10,000~14,000
0.8	4	2.5	0.2	0.3	4,000	18,000~24,000	0.17	0.25	3,400	18,000~24,000	0.3	0.45	4,000	18,000~24,000
	8	5	0.1	0.3	3,000	18,000~24,000	0.09	0.2	2,500	18,000~24,000	0.15	0.45	3,000	18,000~24,000
	12	7.5	0.07	0.15	1,800	18,000~24,000	0.06	0.12	1,500	18,000~24,000	0.1	0.25	1,800	18,000~24,000
	16	10	0.05	0.1	650	12,000~18,000	0.035	0.07	550	12,000~18,000	0.08	0.15	650	12,000~18,000
	20	12.5	0.03	0.05	450	12,000~18,000	0.02	0.04	380	12,000~18,000	0.05	0.08	450	12,000~18,000

MRB230

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (~45HRC)				Hardened Steels SKD・STAVAX・HPM38 (~55HRC)				Copper			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.9	8	4.4	0.15	0.3	2,500	16,000~20,000	0.12	0.2	2,100	16,000~20,000	0.2	0.45	2,500	16,000~20,000
	12	6.7	0.1	0.2	1,800	12,000~16,000	0.07	0.15	1,500	12,000~16,000	0.15	0.3	1,800	12,000~16,000
	16	8.9	0.08	0.13	1,600	10,000~14,000	0.06	0.1	1,400	10,000~14,000	0.12	0.2	1,600	10,000~14,000
	20	11.1	0.05	0.1	1,000	8,000~12,000	0.04	0.08	850	8,000~12,000	0.08	0.15	1,000	8,000~12,000
1	3	1.5	0.3	0.5	4,000	20,000~30,000	0.2	0.5	3,400	20,000~30,000	0.45	0.7	4,000	20,000~30,000
	4	2	0.3	0.5	4,000	20,000~30,000	0.2	0.45	3,400	20,000~30,000	0.45	0.7	4,000	20,000~30,000
	6	3	0.25	0.5	3,000	20,000~30,000	0.2	0.4	2,500	20,000~30,000	0.38	0.7	3,000	20,000~30,000
	8	4	0.2	0.3	2,500	16,000~20,000	0.15	0.3	2,100	16,000~20,000	0.3	0.45	2,500	16,000~20,000
	10	5	0.15	0.3	2,500	16,000~20,000	0.1	0.2	2,100	16,000~20,000	0.23	0.45	2,500	16,000~20,000
	12	6	0.13	0.2	1,800	12,000~16,000	0.1	0.15	1,500	12,000~16,000	0.2	0.3	1,800	12,000~16,000
	13	6.5	0.12	0.2	1,800	12,000~16,000	0.08	0.13	1,500	12,000~16,000	0.2	0.3	1,800	12,000~16,000
	14	7	0.1	0.2	1,800	12,000~16,000	0.07	0.13	1,500	12,000~16,000	0.15	0.3	1,800	12,000~16,000
	16	8	0.1	0.15	1,600	10,000~14,000	0.06	0.11	1,400	10,000~14,000	0.15	0.25	1,600	10,000~14,000
	18	9	0.07	0.12	1,600	10,000~14,000	0.05	0.1	1,400	10,000~14,000	0.1	0.2	1,600	10,000~14,000
	20	10	0.06	0.1	1,000	8,000~12,000	0.05	0.07	850	8,000~12,000	0.1	0.15	1,000	8,000~12,000
	22	11	0.05	0.1	1,000	8,000~12,000	0.04	0.06	850	8,000~12,000	0.08	0.15	1,000	8,000~12,000
	25	12.5	0.03	0.05	800	8,000~12,000	0.03	0.04	680	8,000~12,000	0.05	0.08	800	8,000~12,000
	30	15	0.02	0.04	420	6,000~10,000	0.02	0.04	360	6,000~10,000	0.03	0.06	420	6,000~10,000
	35	17.5	0.02	0.03	140	6,000~10,000	0.015	0.02	120	6,000~10,000	0.03	0.04	140	6,000~10,000
	40	20	0.007	0.01	100	6,000~10,000	0.004	0.007	80	6,000~10,000	0.01	0.015	100	6,000~10,000
1.25	6	2.4	0.35	0.5	4,000	16,000~20,000	0.3	0.4	3,400	16,000~20,000	0.5	0.8	4,000	16,000~20,000
	10	4	0.2	0.5	3,000	16,000~20,000	0.25	0.35	2,500	16,000~20,000	0.3	0.8	3,000	16,000~20,000
	15	6	0.15	0.3	2,500	16,000~20,000	0.1	0.2	2,100	16,000~20,000	0.25	0.45	2,500	16,000~20,000
	20	8	0.1	0.2	1,800	12,000~16,000	0.08	0.15	1,500	12,000~16,000	0.15	0.3	1,800	12,000~16,000
	25	10	0.075	0.14	1,100	10,000~14,000	0.05	0.1	930	10,000~14,000	0.1	0.2	1,100	10,000~14,000
	30	12	0.04	0.08	800	8,000~12,000	0.02	0.06	680	8,000~12,000	0.06	0.15	800	8,000~12,000
	35	14	0.03	0.07	450	6,000~10,000	0.01	0.03	380	6,000~10,000	0.05	0.1	450	6,000~10,000
1.5	6	2	0.35	0.6	4,000	16,000~20,000	0.25	0.5	3,400	16,000~20,000	0.5	1	4,000	16,000~20,000
	8	2.7	0.3	0.5	4,000	16,000~20,000	0.2	0.5	3,400	16,000~20,000	0.45	0.8	4,000	16,000~20,000
	10	3.3	0.3	0.5	4,000	16,000~20,000	0.2	0.45	3,400	16,000~20,000	0.45	0.8	4,000	16,000~20,000
	12	4	0.2	0.4	3,000	16,000~20,000	0.2	0.4	2,500	16,000~20,000	0.3	0.6	3,000	16,000~20,000
	14	4.7	0.2	0.4	3,000	16,000~20,000	0.15	0.35	2,500	16,000~20,000	0.3	0.6	3,000	16,000~20,000
	15	5	0.15	0.4	3,000	16,000~20,000	0.13	0.35	2,500	16,000~20,000	0.23	0.6	3,000	16,000~20,000
	16	5.3	0.15	0.35	3,000	16,000~20,000	0.13	0.35	2,500	16,000~20,000	0.23	0.5	3,000	16,000~20,000
	20	6.7	0.15	0.3	1,800	12,000~16,000	0.1	0.2	1,500	12,000~16,000	0.23	0.45	1,800	12,000~16,000
	25	8.3	0.13	0.27	1,200	12,000~16,000	0.1	0.16	1,000	12,000~16,000	0.2	0.4	1,200	12,000~16,000
	30	10	0.1	0.2	800	8,000~12,000	0.07	0.12	680	8,000~12,000	0.15	0.3	800	8,000~12,000
	35	11.7	0.07	0.15	600	8,000~12,000	0.05	0.1	510	8,000~12,000	0.1	0.2	600	8,000~12,000
	40	13.3	0.05	0.1	460	6,000~10,000	0.05	0.07	390	6,000~10,000	0.08	0.15	460	6,000~10,000
1.75	10	2.9	0.35	0.6	4,000	16,000~20,000	0.25	0.5	3,400	16,000~20,000	0.5	1	4,000	16,000~20,000
	15	4.3	0.3	0.4	4,000	16,000~20,000	0.2	0.45	3,400	16,000~20,000	0.45	0.6	4,000	16,000~20,000
	20	5.7	0.2	0.3	2,400	14,000~18,000	0.13	0.35	2,000	14,000~18,000	0.3	0.45	2,400	14,000~18,000
	25	7.1	0.17	0.3	2,000	14,000~18,000	0.1	0.3	1,800	14,000~18,000	0.25	0.42	2,000	14,000~18,000
	30	8.6	0.15	0.27	1,600	8,000~12,000	0.1	0.2	1,400	8,000~12,000	0.23	0.4	1,600	8,000~12,000
	35	10	0.1	0.2	1,200	8,000~12,000	0.07	0.15	1,000	8,000~12,000	0.15	0.3	1,200	8,000~12,000
	40	11.4	0.07	0.13	800	6,000~10,000	0.05	0.1	680	6,000~10,000	0.1	0.2	800	6,000~10,000
	45	12.9	0.05	0.1	800	6,000~10,000	0.05	0.05	680	6,000~10,000	0.08	0.15	800	6,000~10,000

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Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (~45HRC)				Hardened Steels SKD・STAVAX・HPM38 (~55HRC)				Copper			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
2	10	2.5	0.35	0.8	4,000	16,000~20,000	0.25	0.7	3,400	16,000~20,000	0.55	1.2	4,000	16,000~20,000
	12	3	0.35	0.7	4,000	16,000~20,000	0.25	0.7	3,400	16,000~20,000	0.53	1	4,000	16,000~20,000
	14	3.5	0.3	0.6	4,000	16,000~20,000	0.2	0.5	3,400	16,000~20,000	0.45	1	4,000	16,000~20,000
	15	3.8	0.25	0.55	3,500	16,000~20,000	0.2	0.4	3,000	16,000~20,000	0.38	0.8	3,500	16,000~20,000
	16	4	0.2	0.5	3,500	16,000~20,000	0.2	0.3	3,000	16,000~20,000	0.3	0.8	3,500	16,000~20,000
	20	5	0.2	0.35	3,300	16,000~20,000	0.15	0.3	2,800	16,000~20,000	0.3	0.5	3,300	16,000~20,000
	25	6.3	0.15	0.3	2,600	12,000~16,000	0.12	0.25	2,200	12,000~16,000	0.23	0.45	2,600	12,000~16,000
	30	7.5	0.12	0.25	2,600	12,000~16,000	0.1	0.2	2,200	12,000~16,000	0.2	0.4	2,600	12,000~16,000
	35	8.8	0.12	0.2	1,800	10,000~14,000	0.07	0.15	1,500	10,000~14,000	0.18	0.3	1,800	10,000~14,000
	40	10	0.1	0.15	1,200	10,000~14,000	0.07	0.12	1,000	10,000~14,000	0.15	0.2	1,200	10,000~14,000
	45	11.3	0.07	0.12	800	10,000~14,000	0.05	0.1	700	10,000~14,000	0.1	0.17	800	10,000~14,000
	50	12.5	0.07	0.1	600	6,000~10,000	0.05	0.07	500	6,000~10,000	0.1	0.15	600	6,000~10,000
2.5	10	2	0.4	1.2	4,000	16,000~20,000	0.3	1	3,400	16,000~20,000	0.6	1.8	4,000	16,000~20,000
	15	3	0.35	1	4,000	16,000~20,000	0.3	0.9	3,400	16,000~20,000	0.55	1.5	4,000	16,000~20,000
	20	4	0.3	0.7	4,000	16,000~20,000	0.25	0.7	3,400	16,000~20,000	0.45	1	4,000	16,000~20,000
	25	5	0.25	0.6	3,000	14,000~16,000	0.2	0.5	2,500	14,000~16,000	0.38	0.9	3,000	14,000~16,000
	30	6	0.2	0.5	2,400	14,000~16,000	0.15	0.4	2,000	14,000~16,000	0.3	0.8	2,400	14,000~16,000
	35	7	0.15	0.4	1,600	10,000~14,000	0.15	0.3	1,400	10,000~14,000	0.23	0.6	1,600	10,000~14,000
	40	8	0.15	0.3	1,200	8,000~12,000	0.12	0.2	1,000	8,000~12,000	0.23	0.45	1,200	8,000~12,000
	45	9	0.12	0.2	1,000	8,000~12,000	0.1	0.15	850	8,000~12,000	0.18	0.3	1,000	8,000~12,000
	50	10	0.1	0.15	680	6,000~10,000	0.07	0.1	570	6,000~10,000	0.15	0.25	680	6,000~10,000
3	10	1.7	0.5	1.5	4,000	14,000~18,000	0.35	1.2	3,400	14,000~18,000	0.75	2.3	4,000	14,000~18,000
	15	2.5	0.5	1.3	4,000	14,000~18,000	0.35	1.2	3,400	14,000~18,000	0.75	2	4,000	14,000~18,000
	20	3.3	0.5	1.2	4,000	14,000~18,000	0.35	1.1	3,400	14,000~18,000	0.75	1.8	4,000	14,000~18,000
	25	4.2	0.4	1	4,000	14,000~18,000	0.3	0.8	3,400	14,000~18,000	0.6	1.5	4,000	14,000~18,000
	30	5	0.35	0.7	3,000	8,000~12,000	0.25	0.6	2,500	8,000~12,000	0.53	1	3,000	8,000~12,000
	35	5.8	0.35	0.5	2,500	8,000~12,000	0.2	0.5	2,100	8,000~12,000	0.53	0.8	2,500	8,000~12,000
	40	6.7	0.25	0.4	2,300	8,000~12,000	0.2	0.4	1,900	8,000~12,000	0.38	0.6	2,300	8,000~12,000
	45	7.5	0.25	0.4	1,500	6,000~ 8,000	0.2	0.35	1,200	6,000~ 8,000	0.38	0.6	1,500	6,000~ 8,000
	50	8.3	0.2	0.4	1,500	6,000~ 8,000	0.2	0.3	1,200	6,000~ 8,000	0.3	0.6	1,500	6,000~ 8,000

Notes

※1 Recommend to use the milling condition as just reference. Adjust milling conditions according to machining shape and machine status.
※2 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 In case L/D exceeds 15, find an adequate condition considering machining profile.
※5 Oil mist coolant is recommended for the machining of hardened steels.

MRB230SF

Size R0.1 ～ R1.5

≦55 HRC

MRB230SF

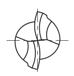
MUGEN COATING 2-Flute Long Neck Ball End Mill with Short Shank

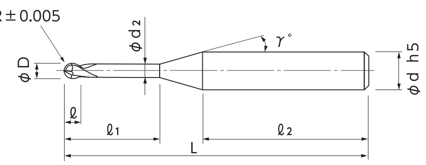
Total 60 sizes

MUGEN COATING 2-Flute Long Neck Ball End Mill with Short Shank

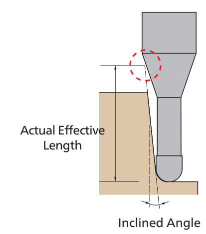
Standard type long neck ball end mill. Suitable for shrink fit holder

MG | 2 | 30° | R ±0.005 | φd h5 | 3D





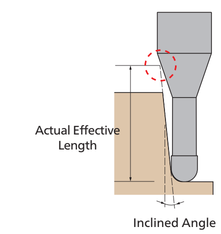
- It fits for shrink chuck system.



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00525-00103	R0.1	0.5	0.15	0.2	0.18	15°	4	27.3	35	0.55	0.56	0.58	0.60	0.64
08-00525-00105		0.75	0.15	0.2	0.18	15°	4	27.1	35	0.81	0.83	0.86	0.89	0.95
08-00525-00107		1	0.15	0.2	0.18	15°	4	26.8	35	1.06	1.10	1.13	1.17	1.26
08-00525-00109		1.25	0.15	0.2	0.18	15°	4	26.6	35	1.32	1.37	1.41	1.46	1.57
08-00525-00151	R0.15	0.5	0.2	0.3	0.28	15°	4	27.5	35	0.55	0.56	0.57	0.59	0.63
08-00525-00152		0.6	0.2	0.3	0.28	15°	4	27.4	35	0.65	0.67	0.69	0.71	0.75
08-00525-00153		0.75	0.2	0.3	0.28	15°	4	27.3	35	0.80	0.83	0.85	0.88	0.94
08-00525-00154		1	0.2	0.3	0.28	15°	4	27	35	1.06	1.09	1.13	1.17	1.25
08-00525-00155		1.25	0.2	0.3	0.28	15°	4	26.8	35	1.32	1.36	1.41	1.45	1.56
08-00525-00156		1.5	0.2	0.3	0.28	15°	4	26.5	35	1.58	1.63	1.68	1.74	1.87
08-00525-00157		1.75	0.2	0.3	0.28	15°	4	26.3	35	1.84	1.90	1.96	2.03	2.18
08-00525-00202	R0.2	0.75	0.3	0.4	0.37	15°	4	27.4	35	0.82	0.84	0.87	0.89	0.95
08-00525-00203		1	0.3	0.4	0.37	15°	4	27.2	35	1.08	1.11	1.14	1.18	1.26
08-00525-00204		1.5	0.3	0.4	0.37	15°	4	26.7	35	1.60	1.65	1.70	1.75	1.88
08-00525-00205		2	0.3	0.4	0.37	15°	4	26.2	35	2.11	2.18	2.25	2.33	2.50
08-00525-00206		2.5	0.3	0.4	0.37	15°	4	25.7	35	2.63	2.72	2.81	2.90	3.13
08-00525-00251	R0.25	1	0.35	0.5	0.46	15°	4	27.3	35	1.10	1.13	1.16	1.19	1.27
08-00525-00252		1.5	0.35	0.5	0.46	15°	4	26.8	35	1.61	1.66	1.71	1.77	1.89
08-00525-00253		2	0.35	0.5	0.46	15°	4	26.3	35	2.13	2.20	2.27	2.34	2.51
08-00525-00254		2.5	0.35	0.5	0.46	15°	4	25.8	35	2.65	2.73	2.82	2.92	3.14
08-00525-00255		3	0.35	0.5	0.46	15°	4	25.3	35	3.16	3.27	3.38	3.49	3.76
08-00525-00301	R0.3	1.5	0.45	0.6	0.56	15°	4	27	35	1.61	1.66	1.71	1.76	1.88
08-00525-00302		2	0.45	0.6	0.56	15°	4	26.5	35	2.13	2.19	2.26	2.34	2.50
08-00525-00303		2.5	0.45	0.6	0.56	15°	4	26	35	2.65	2.73	2.82	2.91	3.12
08-00525-00304		3	0.45	0.6	0.56	15°	4	25.5	35	3.16	3.26	3.37	3.49	3.75
08-00525-00305		3.5	0.45	0.6	0.56	15°	4	25	35	3.68	3.80	3.92	4.06	4.37
08-00525-00306		4	0.45	0.6	0.56	15°	4	29.5	40	4.20	4.33	4.48	4.64	4.99
08-00525-00307		4.5	0.45	0.6	0.56	15°	4	29	40	4.71	4.87	5.03	5.21	5.61
08-00525-00308		5	0.45	0.6	0.56	15°	4	28.5	40	5.23	5.40	5.59	5.79	6.23
08-00525-00309		5.5	0.45	0.6	0.56	15°	4	28	40	5.75	5.94	6.14	6.36	6.85
08-00525-00310		6	0.45	0.6	0.56	15°	4	27.5	40	6.26	6.47	6.70	6.94	7.48

How to Order　When you order, indicate MRB230SF (R)×(ℓ1).　※(γ) is reference value.



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Shank Length (ℓ2)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00525-00401	R0.4	2	0.6	0.8	0.76	15°	4	26.9	35	2.13	2.19	2.25	2.32	2.48
08-00525-00402		3	0.6	0.8	0.76	15°	4	25.9	35	3.16	3.26	3.36	3.47	3.72
08-00525-00403		4	0.6	0.8	0.76	15°	4	29.9	40	4.19	4.33	4.47	4.62	4.97
08-00525-00404		5	0.6	0.8	0.76	15°	4	28.9	40	5.23	5.40	5.58	5.77	6.21
08-00525-00501	R0.5	3	0.75	1	0.95	15°	4	26.3	35	3.18	3.27	3.37	3.48	3.72
08-00525-00502		4	0.75	1	0.95	15°	4	25.3	35	4.21	4.34	4.48	4.63	4.97
08-00525-00503		5	0.75	1	0.95	15°	4	29.3	40	5.24	5.41	5.59	5.78	6.21
08-00525-00504		6	0.75	1	0.95	15°	4	28.3	40	6.28	6.48	6.69	6.93	7.45
08-00525-00505		8	0.75	1	0.95	15°	4	26.3	40	8.34	8.62	8.91	9.23	9.94
08-00525-00506		10	0.75	1	0.95	15°	4	24.3	40	10.41	10.76	11.13	11.53	12.42
08-00525-00751	R0.75	3	1.1	1.5	1.45	15°	4	27.2	35	3.17	3.25	3.34	3.44	3.66
08-00525-00752		4	1.1	1.5	1.45	15°	4	26.2	35	4.20	4.32	4.45	4.59	4.91
08-00525-00754		6	1.1	1.5	1.45	15°	4	29.2	40	6.27	6.46	6.67	6.89	7.39
08-00525-00755		8	1.1	1.5	1.45	15°	4	27.2	40	8.34	8.60	8.88	9.19	9.88
08-00525-00756		10	1.1	1.5	1.45	15°	4	25.2	40	10.40	10.74	11.10	11.49	12.36
08-00525-01001	R1	3	1.5	2	1.94	15°	4	28.1	35	3.18	3.25	3.34	3.43	3.63
08-00525-01002		4	1.5	2	1.94	15°	4	27.1	35	4.21	4.32	4.45	4.58	4.87
08-00525-01003		6	1.5	2	1.94	15°	4	25.1	35	6.28	6.46	6.66	6.88	7.36
08-00525-01004		8	1.5	2	1.94	15°	4	28.1	40	8.35	8.60	8.88	9.18	9.84
08-00525-01005		10	1.5	2	1.94	15°	4	26.1	40	10.41	10.74	11.10	11.48	12.33
08-00525-01006		12	1.5	2	1.94	15°	4	29.1	45	12.48	12.88	13.31	13.77	14.82
08-00525-01007		14	1.5	2	1.94	15°	4	27.1	45	14.55	15.02	15.53	16.07	17.30
08-00525-01008		16	1.5	2	1.94	15°	4	25.1	45	16.62	17.16	17.75	18.37	19.79
08-00525-01009		18	1.5	2	1.94	15°	4	28.1	50	18.68	19.30	19.96	20.67	Free
08-00525-01010		20	1.5	2	1.94	15°	4	26.1	50	20.75	21.44	22.18	22.97	Free
08-00525-01501	R1.5	6	2.5	3	2.85	15°	4	31.8	40	6.44	6.61	6.79	7.00	7.45
08-00525-01502		8	2.5	3	2.85	15°	4	29.8	40	8.50	8.75	9.01	9.29	9.93
08-00525-01503		10	2.5	3	2.85	15°	4	27.8	40	10.57	10.89	11.23	11.59	Free
08-00525-01504		12	2.5	3	2.85	15°	4	25.8	40	12.64	13.03	13.44	13.89	Free

MRB230SF

MRB230SF

Recommended Milling Conditions

Recommended Milling Conditions

Work Material		Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (～44HRC)				Hardened Steels SKD・STAVAX・HPM38 (～55HRC)				Copper			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.1	0.5	0.01	0.02	250	20,000～50,000	0.01	0.01	210	20,000～50,000	0.01	0.02	250	20,000～50,000
	0.75	0.007	0.01	250	20,000～50,000	0.005	0.01	210	20,000～50,000	0.01	0.015	250	20,000～50,000
	1	0.005	0.01	250	20,000～50,000	0.003	0.005	210	20,000～50,000	0.008	0.015	250	20,000～50,000
	1.25	0.003	0.01	150	20,000～50,000	0.003	0.005	120	20,000～50,000	0.005	0.015	150	20,000～50,000
0.15	0.5	0.01	0.02	250	20,000～50,000	0.01	0.015	210	20,000～50,000	0.012	0.025	250	20,000～50,000
	0.6	0.01	0.02	250	20,000～50,000	0.01	0.015	210	20,000～50,000	0.012	0.025	250	20,000～50,000
	0.75	0.008	0.02	250	20,000～50,000	0.007	0.012	210	20,000～50,000	0.011	0.02	250	20,000～50,000
	1	0.007	0.01	250	20,000～50,000	0.005	0.01	210	20,000～50,000	0.01	0.02	250	20,000～50,000
	1.25	0.005	0.01	250	20,000～50,000	0.005	0.005	210	20,000～50,000	0.008	0.015	250	20,000～50,000
	1.5	0.005	0.01	200	20,000～50,000	0.005	0.005	170	20,000～50,000	0.008	0.015	200	20,000～50,000
	1.75	0.005	0.01	200	20,000～50,000	0.005	0.005	170	20,000～50,000	0.008	0.015	200	20,000～50,000
0.2	0.75	0.02	0.05	800	20,000～50,000	0.02	0.03	650	20,000～50,000	0.03	0.07	800	20,000～50,000
	1	0.02	0.05	800	20,000～50,000	0.02	0.03	650	20,000～50,000	0.03	0.07	800	20,000～50,000
	1.5	0.02	0.03	700	20,000～50,000	0.01	0.02	600	20,000～50,000	0.03	0.05	700	20,000～50,000
	2	0.015	0.02	600	20,000～50,000	0.01	0.015	500	20,000～50,000	0.02	0.03	600	20,000～50,000
	2.5	0.015	0.02	450	20,000～50,000	0.01	0.015	380	20,000～50,000	0.02	0.03	450	20,000～50,000
0.25	1	0.03	0.05	800	20,000～50,000	0.02	0.05	680	20,000～50,000	0.045	0.07	800	20,000～50,000
	1.5	0.03	0.05	700	20,000～50,000	0.02	0.04	600	20,000～50,000	0.04	0.07	700	20,000～50,000
	2	0.02	0.04	600	20,000～50,000	0.02	0.03	510	20,000～50,000	0.03	0.06	600	20,000～50,000
	2.5	0.015	0.04	600	20,000～50,000	0.01	0.03	510	20,000～50,000	0.02	0.06	600	20,000～50,000
	3	0.015	0.035	500	20,000～50,000	0.01	0.025	420	20,000～50,000	0.02	0.05	500	20,000～50,000
0.3	1.5	0.05	0.1	1,200	20,000～50,000	0.05	0.07	1,000	20,000～50,000	0.07	0.12	1,200	20,000～50,000
	2	0.05	0.1	1,200	20,000～50,000	0.04	0.07	1,000	20,000～50,000	0.07	0.12	1,200	20,000～50,000
	2.5	0.035	0.1	1,200	20,000～50,000	0.03	0.06	1,000	20,000～50,000	0.05	0.12	1,200	20,000～50,000
	3	0.025	0.1	1,000	20,000～50,000	0.03	0.05	850	20,000～50,000	0.04	0.1	1,000	20,000～50,000
	3.5	0.025	0.08	1,000	20,000～50,000	0.02	0.05	850	20,000～50,000	0.04	0.1	1,000	20,000～50,000
	4	0.025	0.05	800	20,000～50,000	0.02	0.04	680	20,000～50,000	0.035	0.08	800	20,000～50,000
	4.5	0.025	0.05	750	20,000～50,000	0.01	0.03	630	20,000～50,000	0.035	0.08	750	20,000～50,000
	5	0.02	0.04	500	20,000～30,000	0.01	0.02	420	20,000～30,000	0.03	0.06	500	20,000～30,000
	5.5	0.013	0.02	500	20,000～30,000	0.01	0.01	420	20,000～30,000	0.02	0.03	500	20,000～30,000
	6	0.01	0.02	450	20,000～30,000	0.005	0.01	380	20,000～30,000	0.015	0.03	450	20,000～30,000
0.4	2	0.1	0.15	2,000	20,000～50,000	0.1	0.12	1,700	20,000～50,000	0.15	0.2	2,000	20,000～50,000
	3	0.08	0.13	1,700	20,000～50,000	0.08	0.1	1,500	20,000～50,000	0.12	0.2	1,700	20,000～50,000
	4	0.05	0.12	1,500	20,000～50,000	0.05	0.08	1,300	20,000～50,000	0.1	0.2	1,500	20,000～50,000
	5	0.05	0.1	1,200	20,000～50,000	0.04	0.07	1,000	20,000～50,000	0.08	0.15	1,200	20,000～50,000

Work Material		Carbon Steels・Prehardened Steels S50C・NAK・HPM1 (～44HRC)				Hardened Steels SKD・STAVAX・HPM38 (～55HRC)				Copper			
Radius	Under Neck Length	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
		ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹	ap mm	ae mm	mm/min	min⁻¹
0.5	3	0.2	0.3	3,000	20,000～50,000	0.12	0.3	2,500	20,000～50,000	0.25	0.4	3,000	20,000～50,000
	4	0.15	0.25	2,500	20,000～50,000	0.1	0.2	2,100	20,000～50,000	0.2	0.4	2,500	20,000～50,000
	5	0.1	0.25	2,000	20,000～50,000	0.08	0.17	1,700	20,000～50,000	0.15	0.35	2,000	20,000～50,000
	6	0.1	0.2	1,500	20,000～50,000	0.07	0.12	1,200	20,000～50,000	0.15	0.3	1,500	20,000～50,000
	8	0.05	0.1	1,200	20,000～30,000	0.05	0.08	1,000	20,000～30,000	0.08	0.15	1,200	20,000～30,000
	10	0.03	0.05	800	20,000～30,000	0.03	0.05	680	20,000～30,000	0.05	0.08	800	20,000～30,000
0.75	3	0.2	0.35	4,000	20,000～30,000	0.15	0.3	3,400	20,000～30,000	0.3	0.5	4,000	20,000～30,000
	4	0.2	0.3	4,000	20,000～30,000	0.15	0.25	3,400	20,000～30,000	0.3	0.45	4,000	20,000～30,000
	6	0.15	0.3	3,000	20,000～30,000	0.12	0.2	2,500	20,000～30,000	0.2	0.45	3,000	20,000～30,000
	8	0.1	0.25	2,400	20,000～30,000	0.08	0.18	2,000	20,000～30,000	0.15	0.4	2,400	20,000～30,000
	10	0.08	0.2	1,800	20,000～30,000	0.06	0.12	1,500	20,000～30,000	0.12	0.3	1,800	20,000～30,000
1	3	0.3	0.5	4,000	20,000～30,000	0.2	0.5	3,400	20,000～30,000	0.45	0.7	4,000	20,000～30,000
	4	0.3	0.5	4,000	20,000～30,000	0.2	0.45	3,400	20,000～30,000	0.45	0.7	4,000	20,000～30,000
	6	0.25	0.5	3,000	20,000～30,000	0.2	0.4	2,500	20,000～30,000	0.38	0.7	3,000	20,000～30,000
	8	0.2	0.3	2,500	16,000～20,000	0.15	0.3	2,100	16,000～20,000	0.3	0.45	2,500	16,000～20,000
	10	0.15	0.3	2,500	16,000～20,000	0.1	0.2	2,100	16,000～20,000	0.23	0.45	2,500	16,000～20,000
	12	0.13	0.2	1,800	12,000～16,000	0.1	0.15	1,500	12,000～16,000	0.2	0.3	1,800	12,000～16,000
	14	0.1	0.2	1,800	12,000～16,000	0.07	0.13	1,500	12,000～16,000	0.15	0.3	1,800	12,000～16,000
	16	0.1	0.15	1,600	10,000～14,000	0.06	0.11	1,400	10,000～14,000	0.15	0.25	1,600	10,000～14,000
	18	0.07	0.12	1,600	10,000～14,000	0.05	0.1	1,400	10,000～14,000	0.1	0.2	1,600	10,000～14,000
	20	0.06	0.1	1,000	8,000～12,000	0.05	0.07	850	8,000～12,000	0.1	0.15	1,000	8,000～12,000
1.5	6	0.35	0.6	4,000	16,000～20,000	0.25	0.5	3,400	16,000～20,000	0.5	1	4,000	16,000～20,000
	8	0.3	0.5	4,000	16,000～20,000	0.2	0.5	3,400	16,000～20,000	0.45	0.8	4,000	16,000～20,000
	10	0.3	0.5	4,000	16,000～20,000	0.2	0.45	3,400	16,000～20,000	0.45	0.8	4,000	16,000～20,000
	12	0.2	0.4	3,000	16,000～20,000	0.2	0.4	2,500	16,000～20,000	0.3	0.6	3,000	16,000～20,000
Notes	※1 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut. ※2 Adjust both spindle speed and feed at the same rate. ※3 Oil mist coolant is recommended for the machining of hardened steels.												

MRBLN230-6

Size R0.15～R1

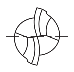
MRBLN230-6

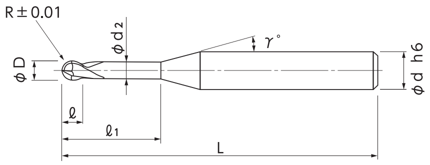
MUGEN COATING 2-Flute Long Neck Ball End Mill (Shank Dia. 6)

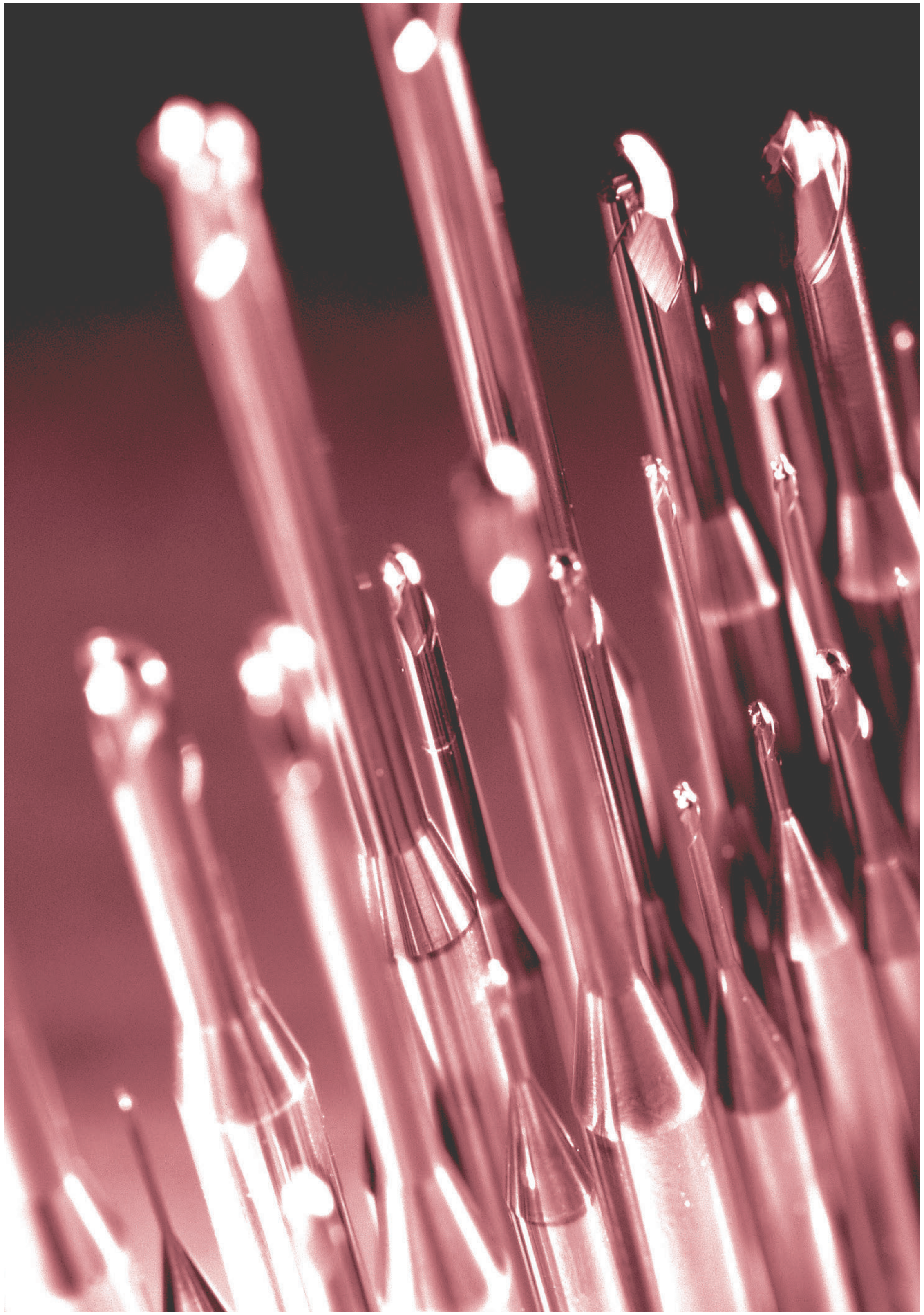
Total 10 sizes

Work material	
Carbon Steel P	◎
Alloy Steel P	◎
Prehardened Steel P	◎
Hardened Steel ~55 HRC H	○
Stainless Steel M	○
Aluminium Alloy N	○
Copper N	○
Resin O	○

2-flute long neck ball end mill. Shank Dia.6mm







Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00522-01501	R0.15	3	0.3	0.3	0.28	15°	6	60
▌08-00522-02001	R0.2	4	0.4	0.4	0.37	15°	6	60
▌08-00522-02501	R0.25	5	0.8	0.5	0.46	15°	6	60
▌08-00522-03001	R0.3	3	1	0.6	0.56	15°	6	60
▌08-00522-03005		5	1	0.6	0.56	15°	6	60
▌08-00522-03006		6	1	0.6	0.56	15°	6	60
▌08-00522-04008	R0.4	8	1.4	0.8	0.76	15°	6	60
▌08-00522-05010	R0.5	10	1.5	1	0.95	15°	6	60
▌08-00522-07515	R0.75	15	1.75	1.5	1.45	15°	6	60
▌08-00522-10020	R1	20	2	2	1.94	15°	6	60

How to Order When you order, indicate MRBLN230-6 (R)×(ℓ1). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Long Neck Ball Coating

MRBTN230

Size R0.1 × neck taper angle30′ ~ R2 × neck taper angle1°

≦55 HRC

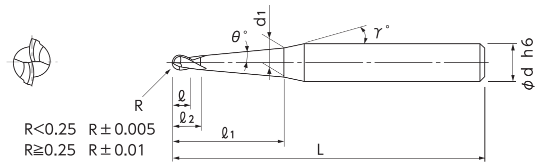
MUGEN COATING 2-Flute Long Taper Neck Ball End Mill

Total 196 sizes

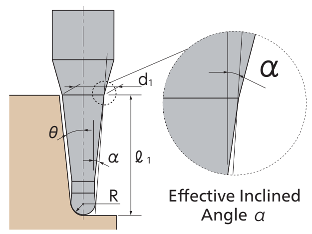
MUGEN COATING 2-Flute Long Taper Neck Ball End Mill

MG 2 30° R ±0.005 (R<0.25) 3D

Taper neck to improve tool rigidity. L/D up to 36.
Option of same taper angle as inclined working angle



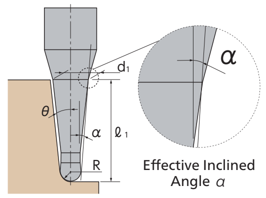
- It is possible to increase rigidity with the neck taper.
- The volume of depth of cut will be more than conventional end mills.



Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00570-01020	R0.1	30′	1	0.21	0.2	0.4	12°	0°19′	4	50
08-00570-01021			1.5	0.22	0.2	0.4	12°	0°23′	4	50
08-00570-01022			2	0.23	0.2	0.4	12°	0°25′	4	50
08-00570-01040		1°	1	0.22	0.2	0.4	12°	0°38′	4	50
08-00570-01041			1.5	0.24	0.2	0.4	12°	0°47′	4	50
08-00570-01042			2	0.26	0.2	0.4	12°	0°51′	4	50
08-00570-01050		1°30′	1	0.23	0.2	0.4	12°	0°57′	4	50
08-00570-01051			1.5	0.26	0.2	0.4	12°	1°11′	4	50
08-00570-01052			2	0.28	0.2	0.4	12°	1°16′	4	50
08-00570-01060		2°	1	0.24	0.2	0.4	12°	1°16′	4	50
08-00570-01061			1.5	0.28	0.2	0.4	12°	1°35′	4	50
08-00570-01062			2	0.31	0.2	0.4	12°	1°41′	4	50
08-00570-01080		3°	1	0.26	0.2	0.4	12°	1°54′	4	50
08-00570-01081			1.5	0.32	0.2	0.4	12°	2°21′	4	50
08-00570-01082			2	0.37	0.2	0.4	12°	2°32′	4	50
08-00570-01092		5°	2	0.48	0.2	0.4	12°	4°13′	4	50
08-00570-01521	R0.15	30′	3	0.34	0.3	0.6	12°	0°25′	4	50
08-00570-01540		1°	2	0.35	0.3	0.6	12°	0°45′	4	50
08-00570-01541			3	0.38	0.3	0.6	12°	0°51′	4	50
08-00570-01550		1°30′	2	0.37	0.3	0.6	12°	1°08′	4	50
08-00570-01551			3	0.43	0.3	0.6	12°	1°16′	4	50
08-00570-01561		2°	3	0.47	0.3	0.6	12°	1°41′	4	50
08-00570-01581		3°	3	0.55	0.3	0.6	12°	2°32′	4	50
08-00570-01591		5°	3	0.72	0.3	0.6	12°	4°13′	4	50
08-00570-02021	R0.2	30′	2	0.42	0.4	0.8	12°	0°20′	4	50
08-00570-02023			3	0.44	0.4	0.8	12°	0°24′	4	50
08-00570-02022			4	0.46	0.4	0.8	12°	0°25′	4	50
08-00570-02041		1°	2	0.44	0.4	0.8	12°	0°40′	4	50
08-00570-02043			3	0.48	0.4	0.8	12°	0°47′	4	50
08-00570-02042			4	0.51	0.4	0.8	12°	0°51′	4	50

How to Order When you order, indicate MRBTN230 (R)×(θ)×(ℓ1). ※(γ) is reference value.

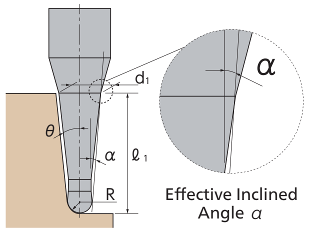


Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00570-02051	R0.2	1°30′	2	0.46	0.4	0.8	12°	1°00′	4	50
08-00570-02053			3	0.52	0.4	0.8	12°	1°11′	4	50
08-00570-02052			4	0.57	0.4	0.8	12°	1°16′	4	50
08-00570-02061		2°	2	0.48	0.4	0.8	12°	1°20′	4	50
08-00570-02063			3	0.55	0.4	0.8	12°	1°34′	4	50
08-00570-02062			4	0.62	0.4	0.8	12°	1°41′	4	50
08-00570-02081		3°	2	0.53	0.4	0.8	12°	2°00′	4	50
08-00570-02082			4	0.74	0.4	0.8	12°	2°31′	4	50
08-00570-02092		5°	4	0.96	0.4	0.8	12°	4°13′	4	50
08-00570-02521	R0.25	30′	3	0.53	0.5	1	12°	0°22′	4	50
08-00570-02522			5	0.57	0.5	1	12°	0°25′	4	50
08-00570-02541		1°	3	0.57	0.5	1	12°	0°44′	4	50
08-00570-02542			5	0.64	0.5	1	12°	0°51′	4	50
08-00570-02551		1°30′	3	0.6	0.5	1	12°	1°06′	4	50
08-00570-02552			5	0.71	0.5	1	12°	1°16′	4	50
08-00570-02561		2°	3	0.64	0.5	1	12°	1°27′	4	50
08-00570-02562			5	0.78	0.5	1	12°	1°41′	4	50
08-00570-02581		3°	3	0.71	0.5	1	12°	2°11′	4	50
08-00570-02582			5	0.92	0.5	1	12°	2°32′	4	50
08-00570-02592		5°	5	1.2	0.5	1	12°	4°13′	4	50
08-00570-03021	R0.3	30′	5	0.67	0.6	1.2	12°	0°24′	4	50
08-00570-03022			8	0.72	0.6	1.2	12°	0°27′	4	50
08-00570-03040		1°	4	0.7	0.6	1.2	12°	0°45′	4	50
08-00570-03041			5	0.73	0.6	1.2	12°	0°49′	4	50
08-00570-03043			6	0.77	0.6	1.2	12°	0°51′	4	50
08-00570-03042			8	0.84	0.6	1.2	12°	0°53′	4	50
08-00570-03051		1°30′	5	0.8	0.6	1.2	12°	1°13′	4	50
08-00570-03052			8	0.96	0.6	1.2	12°	1°19′	4	50
08-00570-03061		2°	6	0.94	0.6	1.2	12°	1°41′	4	50
08-00570-03062			8	1.07	0.6	1.2	12°	1°46′	4	50
08-00570-03081		3°	6	1.1	0.6	1.2	12°	2°32′	4	50
08-00570-03082			8	1.31	0.6	1.2	12°	2°39′	4	50
08-00570-03092		5°	8	1.79	0.6	1.2	12°	4°25′	4	50
08-00570-04021	R0.4	30′	8	0.91	0.8	1.6	12°	0°25′	4	50
08-00570-04022			12	0.98	0.8	1.6	12°	0°27′	4	60
08-00570-04041		1°	8	1.02	0.8	1.6	12°	0°50′	4	50
08-00570-04042			12	1.16	0.8	1.6	12°	0°54′	4	60
08-00570-04051		1°30′	8	1.14	0.8	1.6	12°	1°16′	4	50
08-00570-04052			12	1.34	0.8	1.6	12°	1°21′	4	60
08-00570-04061		2°	8	1.25	0.8	1.6	12°	1°42′	4	50
08-00570-04062			12	1.53	0.8	1.6	12°	1°48′	4	60

MRBTN230

MUGEN COATING 2-Flute Long Taper Neck Ball End Mill



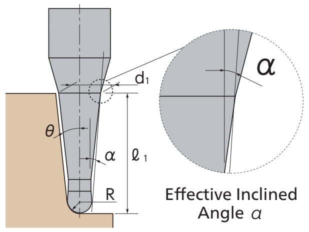
Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00570-04081	R0.4	3°	8	1.47	0.8	1.6	12°	2°31′	4	50
08-00570-04082			12	1.89	0.8	1.6	12°	2°41′	4	60
08-00570-05021	R0.5	30′	10	1.14	1	2	12°	0°25′	4	60
08-00570-05022			15	1.23	1	2	12°	0°27′	4	60
08-00570-05023			20	1.31	1	2	12°	0°28′	4	70
08-00570-05024			25	1.41	1	2	12°	0°29′	4	70
08-00570-05039		1°	6	1.14	1	2	12°	0°43′	4	60
08-00570-05040			8	1.21	1	2	12°	0°48′	4	60
08-00570-05041			10	1.28	1	2	12°	0°50′	4	60
08-00570-05044			12	1.35	1	2	12°	0°52′	4	60
08-00570-05042			15	1.45	1	2	12°	0°54′	4	60
08-00570-05045			16	1.49	1	2	12°	0°54′	4	60
08-00570-05043			20	1.63	1	2	12°	0°55′	4	70
08-00570-05046			22	1.7	1	2	12°	0°56′	4	70
08-00570-05047			25	1.8	1	2	12°	0°56′	4	70
08-00570-05049		1°30′	6	1.21	1	2	12°	1°05′	4	60
08-00570-05050			8	1.31	1	2	12°	1°12′	4	60
08-00570-05051			10	1.42	1	2	12°	1°16′	4	60
08-00570-05054			12	1.52	1	2	12°	1°18′	4	60
08-00570-05052			15	1.68	1	2	12°	1°21′	4	60
08-00570-05055			16	1.73	1	2	12°	1°21′	4	60
08-00570-05053			20	1.94	1	2	12°	1°23′	4	70
08-00570-05056			22	2.05	1	2	12°	1°24′	4	70
08-00570-05057			25	2.2	1	2	12°	1°24′	4	70
08-00570-05059			36	2.78	1	2	12°	1°26′	4	70
08-00570-05061		2°	10	1.56	1	2	12°	1°41′	4	60
08-00570-05062			15	1.91	1	2	12°	1°48′	4	60
08-00570-05063			20	2.26	1	2	12°	1°51′	4	70
08-00570-05081		3°	10	1.84	1	2	12°	2°31′	4	60
08-00570-05082			15	2.36	1	2	12°	2°41′	4	60
08-00570-05083			20	2.89	1	2	12°	2°46′	4	70
08-00570-05092		5°	15	3.27	1	2	12°	4°28′	6	60
08-00570-05093			20	4.15	1	2	12°	4°37′	6	70
08-00570-06021	R0.6	30′	12	1.37	1.2	2.4	12°	0°25′	4	60
08-00570-06022			24	1.58	1.2	2.4	12°	0°28′	4	70
08-00570-06041		1°	12	1.54	1.2	2.4	12°	0°51′	4	60
08-00570-06042			24	1.95	1.2	2.4	12°	0°55′	4	70
08-00570-06051		1°30′	12	1.7	1.2	2.4	12°	1°16′	4	60
08-00570-06052			24	2.33	1.2	2.4	12°	1°23′	4	70
08-00570-06061		2°	12	1.87	1.2	2.4	12°	1°41′	4	60
08-00570-06062			24	2.71	1.2	2.4	12°	1°51′	4	70

How to Order When you order, indicate MRBTN230 (R)×(θ)×(ℓ1). ※(γ) is reference value.

MRBTN230

MUGEN COATING 2-Flute Long Taper Neck Ball End Mill



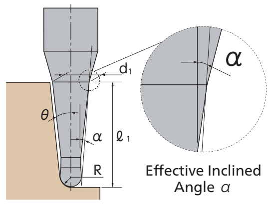
Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00570-06081	R0.6	3°	12	2.21	1.2	2.4	12°	2°32′	4	60
08-00570-06082			24	3.46	1.2	2.4	12°	2°46′	6	70
08-00570-06091		5°	12	2.88	1.2	2.4	12°	4°13′	4	60
08-00570-06092			24	4.98	1.2	2.4	12°	4°37′	6	70
08-00570-07520	R0.75	30′	10	1.62	1.5	3	12°	0°23′	4	60
08-00570-07521			15	1.71	1.5	3	12°	0°25′	4	60
08-00570-07522			30	1.97	1.5	3	12°	0°28′	4	70
08-00570-07540		1°	10	1.74	1.5	3	12°	0°45′	4	60
08-00570-07541			15	1.92	1.5	3	12°	0°51′	4	60
08-00570-07543			20	2.09	1.5	3	12°	0°53′	4	60
08-00570-07542			30	2.44	1.5	3	12°	0°55′	4	70
08-00570-07550		1°30′	10	1.87	1.5	3	12°	1°08′	4	60
08-00570-07551			15	2.13	1.5	3	12°	1°16′	4	60
08-00570-07552			30	2.91	1.5	3	12°	1°23′	4	70
08-00570-07560		2°	10	1.99	1.5	3	12°	1°31′	4	60
08-00570-07561			15	2.34	1.5	3	12°	1°41′	4	60
08-00570-07563			20	2.69	1.5	3	12°	1°46′	4	60
08-00570-07562			30	3.39	1.5	3	12°	1°51′	6	70
08-00570-07581		3°	15	2.76	1.5	3	12°	2°32′	4	60
08-00570-07583			20	3.28	1.5	3	12°	2°39′	4	60
08-00570-07582			30	4.33	1.5	3	12°	2°46′	6	70
08-00570-07591		5°	15	3.6	1.5	3	12°	4°13′	6	60
08-00570-07592			28.7	6	1.5	3	–	4°36′	6	70
08-00570-10019	R1	30′	12	2.14	2	4	12°	0°21′	4	60
08-00570-10020			16	2.21	2	4	12°	0°24′	4	60
08-00570-10021			20	2.28	2	4	12°	0°25′	4	60
08-00570-10022			30	2.45	2	4	12°	0°27′	4	70
08-00570-10023			40	2.63	2	4	12°	0°28′	4	80
08-00570-10039		1°	12	2.28	2	4	12°	0°43′	4	60
08-00570-10040			16	2.42	2	4	12°	0°48′	4	60
08-00570-10041			20	2.56	2	4	12°	0°51′	4	60
08-00570-10044			25	2.73	2	4	12°	0°53′	4	60
08-00570-10042			30	2.91	2	4	12°	0°54′	4	70
08-00570-10045			35	3.08	2	4	12°	0°55′	4	80
08-00570-10043			40	3.26	2	4	12°	0°55′	6	80
08-00570-10049		1°30′	12	2.42	2	4	12°	1°05′	4	60
08-00570-10050			16	2.63	2	4	12°	1°12′	4	60
08-00570-10051			20	2.84	2	4	12°	1°16′	4	60
08-00570-10054			25	3.1	2	4	12°	1°19′	4	60
08-00570-10052			30	3.36	2	4	12°	1°21′	6	70
08-00570-10055			35	3.62	2	4	12°	1°22′	6	80
08-00570-10053			40	3.89	2	4	12°	1°23′	6	80

MRBTN230

MRBTN230

MUGEN COATING 2-Flute Long Taper Neck Ball End Mill



Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ₁)	Neck Dia. (d₁)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ₂)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00570-10059	R1	2°	12	2.56	2	4	12°	1°27′	4	60
08-00570-10060			16	2.84	2	4	12°	1°36′	4	60
08-00570-10061			20	3.12	2	4	12°	1°41′	4	60
08-00570-10062			30	3.82	2	4	12°	1°48′	6	70
08-00570-10063			40	4.51	2	4	12°	1°51′	6	80
08-00570-10079		3°	12	2.84	2	4	12°	2°11′	4	60
08-00570-10080			16	3.26	2	4	12°	2°24′	4	60
08-00570-10081			20	3.68	2	4	12°	2°31′	6	70
08-00570-10082			30	4.73	2	4	12°	2°41′	6	70
08-00570-10083			40	5.77	2	4	12°	2°46′	6	80
08-00570-10091		5°	20	4.8	2	4	12°	4°13′	6	70
08-00570-10092			26.8	6	2	4	–	4°25′	6	70
08-00570-10093			38.2	8	2	4	–	4°36′	8	80
08-00570-15018	R1.5	30′	15	3.16	3	6	12°	0°20′	6	70
08-00570-15019			20	3.24	3	6	12°	0°22′	6	70
08-00570-15020			30	3.43	3	6	12°	0°26′	6	70
08-00570-15022			40	3.6	3	6	12°	0°27′	6	80
08-00570-15021			50	3.77	3	6	12°	0°27′	6	90
08-00570-15038		1°	15	3.31	3	6	12°	0°39′	6	70
08-00570-15039			20	3.49	3	6	12°	0°45′	6	70
08-00570-15040			30	3.84	3	6	12°	0°51′	6	70
08-00570-15042			40	4.19	3	6	12°	0°53′	6	80
08-00570-15041			50	4.54	3	6	12°	0°54′	6	90
08-00570-15048		1°30′	15	3.47	3	6	12°	1°00′	6	70
08-00570-15049			20	3.73	3	6	12°	1°07′	6	70
08-00570-15050			30	4.26	3	6	12°	1°16′	6	70
08-00570-15052			40	4.78	3	6	12°	1°19′	6	80
08-00570-15051			50	5.3	3	6	12°	1°22′	6	90
08-00570-15058		2°	15	3.63	3	6	12°	1°20′	6	70
08-00570-15059			20	3.98	3	6	12°	1°31′	6	70
08-00570-15060			30	4.68	3	6	12°	1°41′	6	70
08-00570-15061			48.9	6	3	6	–	1°49′	6	90
08-00570-15079		3°	20	4.47	3	6	12°	2°16′	6	70
08-00570-15080			30	5.52	3	6	12°	2°32′	6	70
08-00570-15081			50	7.61	3	6	12°	2°43′	8	90
08-00570-15091		5°	23.1	6	3	6	–	3°58′	6	70
08-00570-20019	R2	30′	20	4.21	4	8	12°	0°19′	6	70
08-00570-20020			40	4.56	4	8	12°	0°25′	6	90
08-00570-20021			60	4.91	4	8	12°	0°27′	6	110
08-00570-20039		1°	20	4.42	4	8	12°	0°40′	6	70
08-00570-20040			40	5.12	4	8	12°	0°50′	6	90
08-00570-20041			60	5.82	4	8	12°	0°54′	6	110

How to Order When you order, indicate MRBTN230 (R)×(θ)×(ℓ₁). ※(γ) is reference value.

Recommended Milling Conditions

Work Material			Carbon Steels・Alloy Steels・Prehardened Steels S50C・SCM・SKD・SUS・HPM・NAK			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}
0.1	30′	1	0.01	0.01	~300	20,000
		1.5	0.005	0.005		
		2	0.005	0.005		
	1°	1	0.01	0.01		
		1.5	0.005	0.005		
		2	0.005	0.005		
	1°30′	1	0.01	0.01		
		1.5	0.005	0.01		
		2	0.005	0.01		
	2°	1	0.01	0.01		
		1.5	0.01	0.01		
		2	0.01	0.01		
	3°	1	0.01	0.02		
		1.5	0.01	0.02		
		2	0.01	0.02		
	5°	2	0.01	0.02		
0.15	30′	3	0.005	0.01	~300	20,000
	1°	2	0.005	0.01		
		3	0.005	0.01		
	1°30′	2	0.005	0.01		
		3	0.005	0.01		
	2°	3	0.01	0.02		
	3°	3	0.01	0.02		
	5°	3	0.01	0.02		
0.2	30′	2	0.01	0.02	~500	20,000
		3	0.01	0.02		
		4	0.01	0.02		
	1°	2	0.01	0.02		
		3	0.01	0.02		
		4	0.01	0.02		
	1°30′	2	0.01	0.03		
		3	0.01	0.03		
		4	0.01	0.03		
	2°	2	0.02	0.03		
		3	0.02	0.03		
		4	0.02	0.03		
	3°	2	0.02	0.05		
		4	0.02	0.05		
	5°	4	0.03	0.05		
0.25	30′	3	0.01	0.02	~500	20,000
		5	0.01	0.02		
	1°	3	0.01	0.02		
		5	0.01	0.02		
	1°30′	3	0.01	0.03		
		5	0.01	0.03		
	2°	3	0.02	0.03		
		5	0.02	0.03		
	3°	3	0.02	0.05		
		5	0.02	0.05		
	5°	5	0.03	0.05		
0.3	30′	5	0.01	0.02	~800	20,000
		8	0.01	0.02		
	1°	4	0.01	0.02		
		5	0.01	0.02		
		6	0.01	0.02		
		8	0.01	0.02		
	1°30′	5	0.01	0.03		
		8	0.01	0.03		
	2°	6	0.02	0.03		
		8	0.02	0.03		
	3°	6	0.02	0.05		
		8	0.02	0.05		
	5°	8	0.03	0.05		

MRBTN230

Recommended Milling Conditions

Work Material			Carbon Steels・Alloy Steels・Prehardened Steels S50C・SCM・SKD・SUS・HPM・NAK			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}
0.4	30′	8	0.01	0.02	～1,000	20,000
		12	0.01	0.02		
	1°	8	0.01	0.02		
		12	0.01	0.02		
	1°30′	8	0.02	0.03		
		12	0.02	0.03		
	2°	8	0.03	0.05		
		12	0.03	0.05		
	3°	8	0.03	0.05		
		12	0.03	0.05		
0.5	30′	10	0.01	0.03	～1,200	16,000～20,000
		15	0.01	0.02		
		20	0.01	0.01		
		25	0.005	0.005		
	1°	6	0.05	0.07		
		8	0.03	0.06		
		10	0.02	0.05		
		12	0.02	0.05		
		15	0.02	0.03		
		16	0.01	0.03		
		20	0.01	0.02		
		22	0.01	0.01		
		25	0.005	0.01		
	1°30′	6	0.07	0.15		
		8	0.05	0.1		
		10	0.03	0.05		
		12	0.02	0.05		
		15	0.02	0.03		
		16	0.02	0.03		
		20	0.01	0.05		
		22	0.01	0.01		
		25	0.005	0.01		
		36	0.003	0.005		
	2°	10	0.05	0.1		
		15	0.02	0.05		
		20	0.01	0.03		
	3°	10	0.07	0.15		
		15	0.03	0.05		
		20	0.02	0.05		
	5°	15	0.07	0.2		
		20	0.03	0.05		
0.6	30′	12	0.03	0.05	～1,200	16,000～20,000
		24	0.01	0.01		
	1°	12	0.03	0.05		
		24	0.01	0.02		
	1°30′	12	0.03	0.05		
		24	0.02	0.02		
	2°	12	0.04	0.05		
		24	0.02	0.03		
	3°	12	0.04	0.07		
		24	0.03	0.03		
	5°	12	0.05	0.1		
		24	0.03	0.05		

MRBTN230

Recommended Milling Conditions

Work Material			Carbon Steels・Alloy Steels・Prehardened Steels S50C・SCM・SKD・SUS・HPM・NAK			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}
0.75	30′	10	0.1	0.2	～1,200	16,000～20,000
		15	0.05	0.1		
		30	0.01	0.01		
	1°	10	0.1	0.2		
		15	0.05	0.1		
		20	0.02	0.05		
		30	0.01	0.01		
	1°30′	10	0.1	0.2		
		15	0.05	0.1		
		30	0.01	0.02		
	2°	10	0.1	0.3		
		15	0.05	0.12		
		20	0.03	0.05		
		30	0.02	0.03		
	3°	15	0.1	0.15		
		20	0.05	0.07		
		30	0.03	0.05		
	5°	15	0.1	0.2		
		28.7	0.05	0.07		
1	30′	12	0.1	0.2	～1,600	16,000～20,000
		16	0.07	0.15		
		20	0.05	0.1		
		30	0.02	0.05		
		40	0.01	0.015		
	1°	12	0.1	0.25		
		16	0.08	0.15		
		20	0.05	0.1		
		25	0.03	0.05		
		30	0.02	0.05		
		35	0.02	0.05		
		40	0.01	0.02		
	1°30′	12	0.15	0.3		
		16	0.1	0.15		
		20	0.05	0.12		
		25	0.03	0.07		
		30	0.03	0.05		
		35	0.02	0.05		
		40	0.01	0.02		
	2°	12	0.2	0.3		
		16	0.1	0.2		
		20	0.07	0.15		
		30	0.03	0.1		
		40	0.02	0.03		
	3°	12	0.2	0.5		
		16	0.1	0.3		
		20	0.07	0.2		
		30	0.05	0.1		
		40	0.02	0.05		
	5°	20	0.1	0.3		
		26.8	0.08	0.2		
		38.2	0.05	0.12		

MRBTN230

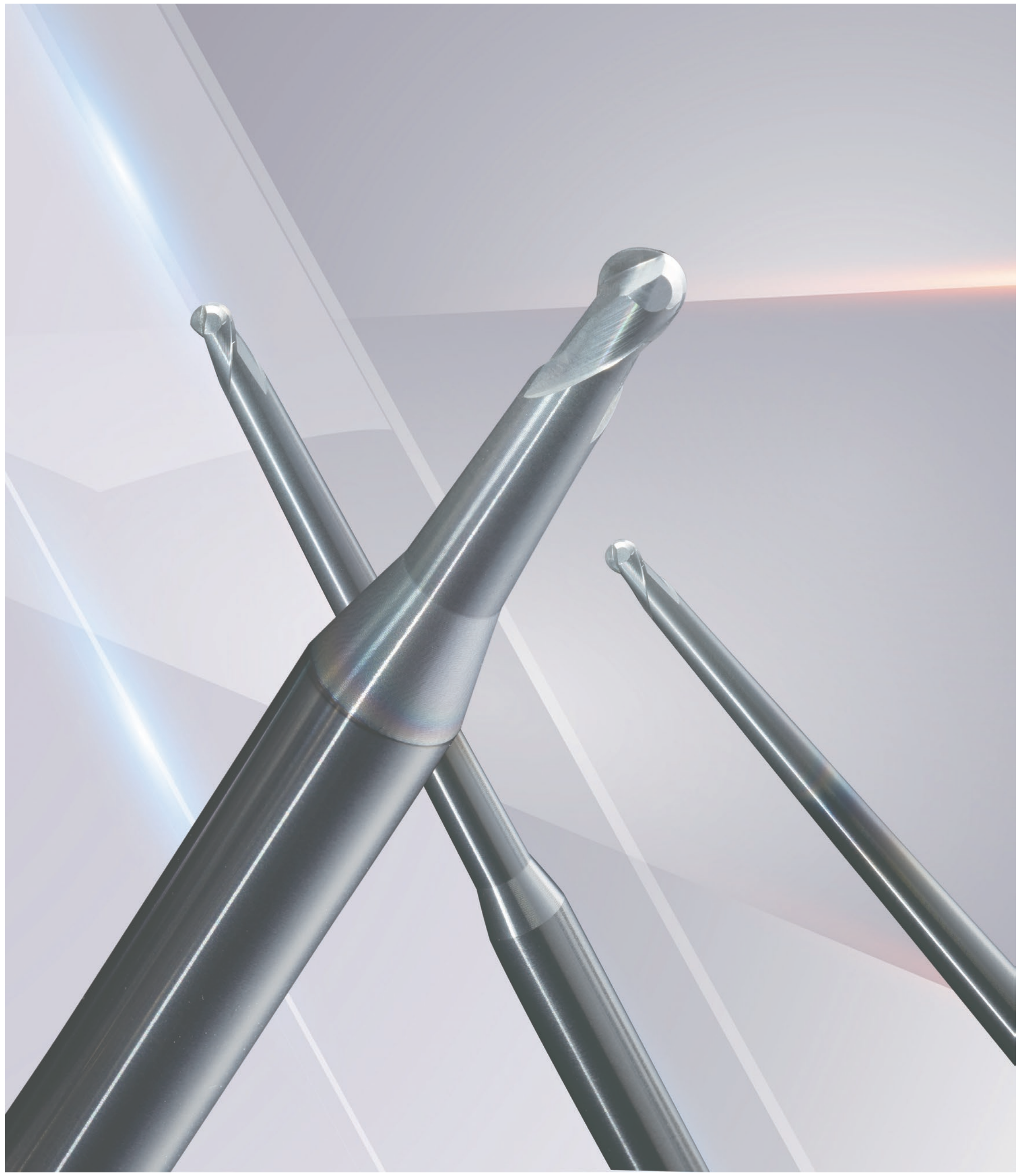
MRBTN230

Recommended Milling Conditions

Work Material			Carbon Steels・Alloy Steels・Prehardened Steels S50C・SCM・SKD・SUS・HPM・NAK			
Radius	Neck Taper Angle	Under Neck Length	Depth of Cut ap mm	Depth of Cut ae mm	Feed mm/min	Spindle Speed min^{-1}
1.5	30′	15	0.15	0.3	～1,600	16,000
		20	0.08	0.1		
		30	0.03	0.05		
		40	0.02	0.03		
		50	0.01	0.01		
	1°	15	0.15	0.3		
		20	0.1	0.15		
		30	0.05	0.07		
		40	0.02	0.05		
		50	0.01	0.02		
	1°30′	15	0.2	0.3		
		20	0.15	0.2		
		30	0.07	0.1		
		40	0.03	0.05		
		50	0.02	0.03		
	2°	15	0.2	0.3		
		20	0.15	0.2		
		30	0.1	0.1		
		48.9	0.03	0.05		
	3°	20	0.2	0.3		
		30	0.1	0.15		
		50	0.05	0.1		
	5°	23.1	0.2	0.3		
2	30′	20	0.2	0.3	～1,400	14,000
		40	0.05	0.1		
		60	0.01	0.02		
	1°	20	0.2	0.5		
		40	0.07	0.2		
		60	0.01	0.03		

Notes

※1 When deciding milling condition in case the effective length is long and/or the neck taper angle is small, it is recommended both axial depth of cut and radial depth of cut values are chosen at lower level within the specified range.
※2 Adjust both spindle speed and feed at the same rate.
※3 Use cutting fluid with smoke retardant.
※4 We recommend using oil mist coolant for hardened steels.



Regular Line
MUGEN COATING
Long Neck Type

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Tapered Ball Coating

MRBTN230L

Size R0.1 × neck taper angle30′ ~ R5 × neck taper angle1° 30′

≦55 HRC

MRBTN230L

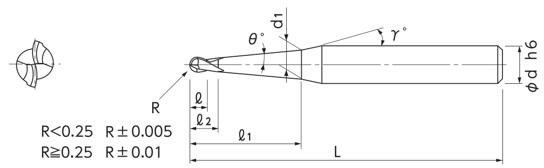
MUGEN COATING 2-Flute Extra Long Taper Neck Ball End Mill

Total 150 sizes

MUGEN COATING 2-Flute Extra Long Taper Neck Ball End Mill

MG 2 30° R ±0.005 (R<0.25) 3D

Taper neck to improve tool rigidity.
L/D up to 80. Option of same taper angle as inclined working angle



Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00580-01021	R0.1	30′	2.5	0.24	0.2	0.4	12°	4	50
▌08-00580-01022			3	0.25	0.2	0.4	12°	4	50
▌08-00580-01041		1°	2.5	0.27	0.2	0.4	12°	4	50
▌08-00580-01042			3	0.29	0.2	0.4	12°	4	50
▌08-00580-01051		1°30′	2.5	0.31	0.2	0.4	12°	4	50
▌08-00580-01052			3	0.34	0.2	0.4	12°	4	50
▌08-00580-01061		2°	2.5	0.35	0.2	0.4	12°	4	50
▌08-00580-01062			3	0.38	0.2	0.4	12°	4	50
▌08-00580-01081		3°	2.5	0.42	0.2	0.4	12°	4	50
▌08-00580-01082			3	0.47	0.2	0.4	12°	4	50
▌08-00580-01092		5°	3	0.65	0.2	0.4	12°	4	50
▌08-00580-01521	R0.15	30′	4	0.36	0.3	0.5	12°	4	50
▌08-00580-01541		1°	4	0.42	0.3	0.5	12°	4	50
▌08-00580-01551		1°30′	4	0.48	0.3	0.5	12°	4	50
▌08-00580-01561		2°-	4	0.54	0.3	0.5	12°	4	50
▌08-00580-01581		3°	4	0.67	0.3	0.5	12°	4	50
▌08-00580-01591		5°	4	0.91	0.3	0.5	12°	4	50
▌08-00580-02021	R0.2	30′	5	0.47	0.4	0.8	12°	4	50
▌08-00580-02022			6	0.49	0.4	0.8	12°	4	50
▌08-00580-02041		1°	5	0.55	0.4	0.8	12°	4	50
▌08-00580-02042			6	0.58	0.4	0.8	12°	4	50
▌08-00580-02051		1°30′	5	0.62	0.4	0.8	12°	4	50
▌08-00580-02052			6	0.67	0.4	0.8	12°	4	50
▌08-00580-02061		2°	5	0.69	0.4	0.8	12°	4	50
▌08-00580-02062			6	0.76	0.4	0.8	12°	4	50
▌08-00580-02081		3°	5	0.84	0.4	0.8	12°	4	50
▌08-00580-02082			6	0.95	0.4	0.8	12°	4	50
▌08-00580-02092		5°	6	1.31	0.4	0.8	12°	4	50
▌08-00580-02521	R0.25	30′	6	0.59	0.5	1	12°	4	50
▌08-00580-02522			7	0.6	0.5	1	12°	4	50
▌08-00580-02541		1°	6	0.67	0.5	1	12°	4	50
▌08-00580-02542			7	0.71	0.5	1	12°	4	50

How to Order When you order, indicate MRBTN230L (R)×(θ)×(ℓ1). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00580-02551	R0.25	1°30′	6	0.76	0.5	1	12°	4	50
▌08-00580-02552			7	0.81	0.5	1	12°	4	50
▌08-00580-02561		2°	6	0.85	0.5	1	12°	4	50
▌08-00580-02562			7	0.92	0.5	1	12°	4	50
▌08-00580-02581		3°	6	1.02	0.5	1	12°	4	50
▌08-00580-02582			7	1.13	0.5	1	12°	4	50
▌08-00580-02592		5°	7	1.55	0.5	1	12°	4	50
▌08-00580-03021	R0.3	30′	10	0.75	0.6	1.2	12°	4	60
▌08-00580-03022			12	0.79	0.6	1.2	12°	4	60
▌08-00580-03023			20	0.93	0.6	1.2	12°	4	60
▌08-00580-03041		1°	10	0.91	0.6	1.2	12°	4	60
▌08-00580-03042			12	0.98	0.6	1.2	12°	4	60
▌08-00580-03043			20	1.26	0.6	1.2	12°	4	60
▌08-00580-03051		1°30′	10	1.06	0.6	1.2	12°	4	60
▌08-00580-03052			12	1.17	0.6	1.2	12°	4	60
▌08-00580-03053			20	1.58	0.6	1.2	12°	4	60
▌08-00580-03061		2°	10	1.21	0.6	1.2	12°	4	60
▌08-00580-03062			12	1.35	0.6	1.2	12°	4	60
▌08-00580-03063			20	1.91	0.6	1.2	12°	4	60
▌08-00580-03081		3°	10	1.52	0.6	1.2	12°	4	60
▌08-00580-03082			12	1.73	0.6	1.2	12°	4	60
▌08-00580-03083			20	2.57	0.6	1.2	12°	4	60
▌08-00580-03091		5°	10	2.14	0.6	1.2	12°	4	60
▌08-00580-03092			12	2.49	0.6	1.2	12°	4	60
▌08-00580-03093			20	4	0.6	1.2	–	4	60
▌08-00580-04021	R0.4	30′	16	1.05	0.8	1.6	12°	4	60
▌08-00580-04022			20	1.12	0.8	1.6	12°	4	60
▌08-00580-04041		1°	16	1.3	0.8	1.6	12°	4	60
▌08-00580-04042			20	1.44	0.8	1.6	12°	4	60
▌08-00580-04051		1°30′	16	1.55	0.8	1.6	12°	4	60
▌08-00580-04052			20	1.76	0.8	1.6	12°	4	60
▌08-00580-04061		2°	16	1.81	0.8	1.6	12°	4	60
▌08-00580-04062			20	2.09	0.8	1.6	12°	4	60
▌08-00580-04081		3°	16	2.31	0.8	1.6	12°	4	60
▌08-00580-04082			20	2.73	0.8	1.6	12°	4	60
▌08-00580-04092		5°	19.8	4	0.8	1.6	–	4	60
▌08-00580-05021	R0.5	30′	30	1.49	1	2	12°	4	70
▌08-00580-05022			50	1.84	1	2	12°	4	90
▌08-00580-05023			80	2.36	1	2	12°	4	130
▌08-00580-05041		1°	30	1.98	1	2	12°	4	70
▌08-00580-05042			50	2.68	1	2	12°	4	90
▌08-00580-05043			80	3.72	1	2	12°	4	130

Regular Line
MUGEN COATING
Long Neck Type
P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Tapered Ball Coating

MUGEN COATING 2-Flute Extra Long Taper Neck Ball End Mill

Carbon Steel P ◎ | Alloy Steel P ◎ | Prehardened Steel P ◎ | Hardened Steel ~55 HRC H ○ | Stainless Steel M ○ | Aluminium Alloy N ○ | Copper N ○ | Resin O ○

Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00580-05051	R0.5	1°30′	30	2.47	1	2	12°	4	70
▌08-00580-05052			50	3.51	1	2	12°	4	90
▌08-00580-05053			80	5.09	1	2	12°	6	130
▌08-00580-05061		2°	30	2.96	1	2	12°	4	70
▌08-00580-05062			50	4.35	1	2	12°	6	90
▌08-00580-05063			73.5	6	1	2	–	6	130
▌08-00580-05081		3°	30.6	4	1	2	–	4	70
▌08-00580-05082			49.7	6	1	2	–	6	90
▌08-00580-05083			80	9.18	1	2	12°	10	130
▌08-00580-05091		5°	30.5	6	1	2	–	6	70
▌08-00580-05092			53.4	10	1	2	–	10	90
▌08-00580-06021	R0.6	30′	36	1.79	1.2	2.4	12°	4	80
▌08-00580-06022			48	2	1.2	2.4	12°	4	90
▌08-00580-06041		1°	36	2.37	1.2	2.4	12°	4	80
▌08-00580-06042			48	2.79	1.2	2.4	12°	4	90
▌08-00580-06051		1°30′	36	2.96	1.2	2.4	12°	4	80
▌08-00580-06052			48	3.59	1.2	2.4	12°	4	90
▌08-00580-06061		2°	36	3.55	1.2	2.4	12°	4	80
▌08-00580-06062			48	4.38	1.2	2.4	12°	6	90
▌08-00580-06081		3°	36	4.72	1.2	2.4	12°	6	80
▌08-00580-06082			48	6	1.2	2.4	–	6	90
▌08-00580-06092		5°	41.2	8	1.2	2.4	–	8	90
▌08-00580-07521	R0.75	30′	45	2.23	1.5	3	12°	4	90
▌08-00580-07522			60	2.49	1.5	3	12°	4	110
▌08-00580-07541		1°	45	2.97	1.5	3	12°	4	90
▌08-00580-07542			60	3.49	1.5	3	12°	4	110
▌08-00580-07551		1°30′	45	3.7	1.5	3	12°	4	90
▌08-00580-07552			60	4.49	1.5	3	12°	6	110
▌08-00580-07561		2°	45	4.43	1.5	3	12°	6	90
▌08-00580-07562			60	5.48	1.5	3	12°	6	110
▌08-00580-07581		3°	45.9	6	1.5	3	–	6	90
▌08-00580-07582			60	7.47	1.5	3	12°	8	110
▌08-00580-07591		5°	45	8.85	1.5	3	12°	10	90
▌08-00580-07592			60	11.47	1.5	3	12°	12	110
▌08-00580-10021	R1	30′	50	2.8	2	4	12°	4	100
▌08-00580-10022			80	3.33	2	4	12°	4	130
▌08-00580-10041		1°	50	3.61	2	4	12°	4	100
▌08-00580-10042			80	4.65	2	4	12°	6	130
▌08-00580-10051		1°30′	50	4.41	2	4	12°	6	100
▌08-00580-10052			80.3	6	2	4	–	6	130
▌08-00580-10061		2°	50	5.21	2	4	12°	6	100
▌08-00580-10062			80	7.31	2	4	12°	8	130

How to Order When you order, indicate MRBTN230 (R)×(θ)×(ℓ1). ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

MUGEN COATING 2-Flute Extra Long Taper Neck Ball End Mill

P Carbon Steel ◎ | P Alloy Steel ◎ | P Prehardened Steel ◎ | H ~55 HRC Hardened Steel ○ | M Stainless Steel ○ | N Aluminium Alloy ○ | N Copper ○ | O Resin ○

Unit : mm

Code No.	Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00580-10081	R1	3°	50	6.82	2	4	12°	8	100
▌08-00580-10082			80.3	10	2	4	–	10	130
▌08-00580-10091		5°	49.7	10	2	4	–	10	100
▌08-00580-15021	R1.5	30′	80	4.29	3	6	12°	6	130
▌08-00580-15041		1°	80	5.58	3	6	12°	6	130
▌08-00580-15051		1°30′	80	6.88	3	6	12°	8	130
▌08-00580-15061		2°	77.5	8	3	6	–	8	130
▌08-00580-15081		3°	72.7	10	3	6	–	10	130
▌08-00580-20021	R2	30′	80	5.26	4	8	12°	6	130
▌08-00580-20041		1°	80	6.51	4	8	12°	8	130
▌08-00580-20051		1°30′	60	6.72	4	8	12°	8	110
▌08-00580-20052			84.3	8	4	8	–	8	130
▌08-00580-20061		2°	60	7.63	4	8	12°	8	110
▌08-00580-20062			80	9.03	4	8	12°	10	130
▌08-00580-20081		3°	60	9.45	4	8	12°	10	110
▌08-00580-20082			84.3	12	4	8	–	12	130
▌08-00580-25021	R2.5	30′	50	5.7	5	10	12°	6	100
▌08-00580-25022			80	6.22	5	10	12°	8	130
▌08-00580-25041		1°	50	6.4	5	10	12°	8	100
▌08-00580-25042			80	7.44	5	10	12°	8	130
▌08-00580-25051		1°30′	50	7.09	5	10	12°	8	100
▌08-00580-25052			80	8.67	5	10	12°	10	130
▌08-00580-25061		2°	52.9	8	5	10	–	8	100
▌08-00580-25062			81.5	10	5	10	–	10	130
▌08-00580-25081		3°	57.7	10	5	10	–	10	110
▌08-00580-30041	R3	1°	69.2	8	6	12	–	8	130
▌08-00580-30051		1°30′	88.3	10	6	12	–	10	140
▌08-00580-30061		2°	69.3	10	6	12	–	10	130
▌08-00580-30081		3°	69.2	12	6	12	–	12	130
▌08-00580-40041	R4	1°	73.2	10	8	16	–	10	130
▌08-00580-40051		1°30′	80	11.35	8	16	12°	12	130
▌08-00580-40061		2°	73.2	12	8	16	–	12	130
▌08-00580-50041	R5	1°	77.2	12	10	20	–	12	130
▌08-00580-50051		1°30′	58.2	12	10	20	–	12	110

MHR230R

Size ϕ0.2 × R0.05 ～ ϕ6 × R1

≦55 HRC

MUGEN COATING 2-Flute Long Neck Radius End Mill

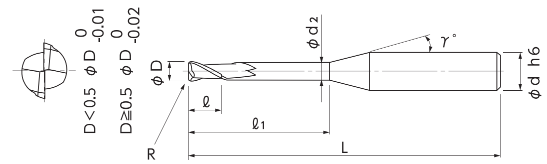
Total 387 sizes

MUGEN COATING 2-Flute Long Neck Radius End Mill

2-flute long neck corner radius end mill. Maximum L/D=20

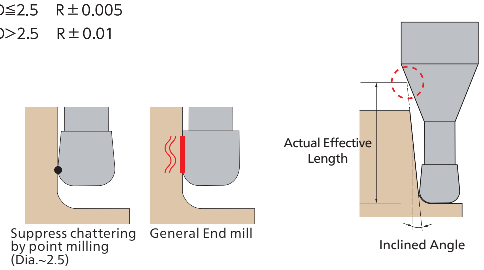
MG | 2 | 30° | Corner R ±0.005 (D≦2.5)

Side | Slot | Face



D≦2.5 R±0.005
D>2.5 R±0.01

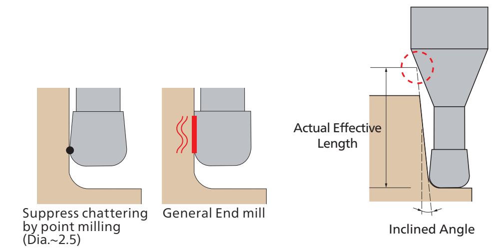
- Minimized chattering by peripheral cutting edge designed for minimal contact to work material.
- Realized high efficiency milling by obtaining larger radial depth of cutting comparing with Ball End Mill.
- Corner R accuracy : ±5μm (Dia. ～2.5)
- Better performance in wide range of machining of direct carving on Hardened Steels, Prehardened Steels and Copper Electrode.



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00221-02050	0.2	R0.05	0.5	0.15	0.18	12°	4	45	0.56	0.59	0.61	0.64	0.71
08-00220-02001			0.5				6	50	0.56	0.59	0.61	0.64	0.71
08-00221-02051			1				4	45	1.08	1.13	1.18	1.24	1.37
08-00220-02002			1				6	50	1.08	1.13	1.18	1.24	1.37
08-00221-02052			1.5				4	45	1.61	1.68	1.75	1.84	2.03
08-00221-02053			2				4	45	2.13	2.22	2.32	2.43	2.70
08-00221-03050	0.3	R0.05	1	0.25	0.28	12°	4	45	1.08	1.13	1.18	1.24	1.37
08-00220-03001			1				6	50	1.08	1.13	1.18	1.24	1.37
08-00221-03051			1.5				4	45	1.61	1.68	1.75	1.84	2.03
08-00221-03052			2				4	45	2.13	2.22	2.32	2.43	2.70
08-00220-03002			2				6	50	2.13	2.22	2.32	2.43	2.70
08-00221-03053			2.5				4	45	2.65	2.77	2.89	3.03	3.36
08-00221-03054			3				4	45	3.17	3.31	3.46	3.63	4.02
08-00221-04050	0.4	R0.05	1	0.3	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.40
08-00221-04051			1.5				4	45	1.63	1.70	1.78	1.86	2.06
08-00221-04052			2				4	45	2.15	2.25	2.35	2.46	2.73
08-00220-04005			2				6	50	2.15	2.25	2.35	2.46	2.73
08-00221-04053			3				4	45	3.19	3.34	3.49	3.66	4.05
08-00220-04006			3				6	50	3.19	3.34	3.49	3.66	4.05
08-00221-04054			4				4	45	4.24	4.43	4.63	4.86	5.38
08-00220-04007			4				6	50	4.24	4.43	4.63	4.86	5.38
08-00221-04100		R0.1	1				4	45	1.11	1.15	1.20	1.26	1.38
08-00221-04101			1.5				4	45	1.63	1.70	1.77	1.86	2.05
08-00221-04102			2				4	45	2.15	2.24	2.34	2.45	2.71
08-00220-04011			2				6	50	2.15	2.24	2.34	2.45	2.71
08-00221-04103			3				4	45	3.19	3.33	3.48	3.65	4.04
08-00220-04013			3				6	50	3.19	3.33	3.48	3.65	4.04
08-00221-04104			4				4	45	4.24	4.42	4.62	4.85	5.37
08-00220-04012			4				6	50	4.24	4.42	4.62	4.85	5.37

How to Order When you order, indicate MHR230R (D)×(R)×(ℓ1)×(d). ※(γ) is reference value.



Unit : mm

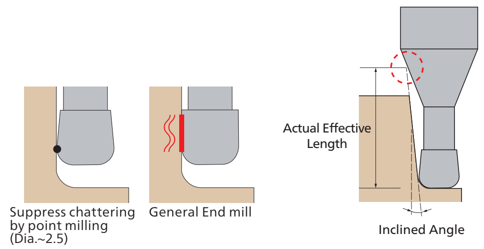
Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00221-05050	0.5	R0.05	1	0.4	0.46	12°	4	45	1.13	1.18	1.24	1.29	1.43
08-00221-05051			2				4	45	2.18	2.27	2.38	2.49	2.76
08-00220-05005			2				6	50	2.18	2.27	2.38	2.49	2.76
08-00221-05052			3				4	45	3.22	3.36	3.52	3.69	4.09
08-00220-05006			3				6	50	3.22	3.36	3.52	3.69	4.09
08-00221-05053			4				4	45	4.26	4.45	4.66	4.88	5.41
08-00220-05007			4				6	50	4.26	4.45	4.66	4.88	5.41
08-00221-05054			5				4	45	5.31	5.54	5.80	6.08	6.74
08-00220-05008			5				6	50	5.31	5.54	5.80	6.08	6.74
08-00221-05055			6				4	45	6.35	6.63	6.94	7.28	8.07
08-00221-05100		R0.1	1				4	45	1.13	1.18	1.23	1.28	1.42
08-00221-05101			2				4	45	2.17	2.27	2.37	2.48	2.74
08-00220-05011			2				6	50	2.17	2.27	2.37	2.48	2.74
08-00221-05102			3				4	45	3.22	3.36	3.51	3.68	4.07
08-00220-05013			3				6	50	3.22	3.36	3.51	3.68	4.07
08-00221-05103			4				4	45	4.26	4.45	4.65	4.87	5.40
08-00220-05012			4				6	50	4.26	4.45	4.65	4.87	5.40
08-00221-05104			5				4	45	5.30	5.54	5.79	6.07	6.72
08-00220-05014			5				6	50	5.30	5.54	5.79	6.07	6.72
08-00221-05105			6				4	45	6.35	6.63	6.93	7.27	8.05
08-00221-06050	0.6	R0.05	2	0.5	0.56	12°	4	45	2.18	2.27	2.38	2.49	2.76
08-00220-06005			2				6	50	2.18	2.27	2.38	2.49	2.76
08-00221-06051			3				4	45	3.22	3.36	3.52	3.69	4.09
08-00221-06052			4				4	45	4.26	4.45	4.66	4.88	5.41
08-00220-06007			4				6	50	4.26	4.45	4.66	4.88	5.41
08-00221-06053			6				4	45	6.35	6.63	6.94	7.28	8.07
08-00220-06009			6				6	50	6.35	6.63	6.94	7.28	8.07
08-00221-06054			8				4	50	8.43	8.81	9.22	9.67	10.72
08-00221-06100		R0.1	2				4	45	2.17	2.27	2.37	2.48	2.74
08-00221-06101			3				4	45	3.22	3.36	3.51	3.68	4.07
08-00221-06102			4				4	45	4.26	4.45	4.65	4.87	5.40
08-00220-06011			4				6	50	4.26	4.45	4.65	4.87	5.40
08-00221-06103			6				4	45	6.35	6.63	6.93	7.27	8.05
08-00220-06012			6				6	50	6.35	6.63	6.93	7.27	8.05
08-00221-06104			8				4	50	8.43	8.80	9.21	9.66	10.71
08-00221-06200		R0.2	2				4	45	2.17	2.26	2.36	2.46	2.71
08-00221-06201			3				4	45	3.21	3.35	3.50	3.66	4.04

MHR230R

MHR230R

MUGEN COATING 2-Flute Long Neck Radius End Mill

MUGEN COATING 2-Flute Long Neck Radius End Mill



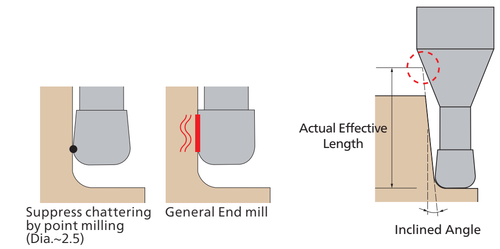
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
08-00221-06202	0.6	R0.2	4	0.5	0.56	12°	4	45	4.26	4.44	4.64	4.86	5.37
08-00221-06203			6				4	45	6.34	6.62	6.92	7.25	8.02
08-00221-06204			8				4	50	8.43	8.80	9.20	9.64	10.67
08-00221-07050	0.7	R0.05	4	0.55	0.66	12°	4	45	4.26	4.45	4.66	4.88	5.41
08-00220-07005			4				6	50	4.26	4.45	4.66	4.88	5.41
08-00221-07051			6				4	45	6.35	6.63	6.94	7.28	8.07
08-00220-07006			6				6	50	6.35	6.63	6.94	7.28	8.07
08-00221-07100		R0.1	4				4	45	4.26	4.45	4.65	4.87	5.40
08-00220-07011			4				6	50	4.26	4.45	4.65	4.87	5.40
08-00221-07101			6				4	45	6.35	6.63	6.93	7.27	8.05
08-00220-07012			6				6	50	6.35	6.63	6.93	7.27	8.05
08-00221-08050	0.8	R0.05	4	0.65	0.76	12°	4	45	4.26	4.45	4.66	4.88	5.41
08-00220-08005			4				6	50	4.26	4.45	4.66	4.88	5.41
08-00221-08051			6				4	45	6.35	6.63	6.94	7.28	8.07
08-00220-08006			6				6	50	6.35	6.63	6.94	7.28	8.07
08-00221-08052			8				4	50	8.43	8.81	9.22	9.67	10.72
08-00220-08007			8				6	50	8.43	8.81	9.22	9.67	10.72
08-00221-08100		R0.1	4				4	45	4.26	4.45	4.65	4.87	5.40
08-00220-08011			4				6	50	4.26	4.45	4.65	4.87	5.40
08-00221-08101			6				4	45	6.35	6.63	6.93	7.27	8.05
08-00220-08012			6				6	50	6.35	6.63	6.93	7.27	8.05
08-00221-08102			8				4	50	8.43	8.80	9.21	9.66	10.71
08-00220-08013			8				6	50	8.43	8.80	9.21	9.66	10.71
08-00221-08200		R0.2	4				4	45	4.26	4.44	4.64	4.86	5.37
08-00220-08021			4				6	50	4.26	4.44	4.64	4.86	5.37
08-00221-08201			6				4	45	6.34	6.62	6.92	7.25	8.02
08-00220-08022			6				6	50	6.34	6.62	6.92	7.25	8.02
08-00221-08202			8				4	50	8.43	8.80	9.20	9.64	10.67
08-00220-08023			8				6	50	8.43	8.80	9.20	9.64	10.67
08-00221-09100	0.9	R0.1	4	0.7	0.85	12°	4	45	4.28	4.47	4.68	4.90	5.43
08-00220-09011			4				6	50	4.28	4.47	4.68	4.90	5.43
08-00221-09101			8				4	50	8.46	8.83	9.24	9.69	10.74
08-00220-09012			8				6	50	8.46	8.83	9.24	9.69	10.74
08-00221-10050	1	R0.05	2	0.8	0.95	12°	4	50	2.20	2.30	2.40	2.52	2.79
08-00221-10051			3				4	50	3.24	3.39	3.54	3.72	4.12
08-00220-10001			3				6	50	3.24	3.39	3.54	3.72	4.12
08-00221-10052			4				4	50	4.29	4.48	4.68	4.91	5.44

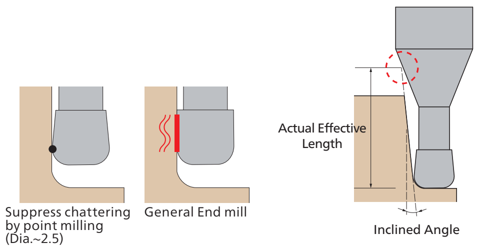
How to Order When you order, indicate MHR230R (D)×(R)×(ℓ1)×(d). ※(γ) is reference value.

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
08-00220-10002	1	R0.05	4	0.8	0.95	12°	6	50	5.33	5.57	5.82	6.11	6.77
08-00221-10053			5				4	50	5.33	5.57	5.82	6.11	6.77
08-00220-10003			5				6	50	6.37	6.66	6.97	7.31	8.10
08-00221-10054			6				4	50	6.37	6.66	6.97	7.31	8.10
08-00220-10004			6				6	50	8.46	8.83	9.25	9.70	10.75
08-00221-10055			8				4	50	8.46	8.83	9.25	9.70	10.75
08-00220-10006			8				6	50	10.54	11.01	11.53	12.09	13.41
08-00221-10056			10				4	50	10.54	11.01	11.53	12.09	13.41
08-00220-10008			10				6	50	12.63	13.19	13.81	14.49	16.06
08-00221-10057			12				4	50	12.63	13.19	13.81	14.49	16.06
08-00220-10009			12				6	50	16.80	17.55	18.37	19.27	21.37
08-00221-10058			16				4	60	20.97	21.91	22.93	24.06	26.68
08-00221-10059			20				4	60	2.20	2.29	2.40	2.51	2.77
08-00221-10100		R0.1	2				4	50	3.24	3.38	3.54	3.71	4.10
08-00221-10101			3				4	50	3.24	3.38	3.54	3.71	4.10
08-00220-10010			3				6	50	4.28	4.47	4.68	4.90	5.43
08-00221-10102			4				4	50	4.28	4.47	4.68	4.90	5.43
08-00220-10011			4				6	50	5.33	5.56	5.82	6.10	6.76
08-00221-10103			5				4	50	5.33	5.56	5.82	6.10	6.76
08-00220-10014			5				6	50	6.37	6.65	6.96	7.30	8.08
08-00221-10104			6				4	50	6.37	6.65	6.96	7.30	8.08
08-00220-10015			6				6	50	8.46	8.83	9.24	9.69	10.74
08-00221-10105			8				4	50	8.46	8.83	9.24	9.69	10.74
08-00220-10012			8				6	50	10.54	11.01	11.52	12.08	13.39
08-00221-10106			10				4	50	10.54	11.01	11.52	12.08	13.39
08-00220-10016			10				6	50	12.63	13.19	13.80	14.48	16.05
08-00221-10107			12				4	50	12.63	13.19	13.80	14.48	16.05
08-00220-10013			12				6	50	16.80	17.55	18.36	19.26	21.36
08-00221-10108			16				4	60	20.97	21.90	22.93	24.05	26.66
08-00221-10109			20				4	60	2.19	2.28	2.38	2.49	2.74
08-00221-10200		R0.2	2				4	50	3.24	3.37	3.52	3.69	4.07
08-00221-10201			3				4	50	3.24	3.37	3.52	3.69	4.07
08-00220-10024			3				6	50	4.28	4.46	4.66	4.88	5.40
08-00221-10202			4				4	50	4.28	4.46	4.66	4.88	5.40
08-00220-10021			4				6	50	5.32	5.55	5.80	6.08	6.72
08-00221-10203			5				4	50	5.32	5.55	5.80	6.08	6.72
08-00220-10025			5				6	50	5.33	5.56	5.81	6.09	6.75



MUGEN COATING 2-Flute Long Neck Radius End Mill

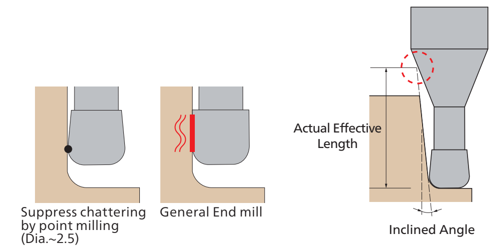


Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00221-10204	1	R0.2	6	0.8	0.95	12°	4	50	6.37	6.64	6.94	7.28	8.05
08-00220-10026			6				6	50	6.37	6.64	6.94	7.28	8.05
08-00221-10205			8				4	50	8.45	8.82	9.23	9.67	10.71
08-00220-10022			8				6	50	8.45	8.82	9.23	9.67	10.71
08-00221-10206			10				4	50	10.54	11.00	11.51	12.06	13.36
08-00220-10027			10				6	50	10.54	11.00	11.51	12.06	13.36
08-00221-10207			12				4	50	12.62	13.18	13.79	14.46	16.01
08-00220-10023			12				6	50	12.62	13.18	13.79	14.46	16.01
08-00221-10208			16				4	60	16.79	17.54	18.35	19.24	21.32
08-00221-10209			20				4	60	20.97	21.89	22.91	24.03	26.63
08-00221-10300		R0.3	2				4	50	2.19	2.28	2.37	2.47	2.71
08-00221-10301			3				4	50	3.23	3.36	3.51	3.67	4.04
08-00220-10034			3				6	50	3.23	3.36	3.51	3.67	4.04
08-00221-10302			4				4	50	4.28	4.45	4.65	4.86	5.36
08-00220-10031			4				6	50	4.28	4.45	4.65	4.86	5.36
08-00221-10303			5				4	50	5.32	5.54	5.79	6.06	6.69
08-00220-10035			5				6	50	5.32	5.54	5.79	6.06	6.69
08-00221-10304			6				4	50	6.36	6.63	6.93	7.26	8.02
08-00220-10036			6				6	50	6.36	6.63	6.93	7.26	8.02
08-00221-10305			8				4	50	8.45	8.81	9.21	9.65	10.67
08-00220-10032			8				6	50	8.45	8.81	9.21	9.65	10.67
08-00221-10306			10				4	50	10.53	10.99	11.49	12.04	13.33
08-00220-10037			10				6	50	10.53	10.99	11.49	12.04	13.33
08-00221-10307			12				4	50	12.62	13.17	13.77	14.44	15.98
08-00220-10033			12				6	50	12.62	13.17	13.77	14.44	15.98
08-00221-10308			16				4	60	16.79	17.53	18.34	19.22	21.29
08-00221-10309			20				4	60	20.96	21.89	22.90	24.01	26.60
08-00220-12011	1.2	R0.1	5	1	1.14	12°	6	50	5.35	5.59	5.84	6.13	6.79
08-00221-12100			6				4	50	6.39	6.68	6.99	7.32	8.11
08-00221-12101			8				4	50	8.48	8.86	9.27	9.72	10.77
08-00221-12102			10				4	50	10.57	11.03	11.55	12.11	13.42
08-00220-12013			10				6	50	10.57	11.03	11.55	12.11	13.42
08-00221-12103			12				4	50	12.65	13.21	13.83	14.50	16.08
08-00220-12015			15				6	60	15.78	16.48	17.25	18.09	20.06
08-00221-12104			16				4	60	16.82	17.57	18.39	19.29	21.39
08-00221-12105			20				4	60	20.99	21.93	22.95	24.08	26.70
08-00220-12021		R0.2	5				6	50	5.35	5.58	5.83	6.11	6.75

How to Order　When you order, indicate MHR230R (D)×(R)×(ℓ1)×(d).　※(γ) is reference value.

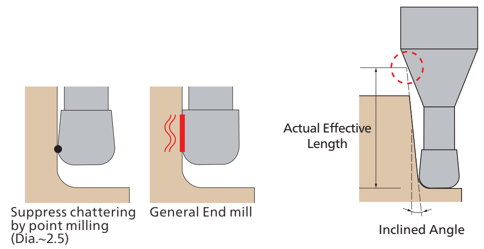
MUGEN COATING 2-Flute Long Neck Radius End Mill



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00221-12200	1.2	R0.2	6	1	1.14	12°	4	50	6.39	6.67	6.97	7.30	8.08
08-00221-12201			8				4	50	8.48	8.85	9.25	9.70	10.74
08-00221-12202			10				4	50	10.56	11.03	11.53	12.09	13.39
08-00220-12022			10				6	50	10.56	11.03	11.53	12.09	13.39
08-00221-12203			12				4	50	12.65	13.20	13.81	14.48	16.05
08-00220-12023			15				6	60	15.78	16.47	17.24	18.07	20.03
08-00221-12204			16				4	60	16.82	17.56	18.38	19.27	21.35
08-00221-12205			20				4	60	20.99	21.92	22.94	24.06	26.66
08-00220-12031		R0.3	5				6	50	5.34	5.57	5.82	6.09	6.72
08-00221-12300			6				4	50	6.39	6.66	6.96	7.29	8.05
08-00221-12301			8				4	50	8.47	8.84	9.24	9.68	10.70
08-00221-12302			10				4	50	10.56	11.02	11.52	12.07	13.36
08-00220-12032			10				6	50	10.56	11.02	11.52	12.07	13.36
08-00221-12303			12				4	50	12.64	13.20	13.80	14.46	16.01
08-00220-12033			15				6	60	15.77	16.46	17.22	18.05	20.00
08-00221-12304			16				4	60	16.81	17.55	18.36	19.25	21.32
08-00221-12305			20				4	60	20.99	21.91	22.92	24.04	26.63
08-00221-15100	1.5	R0.1	4	1.2	1.45	12°	4	50	4.28	4.47	4.68	4.90	5.43
08-00221-15101			6				4	50	6.37	6.65	6.96	7.30	8.08
08-00220-15011			6				6	50	6.37	6.65	6.96	7.30	8.08
08-00221-15102			8				4	50	8.46	8.83	9.24	9.69	10.74
08-00221-15103			10				4	50	10.54	11.01	11.52	12.08	13.39
08-00221-15104			12				4	50	12.63	13.19	13.80	14.48	16.05
08-00220-15013			12				6	50	12.63	13.19	13.80	14.48	16.05
08-00221-15105			16				4	60	16.80	17.55	18.36	19.26	21.36
08-00221-15106			18				4	60	18.88	19.72	20.64	21.65	Free
08-00220-15015			18				6	60	18.88	19.72	20.64	21.65	24.01
08-00221-15107			20				4	60	20.97	21.90	22.93	24.05	Free
08-00221-15200		R0.2	4				4	50	4.28	4.46	4.66	4.88	5.40
08-00221-15201			6				4	50	6.37	6.64	6.94	7.28	8.05
08-00220-15021			6				6	50	6.37	6.64	6.94	7.28	8.05
08-00221-15202			8				4	50	8.45	8.82	9.23	9.67	10.71
08-00221-15203			10				4	50	10.54	11.00	11.51	12.06	13.36
08-00221-15204			12				4	50	12.62	13.18	13.79	14.46	16.01
08-00220-15023			12				6	50	12.62	13.18	13.79	14.46	16.01
08-00221-15205			16				4	60	16.79	17.54	18.35	19.24	21.32
08-00221-15206			18				4	60	18.88	19.72	20.63	21.64	23.98

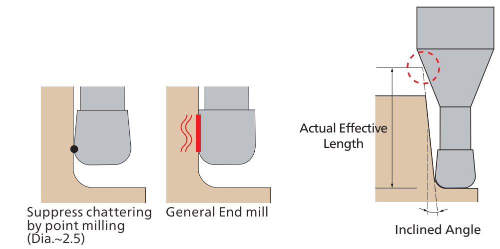
MUGEN COATING 2-Flute Long Neck Radius End Mill



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00220-15025	1.5	R0.2	18	1.2	1.45	12°	6	60	18.89	19.73	20.65	21.67	24.05
08-00221-15207	1.5	R0.2	20	1.2	1.45	12°	4	60	20.97	21.91	22.93	24.06	26.71
08-00221-15300	1.5	R0.3	4	1.2	1.45	12°	4	50	4.28	4.46	4.66	4.87	5.38
08-00221-15301	1.5	R0.3	6	1.2	1.45	12°	4	50	6.37	6.64	6.94	7.27	8.04
08-00220-15031	1.5	R0.3	6	1.2	1.45	12°	6	50	6.37	6.64	6.94	7.27	8.04
08-00221-15302	1.5	R0.3	8	1.2	1.45	12°	4	50	8.45	8.82	9.22	9.67	10.71
08-00221-15303	1.5	R0.3	10	1.2	1.45	12°	4	50	10.54	11.00	11.51	12.06	13.37
08-00221-15304	1.5	R0.3	12	1.2	1.45	12°	4	50	12.62	13.18	13.79	14.46	16.03
08-00220-15032	1.5	R0.3	12	1.2	1.45	12°	6	50	12.62	13.18	13.79	14.46	16.03
08-00221-15305	1.5	R0.3	16	1.2	1.45	12°	4	60	16.80	17.54	18.35	19.25	21.35
08-00221-15306	1.5	R0.3	18	1.2	1.45	12°	4	60	18.88	19.72	20.64	21.65	24.01
08-00220-15033	1.5	R0.3	18	1.2	1.45	12°	6	60	18.88	19.72	20.64	21.65	24.01
08-00221-15307	1.5	R0.3	20	1.2	1.45	12°	4	60	20.97	21.90	22.92	24.04	26.68
08-00221-15500	1.5	R0.5	4	1.2	1.45	12°	4	50	4.27	4.44	4.63	4.83	5.32
08-00221-15501	1.5	R0.5	6	1.2	1.45	12°	4	50	6.36	6.62	6.91	7.23	7.98
08-00220-15051	1.5	R0.5	6	1.2	1.45	12°	6	50	6.36	6.62	6.91	7.23	7.98
08-00221-15502	1.5	R0.5	8	1.2	1.45	12°	4	50	8.44	8.80	9.19	9.63	10.64
08-00221-15503	1.5	R0.5	10	1.2	1.45	12°	4	50	10.53	10.98	11.48	12.02	13.30
08-00221-15504	1.5	R0.5	12	1.2	1.45	12°	4	50	12.62	13.16	13.76	14.42	15.96
08-00220-15052	1.5	R0.5	12	1.2	1.45	12°	6	50	12.62	13.16	13.76	14.42	15.96
08-00221-15505	1.5	R0.5	16	1.2	1.45	12°	4	60	16.79	17.52	18.32	19.21	21.29
08-00221-15506	1.5	R0.5	18	1.2	1.45	12°	4	60	18.87	19.70	20.61	21.61	23.95
08-00220-15053	1.5	R0.5	18	1.2	1.45	12°	6	60	18.87	19.70	20.61	21.61	23.95
08-00221-15507	1.5	R0.5	20	1.2	1.45	12°	4	60	20.96	21.88	22.89	24.00	26.61
08-00221-20100	2	R0.1	4	1.6	1.91	12°	4	50	4.31	4.50	4.71	4.94	5.48
08-00221-20101	2	R0.1	6	1.6	1.91	12°	4	50	6.40	6.68	7.00	7.34	8.14
08-00221-20102	2	R0.1	8	1.6	1.91	12°	4	50	8.49	8.86	9.28	9.73	10.80
08-00220-20011	2	R0.1	8	1.6	1.91	12°	6	50	8.49	8.86	9.28	9.73	10.80
08-00221-20103	2	R0.1	10	1.6	1.91	12°	4	50	10.57	11.04	11.56	12.13	13.47
08-00221-20104	2	R0.1	12	1.6	1.91	12°	4	50	12.66	13.22	13.84	14.53	16.13
08-00220-20014	2	R0.1	12	1.6	1.91	12°	6	50	12.66	13.22	13.84	14.53	16.13
08-00221-20105	2	R0.1	16	1.6	1.91	12°	4	60	16.83	17.58	18.41	19.32	21.45
08-00220-20012	2	R0.1	16	1.6	1.91	12°	6	60	16.83	17.58	18.41	19.32	21.45
08-00221-20106	2	R0.1	20	1.6	1.91	12°	4	60	21.00	21.94	22.97	24.11	26.77
08-00220-20015	2	R0.1	20	1.6	1.91	12°	6	60	21.00	21.94	22.97	24.11	26.77
08-00221-20107	2	R0.1	24	1.6	1.91	12°	4	70	25.17	26.30	27.54	28.90	32.10
08-00220-20013	2	R0.1	24	1.6	1.91	12°	6	70	25.17	26.30	27.54	28.90	32.10

How to Order When you order, indicate MHR230R (D)×(R)×(ℓ1)×(d). ※(γ) is reference value.

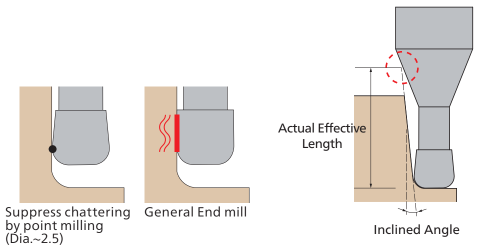


Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00221-20108	2	R0.1	26	1.6	1.91	12°	4	70	27.32	28.54	29.88	Free	Free
08-00221-20109	2	R0.1	30	1.6	1.91	12°	4	70	31.50	32.90	34.44	Free	Free
08-00221-20200	2	R0.2	4	1.6	1.91	12°	4	50	4.38	4.57	4.77	5.00	5.52
08-00221-20201	2	R0.2	6	1.6	1.91	12°	4	50	6.46	6.74	7.05	7.39	8.18
08-00221-20202	2	R0.2	8	1.6	1.91	12°	4	50	8.55	8.92	9.33	9.78	10.83
08-00220-20021	2	R0.2	8	1.6	1.91	12°	6	50	8.55	8.92	9.33	9.78	10.83
08-00221-20203	2	R0.2	10	1.6	1.91	12°	4	50	10.64	11.10	11.61	12.18	13.48
08-00221-20204	2	R0.2	12	1.6	1.91	12°	4	50	12.72	13.28	13.89	14.57	16.14
08-00220-20023	2	R0.2	12	1.6	1.91	12°	6	50	12.72	13.28	13.89	14.57	16.14
08-00221-20205	2	R0.2	16	1.6	1.91	12°	4	60	16.89	17.64	18.46	19.36	Free
08-00220-20025	2	R0.2	16	1.6	1.91	12°	6	60	16.89	17.64	18.46	19.36	21.45
08-00221-20206	2	R0.2	20	1.6	1.91	12°	4	60	21.06	22.00	23.02	24.14	Free
08-00220-20027	2	R0.2	20	1.6	1.91	12°	6	60	21.06	22.00	23.02	24.14	26.76
08-00221-20207	2	R0.2	24	1.6	1.91	12°	4	70	25.23	26.36	27.58	Free	Free
08-00220-20029	2	R0.2	24	1.6	1.91	12°	6	70	25.23	26.36	27.58	28.93	32.07
08-00221-20208	2	R0.2	26	1.6	1.91	12°	4	70	27.32	28.53	29.86	Free	Free
08-00221-20209	2	R0.2	30	1.6	1.91	12°	4	70	31.49	32.89	34.42	Free	Free
08-00221-20300	2	R0.3	4	1.6	1.91	12°	4	50	4.37	4.56	4.76	4.98	5.49
08-00221-20301	2	R0.3	6	1.6	1.91	12°	4	50	6.46	6.74	7.04	7.37	8.14
08-00221-20302	2	R0.3	8	1.6	1.91	12°	4	50	8.55	8.91	9.32	9.76	10.80
08-00220-20031	2	R0.3	8	1.6	1.91	12°	6	50	8.55	8.91	9.32	9.76	10.80
08-00221-20303	2	R0.3	10	1.6	1.91	12°	4	50	10.63	11.09	11.60	12.16	13.45
08-00221-20304	2	R0.3	12	1.6	1.91	12°	4	50	12.72	13.27	13.88	14.55	16.11
08-00220-20034	2	R0.3	12	1.6	1.91	12°	6	50	12.72	13.27	13.88	14.55	16.11
08-00221-20305	2	R0.3	16	1.6	1.91	12°	4	60	16.89	17.63	18.44	19.34	Free
08-00220-20032	2	R0.3	16	1.6	1.91	12°	6	60	16.89	17.63	18.44	19.34	21.42
08-00221-20306	2	R0.3	20	1.6	1.91	12°	4	60	21.06	21.99	23.00	24.12	Free
08-00220-20035	2	R0.3	20	1.6	1.91	12°	6	60	21.06	21.99	23.00	24.12	26.73
08-00221-20307	2	R0.3	24	1.6	1.91	12°	4	70	25.23	26.35	27.57	28.91	Free
08-00220-20033	2	R0.3	24	1.6	1.91	12°	6	70	25.23	26.35	27.57	28.91	32.03
08-00221-20308	2	R0.3	26	1.6	1.91	12°	4	70	27.32	28.53	29.85	Free	Free
08-00221-20309	2	R0.3	30	1.6	1.91	12°	4	70	31.49	32.88	34.41	Free	Free
08-00221-20500	2	R0.5	4	1.6	1.91	12°	4	50	4.37	4.54	4.73	4.94	5.43
08-00221-20501	2	R0.5	6	1.6	1.91	12°	4	50	6.45	6.72	7.01	7.33	8.08
08-00221-20502	2	R0.5	8	1.6	1.91	12°	4	50	8.54	8.90	9.29	9.72	10.73
08-00220-20051	2	R0.5	8	1.6	1.91	12°	6	50	8.54	8.90	9.29	9.72	10.73
08-00221-20503	2	R0.5	10	1.6	1.91	12°	4	50	10.62	11.08	11.57	12.12	13.39

MHR230R

MUGEN COATING 2-Flute Long Neck Radius End Mill



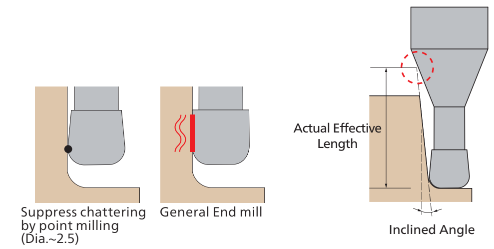
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00221-20504	2	R0.5	12	1.6	1.91	12°	4	50	12.71	13.25	13.85	14.51	16.04
08-00220-20054			12				6	50	12.71	13.25	13.85	14.51	16.04
08-00221-20505			16				4	60	16.88	17.61	18.42	19.30	Free
08-00220-20052			16				6	60	16.88	17.61	18.42	19.30	21.35
08-00221-20506			20				4	60	21.05	21.97	22.98	24.08	Free
08-00220-20055			20				6	60	21.05	21.97	22.98	24.08	26.66
08-00221-20507			24				4	70	25.22	26.33	27.54	28.87	Free
08-00220-20053			24				6	70	25.22	26.33	27.54	28.87	31.97
08-00221-20508			26				4	70	27.31	28.51	29.82	Free	Free
08-00221-20509			30				4	70	31.48	32.87	34.38	Free	Free
08-00221-25100	2.5	R0.1	10	2	2.39	12°	4	50	10.69	11.16	11.68	12.25	13.58
08-00220-25011			10				6	50	10.69	11.16	11.68	12.25	13.58
08-00221-25101			20				4	60	21.12	22.06	23.09	Free	Free
08-00220-25013			20				6	60	21.12	22.06	23.09	24.22	26.85
08-00221-25102			30				4	70	31.55	32.95	Free	Free	Free
08-00220-25015			30				6	70	31.55	32.95	34.49	36.18	Free
08-00221-25200		R0.2	10				4	50	10.68	11.15	11.67	12.23	13.55
08-00220-25021			10				6	50	10.68	11.15	11.67	12.23	13.55
08-00221-25201			20				4	60	21.11	22.05	23.07	Free	Free
08-00220-25023			20				6	60	21.11	22.05	23.07	24.20	26.82
08-00221-25202			30				4	70	31.54	32.94	Free	Free	Free
08-00220-25025			30				6	70	31.54	32.94	34.48	36.16	Free
08-00221-25300		R0.3	10				4	50	10.68	11.14	11.65	12.21	13.52
08-00220-25031			10				6	50	10.68	11.14	11.65	12.21	13.52
08-00221-25301			20				4	60	21.11	22.04	23.06	Free	Free
08-00220-25032			20				6	60	21.11	22.04	23.06	24.18	26.79
08-00221-25302			30				4	70	31.54	32.93	Free	Free	Free
08-00220-25033			30				6	70	31.54	32.93	34.46	36.14	Free
08-00221-25500		R0.5	10				4	50	10.67	11.13	11.63	12.17	13.45
08-00220-25051			10				6	50	10.67	11.13	11.63	12.17	13.45
08-00221-25501			20				4	60	21.10	22.02	23.03	Free	Free
08-00220-25052			20				6	60	21.10	22.02	23.03	24.14	26.72
08-00221-25502			30				4	70	31.53	32.92	Free	Free	Free
08-00220-25053			30				6	70	31.53	32.92	34.44	36.11	Free

How to Order When you order, indicate MHR230R (D)×(R)×(ℓ1)×(d). ※(γ) is reference value.

MHR230R

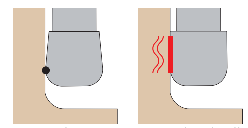
MUGEN COATING 2-Flute Long Neck Radius End Mill



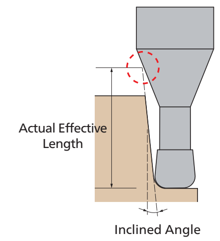
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00220-30011	3	R0.1	12	4.5	2.85	12°	6	50	12.87	13.44	14.07	14.76	16.36
08-00220-30013			18				6	60	19.13	19.98	20.91	21.94	24.32
08-00220-30015			24				6	70	25.39	26.52	27.76	29.12	Free
08-00220-30017			30				6	70	31.64	33.05	34.60	36.30	Free
08-00220-30019			36				6	80	37.90	39.59	41.44	Free	Free
08-00220-30021		R0.2	12				6	50	12.87	13.44	14.06	14.74	16.33
08-00220-30023			18				6	60	19.13	19.97	20.90	21.92	24.29
08-00220-30025			24				6	70	25.38	26.51	27.74	29.10	Free
08-00220-30027			30				6	70	31.64	33.05	34.58	36.28	Free
08-00220-30029			36				6	80	37.90	39.58	41.43	Free	Free
08-00220-30031		R0.3	12				6	50	12.86	13.43	14.04	14.72	16.29
08-00220-30034			18				6	60	19.12	19.96	20.88	21.90	24.26
08-00220-30032			24				6	70	25.38	26.50	27.73	29.08	Free
08-00220-30035			30				6	70	31.63	33.04	34.57	36.26	Free
08-00220-30033			36				6	80	37.89	39.57	41.41	Free	Free
08-00220-30051		R0.5	12				6	50	12.86	13.41	14.01	14.68	16.23
08-00220-30054			18				6	60	19.11	19.95	20.86	21.86	24.19
08-00220-30052			24				6	70	25.37	26.48	27.70	29.04	Free
08-00220-30055			30				6	70	31.63	33.02	34.54	36.22	Free
08-00220-30053			36				6	80	37.88	39.56	41.39	43.40	Free
08-00220-30101		R1	12				6	50	12.83	13.36	13.94	14.58	16.07
08-00220-30104			18				6	60	19.09	19.90	20.79	21.76	24.04
08-00220-30102			24				6	70	25.35	26.44	27.63	28.94	Free
08-00220-30105			30				6	70	31.60	32.97	34.47	36.12	Free
08-00220-30103			36				6	80	37.86	39.51	41.32	43.30	Free
08-00220-40011	4	R0.1	16	6	3.8	12°	6	60	17.17	17.93	18.77	19.68	Free
08-00220-40013			24				6	70	25.51	26.65	27.89	Free	Free
08-00220-40015			32				6	70	33.85	35.36	37.01	Free	Free
08-00220-40017			48				6	100	50.54	52.79	Free	Free	Free
08-00220-40021		R0.2	16				6	60	17.16	17.92	18.75	19.66	Free
08-00220-40023			24				6	70	25.50	26.64	27.88	Free	Free
08-00220-40025			32				6	70	33.85	35.35	37.00	Free	Free
08-00220-40027			48				6	100	50.53	52.78	Free	Free	Free
08-00220-40031		R0.3	16				6	60	17.16	17.91	18.74	19.65	Free
08-00220-40034			24				6	70	25.50	26.63	27.86	Free	Free
08-00220-40032			32				6	70	33.84	35.34	36.99	Free	Free
08-00220-40033			48				6	100	50.53	52.78	Free	Free	Free

MUGEN COATING 2-Flute Long Neck Radius End Mill



Suppress chattering by point milling (Dia.~2.5)　General End mill



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
08-00220-40051	4	R0.5	16	6	3.8	12°	6	60	17.15	17.89	18.71	19.61	Free
08-00220-40054			24				6	70	25.49	26.61	27.83	Free	Free
08-00220-40052			32				6	70	33.83	35.33	36.96	Free	Free
08-00220-40053			48				6	100	50.52	52.76	Free	Free	Free
08-00220-40101		R1	16				6	60	17.13	17.85	18.64	19.51	Free
08-00220-40104			24				6	70	25.47	26.57	27.77	29.08	Free
08-00220-40102			32				6	70	33.81	35.28	36.89	Free	Free
08-00220-40103			48				6	100	50.50	52.71	Free	Free	Free
08-00220-50011	5	R0.1	20	7.5	4.8	12°	6	70	21.34	22.29	Free	Free	Free
08-00220-50013			40				6	90	42.19	Free	Free	Free	Free
08-00220-50021		R0.2	20				6	70	21.33	22.28	Free	Free	Free
08-00220-50023			40				6	90	42.19	Free	Free	Free	Free
08-00220-50031		R0.3	20				6	70	21.33	22.27	Free	Free	Free
08-00220-50032			40				6	90	42.19	Free	Free	Free	Free
08-00220-50051		R0.5	20				6	70	21.32	22.25	Free	Free	Free
08-00220-50052			40				6	90	42.18	Free	Free	Free	Free
08-00220-50101		R1	20				6	70	21.30	22.21	Free	Free	Free
08-00220-50102			40				6	90	42.16	Free	Free	Free	Free
08-00220-60011	6	R0.1	24	9	5.8	–	6	90	Free	Free	Free	Free	Free
08-00220-60013			48				6	110	Free	Free	Free	Free	Free
08-00220-60021		R0.2	24				6	90	Free	Free	Free	Free	Free
08-00220-60023			48				6	110	Free	Free	Free	Free	Free
08-00220-60031		R0.3	24				6	90	Free	Free	Free	Free	Free
08-00220-60032			48				6	110	Free	Free	Free	Free	Free
08-00220-60051		R0.5	24				6	90	Free	Free	Free	Free	Free
08-00220-60052			48				6	110	Free	Free	Free	Free	Free
08-00220-60101		R1	24				6	90	Free	Free	Free	Free	Free
08-00220-60102			48				6	110	Free	Free	Free	Free	Free

How to Order When you order, indicate MHR230R (D)×(R)×(ℓ1)×(d).　※(γ) is reference value.

MHR230R

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Aluminium Alloy・Copper			
Dia.	Corner Radius	Under Neck Length	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Depth of Cut ae mm
0.2	0.05	0.5	30,000	200	0.01	0.05	30,000	150	0.003	0.04	30,000	250	0.012	0.05
		1	30,000	150	0.007	0.05	30,000	100	0.003	0.04	30,000	200	0.008	0.05
		1.5	30,000	100	0.005	0.05	30,000	80	0.002	0.04	30,000	135	0.006	0.05
		2	30,000	50	0.003	0.05	30,000	50	0.002	0.04	30,000	75	0.004	0.05
0.3	0.05	1	30,000	200	0.02	0.1	30,000	180	0.003	0.08	30,000	300	0.024	0.1
		1.5	30,000	180	0.015	0.1	30,000	130	0.003	0.08	30,000	260	0.018	0.1
		2	30,000	150	0.01	0.1	30,000	100	0.003	0.08	30,000	250	0.012	0.1
		2.5	30,000	120	0.007	0.1	25,000	80	0.002	0.08	30,000	240	0.008	0.1
		3	30,000	100	0.005	0.1	25,000	50	0.002	0.08	30,000	220	0.006	0.1
0.4	0.05 0.1	1	30,000	350	0.025	0.12	30,000	300	0.005	0.1	30,000	450	0.03	0.12
		1.5	30,000	300	0.022	0.12	30,000	270	0.005	0.1	30,000	400	0.027	0.12
		2	30,000	250	0.02	0.12	25,000	180	0.005	0.1	30,000	360	0.024	0.12
		3	30,000	220	0.015	0.12	25,000	150	0.004	0.1	30,000	300	0.018	0.12
		4	25,000	160	0.01	0.12	20,000	100	0.003	0.1	30,000	240	0.012	0.12
0.5	0.05 0.1	1	30,000	500	0.03	0.14	25,000	400	0.01	0.12	30,000	650	0.036	0.14
		2	30,000	400	0.025	0.14	25,000	300	0.01	0.12	30,000	600	0.03	0.14
		3	30,000	340	0.02	0.14	25,000	250	0.008	0.12	30,000	480	0.024	0.14
		4	25,000	280	0.015	0.14	20,000	180	0.005	0.12	30,000	430	0.018	0.14
		5	25,000	230	0.01	0.14	20,000	150	0.004	0.12	30,000	360	0.012	0.14
		6	20,000	180	0.008	0.14	16,000	100	0.003	0.12	25,000	270	0.01	0.14
0.6	0.05 0.1 0.2	2	30,000	600	0.035	0.16	25,000	400	0.02	0.13	30,000	800	0.04	0.16
		3	30,000	500	0.03	0.16	25,000	350	0.015	0.13	30,000	750	0.035	0.16
		4	25,000	400	0.025	0.16	20,000	250	0.015	0.13	30,000	650	0.03	0.16
		6	20,000	250	0.015	0.16	16,000	150	0.008	0.13	25,000	400	0.018	0.16
		8	18,000	180	0.01	0.16	14,000	100	0.005	0.13	20,000	300	0.012	0.16
0.7	0.05 0.1	4	25,000	600	0.03	0.2	20,000	400	0.02	0.16	30,000	1,000	0.04	0.2
		6	20,000	450	0.02	0.2	16,000	250	0.01	0.16	25,000	700	0.025	0.2
0.8	0.05 0.1 0.2	4	25,000	1,000	0.045	0.25	20,000	600	0.025	0.2	30,000	1,400	0.055	0.25
		6	20,000	700	0.03	0.25	16,000	400	0.02	0.2	25,000	1,000	0.04	0.25
		8	18,000	400	0.02	0.25	14,000	250	0.01	0.2	22,000	600	0.025	0.25
0.9	0.1	4	25,000	1,100	0.05	0.3	20,000	700	0.03	0.24	30,000	1,500	0.06	0.3
		8	18,000	500	0.03	0.3	14,000	350	0.01	0.24	22,000	800	0.04	0.3
1	0.05 0.1 0.2 0.3	2	25,000	1,600	0.065	0.35	20,000	900	0.05	0.28	30,000	2,200	0.08	0.35
		3	25,000	1,500	0.06	0.35	20,000	850	0.05	0.28	30,000	2,100	0.07	0.35
		4	25,000	1,400	0.055	0.35	20,000	800	0.04	0.28	30,000	2,000	0.065	0.35
		5	22,000	1,200	0.05	0.35	18,000	700	0.03	0.28	27,000	1,700	0.06	0.35
		6	20,000	1,000	0.045	0.35	16,000	600	0.02	0.28	25,000	1,500	0.055	0.35
		8	18,000	700	0.035	0.35	14,000	450	0.02	0.28	22,000	1,000	0.045	0.35
		10	16,000	600	0.025	0.35	13,000	350	0.01	0.28	20,000	800	0.03	0.35
		12	14,000	350	0.02	0.35	12,000	250	0.008	0.28	18,000	600	0.025	0.35
		16	12,000	250	0.01	0.35	10,000	150	0.005	0.28	14,000	350	0.012	0.35
		20	11,000	150	0.005	0.35	9,000	100	0.003	0.28	13,000	250	0.006	0.35
1.2	0.1 0.2 0.3	5	22,000	1,500	0.055	0.4	18,000	850	0.03	0.32	26,000	2,200	0.065	0.4
		6	20,000	1,300	0.05	0.4	17,000	750	0.03	0.32	25,000	2,000	0.06	0.4
		8	18,000	1,100	0.04	0.4	15,000	600	0.025	0.32	22,000	1,600	0.05	0.4
		10	16,000	900	0.03	0.4	13,000	500	0.02	0.32	20,000	1,400	0.04	0.4
		12	14,000	700	0.025	0.4	11,000	400	0.015	0.32	17,000	1,000	0.03	0.4
		15	12,000	360	0.018	0.4	10,000	210	0.01	0.32	14,000	520	0.022	0.4
		16	12,000	350	0.015	0.4	10,000	200	0.008	0.32	14,000	500	0.02	0.4
		20	10,000	230	0.01	0.4	8,000	150	0.005	0.32	12,000	330	0.012	0.4

MHR230R

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Aluminium Alloy・Copper			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
1.5	0.1 0.2 0.3 0.5	4	22,000	1,600	0.09	0.45	18,000	1,000	0.05	0.36	26,000	2,300	0.1	0.45
		6	20,000	1,400	0.08	0.45	16,000	850	0.045	0.36	24,000	2,000	0.09	0.45
		8	18,000	1,200	0.07	0.45	15,000	700	0.04	0.36	22,000	1,800	0.08	0.45
		10	16,000	1,000	0.06	0.45	13,000	550	0.035	0.36	20,000	1,500	0.07	0.45
		12	14,000	800	0.05	0.45	11,000	450	0.03	0.36	17,000	1,200	0.06	0.45
		16	12,000	600	0.035	0.45	10,000	350	0.018	0.36	15,000	900	0.04	0.45
		18	11,000	450	0.03	0.45	9,000	280	0.01	0.36	13,000	650	0.035	0.45
		20	10,000	300	0.02	0.45	8,000	200	0.005	0.36	12,000	450	0.025	0.45
2	0.1 0.2 0.3 0.5	4	16,000	2,200	0.13	0.5	14,000	1,000	0.06	0.4	20,000	3,000	0.15	0.5
		6	16,000	2,100	0.12	0.5	14,000	900	0.055	0.4	20,000	2,800	0.14	0.5
		8	16,000	2,000	0.11	0.5	13,000	800	0.05	0.4	20,000	2,600	0.13	0.5
		10	16,000	1,800	0.1	0.5	13,000	750	0.045	0.4	20,000	2,300	0.12	0.5
		12	14,000	1,500	0.09	0.5	11,000	600	0.04	0.4	17,000	1,900	0.11	0.5
		16	12,000	1,200	0.07	0.5	10,000	500	0.03	0.4	15,000	1,600	0.085	0.5
		20	10,000	800	0.05	0.5	8,000	350	0.02	0.4	12,000	1,000	0.06	0.5
		24	9,000	700	0.03	0.5	7,000	280	0.01	0.4	11,000	900	0.04	0.5
		26	9,000	600	0.025	0.5	7,000	250	0.008	0.4	11,000	850	0.03	0.5
		30	8,000	400	0.02	0.5	6,400	200	0.005	0.4	9,000	550	0.025	0.5
2.5	0.1 0.2 0.3 0.5	10	13,000	1,800	0.14	0.8	11,000	900	0.07	0.65	16,000	3,000	0.17	0.8
		20	9,000	1,000	0.08	0.8	7,000	450	0.05	0.65	11,000	1,600	0.1	0.8
		30	7,000	500	0.03	0.8	5,600	250	0.01	0.65	8,500	850	0.035	0.8
3	0.1 0.2 0.3 0.5 1	12	11,000	1,800	0.16	0.9	9,000	900	0.08	0.75	13,000	3,000	0.2	0.9
		18	10,000	1,400	0.12	0.9	8,000	700	0.07	0.75	12,000	2,400	0.14	0.9
		24	8,000	1,000	0.08	0.9	6,400	500	0.05	0.75	10,000	1,800	0.1	0.9
		30	7,000	800	0.06	0.9	5,600	400	0.03	0.75	8,500	1,300	0.07	0.9
		36	6,000	500	0.03	0.9	4,800	300	0.01	0.75	7,200	1,000	0.04	0.9
4	0.1 0.2 0.3 0.5 1	16	8,000	2,000	0.2	1.2	6,400	850	0.1	1	10,000	3,200	0.3	1.2
		24	7,000	1,500	0.12	1.2	5,600	700	0.08	1	8,500	2,400	0.18	1.2
		32	6,000	800	0.08	1.2	4,800	500	0.04	1	8,000	1,800	0.14	1.2
		48	4,000	400	0.04	1.2	3,200	300	0.01	1	4,800	700	0.05	1.2

MHR230R

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (~55HRC)				Copper・Aluminium Alloy			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
5	0.1 0.2 0.3 0.5 1	20	6,000	1,800	0.25	1.6	4,800	800	0.1	1.3	7,200	3,000	0.36	1.6
		40	4,000	700	0.07	1.6	3,200	400	0.05	1.3	4,800	1,300	0.16	1.6
6	0.1 0.2 0.3 0.5 1	24	4,500	1,500	0.3	2.1	3,600	700	0.15	1.7	5,400	2,600	0.48	2.1
		48	3,000	600	0.1	2.1	2,400	350	0.05	1.7	3,600	1,000	0.18	2.1

Notes

※1 Adjust milling conditions according to milling shape and machine type.
※2 ap : Axial Depth of Cut, ae : Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Recommend to apply helical or ramping for approaching into axial direction.
※5 Adjust feed rate 50% lower and cutting depth (ae) 30% lower for milling deep wall area when L/D exceeds 8 for stable milling.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

MHR430R

Size ϕ1 × R0.05 ～ ϕ6 × R1

≦55 HRC

MHR430R

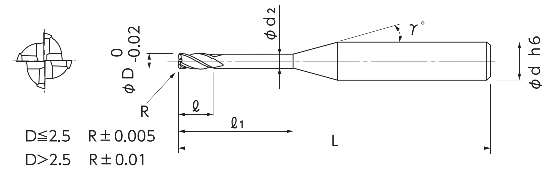
MUGEN COATING 4-Flute Long Neck Radius End Mill

Total 146 sizes

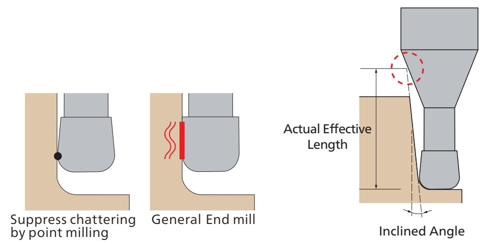
MUGEN COATING 4-Flute Long Neck Radius End Mill

4-flute long neck corner radius end mill. Maximum L/D=12

MG 4 30° Corner R ±0.005 (D≦2.5)
Side Slot Face



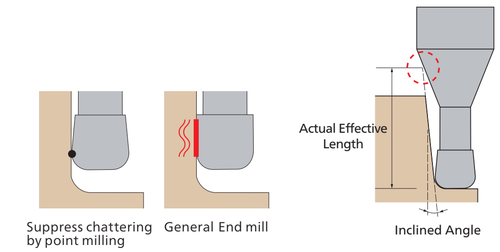
- Employing short flute length. Less contact to work material reduces chattering.
- Corner R accuracy : ±5μm (Dia. ～2.5)
- Upgraded MUGEN COATING brings outstanding performance for milling of Prehardened Steels and Copper Electrode as well.



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00230-10021	1	R0.05	3	0.8	0.95	12°	4	50	3.24	3.39	3.54	3.72	4.12
08-00230-10022			4					50	4.29	4.48	4.68	4.91	5.44
08-00230-10023			5					50	5.33	5.57	5.82	6.11	6.77
08-00230-10024			6					50	6.37	6.66	6.97	7.31	8.10
08-00230-10025			8					50	8.46	8.83	9.25	9.70	10.75
08-00230-10026			10					50	10.54	11.01	11.53	12.09	13.41
08-00230-10027			12					50	12.63	13.19	13.81	14.49	16.06
08-00230-10031		R0.1	3					50	3.24	3.38	3.54	3.71	4.10
08-00230-10032			4					50	4.28	4.47	4.68	4.90	5.43
08-00230-10033			5					50	5.33	5.56	5.82	6.10	6.76
08-00230-10034			6					50	6.37	6.65	6.96	7.30	8.08
08-00230-10035			8					50	8.46	8.83	9.24	9.69	10.74
08-00230-10036			10					50	10.54	11.01	11.52	12.08	13.39
08-00230-10037			12					50	12.63	13.19	13.80	14.48	16.05
08-00230-10041		R0.2	3					50	3.24	3.37	3.52	3.69	4.07
08-00230-10042			4					50	4.28	4.46	4.66	4.88	5.40
08-00230-10043			5					50	5.32	5.55	5.80	6.08	6.72
08-00230-10044			6					50	6.37	6.64	6.94	7.28	8.05
08-00230-10045			8					50	8.45	8.82	9.23	9.67	10.71
08-00230-10046			10					50	10.54	11.00	11.51	12.06	13.36
08-00230-10047			12					50	12.62	13.18	13.79	14.46	16.01
08-00230-10051		R0.3	3					50	3.23	3.36	3.51	3.67	4.04
08-00230-10052			4					50	4.28	4.45	4.65	4.86	5.36
08-00230-10053			5					50	5.32	5.54	5.79	6.06	6.69
08-00230-10054			6					50	6.36	6.63	6.93	7.26	8.02
08-00230-10055			8					50	8.45	8.81	9.21	9.65	10.67
08-00230-10056			10					50	10.53	10.99	11.49	12.04	13.33
08-00230-10057			12					50	12.62	13.17	13.77	14.44	15.98
08-00230-12031	1.2	R0.1	5	1	1.14	12°	4	50	5.35	5.59	5.84	6.13	6.79
08-00230-12032			10					50	10.57	11.03	11.55	12.11	13.42
08-00230-12033			15					60	15.78	16.48	17.25	18.09	20.06

How to Order When you order, indicate MHR430R (D)×(R)×(ℓ1). ※(γ) is reference value.



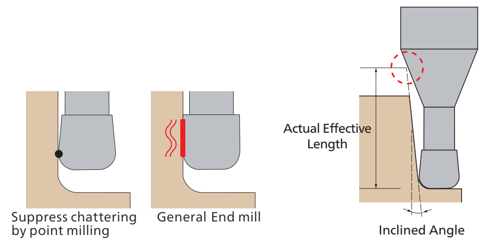
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00230-12041	1.2	R0.2	5	1	1.14	12°	4	50	5.35	5.58	5.83	6.11	6.75
08-00230-12042			10					50	10.56	11.03	11.53	12.09	13.39
08-00230-12043			15					60	15.78	16.47	17.24	18.07	20.03
08-00230-12051		R0.3	5					50	5.34	5.57	5.82	6.09	6.72
08-00230-12052			10					50	10.56	11.02	11.52	12.07	13.36
08-00230-12053			15					60	15.77	16.46	17.22	18.05	20.00
08-00230-15031	1.5	R0.1	6	1.2	1.45	12°	4	50	6.37	6.65	6.96	7.30	8.08
08-00230-15032			12					50	12.63	13.19	13.80	14.48	16.05
08-00230-15033			18					60	18.88	19.72	20.64	21.65	Free
08-00230-15041		R0.2	6					50	6.37	6.64	6.94	7.28	8.05
08-00230-15042			12					50	12.62	13.18	13.79	14.46	16.01
08-00230-15043			18					60	18.88	19.72	20.63	21.64	23.98
08-00230-15051		R0.3	6					50	6.36	6.63	6.93	7.26	8.02
08-00230-15052			12					50	12.62	13.17	13.77	14.44	15.98
08-00230-15053			18					60	18.88	19.71	20.62	21.62	23.95
08-00230-15061		R0.5	6					50	6.35	6.62	6.90	7.22	7.96
08-00230-15062			12					50	12.61	13.15	13.75	14.40	15.92
08-00230-15063			18					60	18.87	19.69	20.59	21.58	23.88
08-00230-20031	2	R0.1	8	1.6	1.91	12°	4	50	8.55	8.93	9.35	9.80	10.86
08-00230-20032			12					50	12.73	13.29	13.91	14.59	16.17
08-00230-20033			16					60	16.90	17.65	18.47	19.37	Free
08-00230-20034			20					60	21.07	22.01	23.03	24.16	Free
08-00230-20035			24					70	25.24	26.36	27.59	Free	Free
08-00230-20041		R0.2	8					50	8.55	8.92	9.33	9.78	10.83
08-00230-20042			12					50	12.72	13.28	13.89	14.57	16.14
08-00230-20043			16					60	16.89	17.64	18.46	19.36	Free
08-00230-20044			20					60	21.06	22.00	23.02	24.14	Free
08-00230-20045			24					70	25.23	26.36	27.58	Free	Free
08-00230-20051		R0.3	8					50	8.55	8.91	9.32	9.76	10.80
08-00230-20052			12					50	12.72	13.27	13.88	14.55	16.11
08-00230-20053			16					60	16.89	17.63	18.44	19.34	Free
08-00230-20054			20					60	21.06	21.99	23.00	24.12	Free
08-00230-20055			24					70	25.23	26.35	27.57	28.91	Free
08-00230-20061		R0.5	8					50	8.54	8.90	9.29	9.72	10.73
08-00230-20062			12					50	12.71	13.25	13.85	14.51	16.04
08-00230-20063			16					60	16.88	17.61	18.42	19.30	Free
08-00230-20064			20					60	21.05	21.97	22.98	24.08	Free
08-00230-20065			24					70	25.22	26.33	27.54	28.87	Free

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O
Long Neck Corner Radius Coating

MHR430R

MUGEN COATING 4-Flute Long Neck Radius End Mill



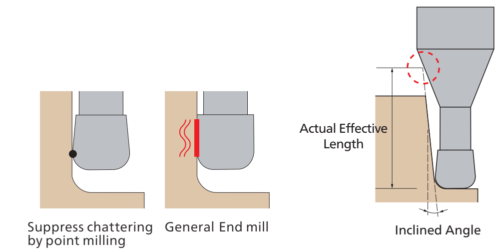
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00230-25031	2.5	R0.1	10	2	2.39	12°	4	50	10.69	11.16	11.68	12.25	13.58
08-00230-25032			20					60	21.12	22.06	23.09	Free	Free
08-00230-25033			30					70	31.55	32.95	Free	Free	Free
08-00230-25041		R0.2	10					50	10.68	11.15	11.67	12.23	13.55
08-00230-25042			20					60	21.11	22.05	23.07	Free	Free
08-00230-25043			30					70	31.54	32.94	Free	Free	Free
08-00230-25051		R0.3	10					50	10.68	11.14	11.65	12.21	13.52
08-00230-25052			20					60	21.11	22.04	23.06	Free	Free
08-00230-25053			30					70	31.54	32.93	Free	Free	Free
08-00230-25061		R0.5	10					50	10.67	11.13	11.63	12.17	13.45
08-00230-25062			20					60	21.10	22.02	23.03	Free	Free
08-00230-25063			30					70	31.53	32.92	Free	Free	Free
08-00230-30031	3	R0.1	12	2.5	2.85	12°	6	50	12.87	13.44	14.07	14.76	16.36
08-00230-30032			18					60	19.13	19.98	20.91	21.94	24.32
08-00230-30033			24					70	25.39	26.52	27.76	29.12	Free
08-00230-30034			30					70	31.64	33.05	34.60	36.30	Free
08-00230-30035			36					80	37.90	39.59	41.44	Free	Free
08-00230-30041		R0.2	12					50	12.87	13.44	14.06	14.74	16.33
08-00230-30042			18					60	19.13	19.97	20.90	21.92	24.29
08-00230-30043			24					70	25.38	26.51	27.74	29.10	Free
08-00230-30044			30					70	31.64	33.05	34.58	36.28	Free
08-00230-30045			36					80	37.90	39.58	41.43	Free	Free
08-00230-30051		R0.3	12					50	12.86	13.43	14.04	14.72	16.29
08-00230-30052			20					60	21.21	22.14	23.17	24.29	26.91
08-00230-30053			24					70	25.38	26.50	27.73	29.08	Free
08-00230-30054			30					70	31.63	33.04	34.57	36.26	Free
08-00230-30055			36					80	37.89	39.57	41.41	Free	Free
08-00230-30061		R0.5	12					50	12.86	13.41	14.01	14.68	16.23
08-00230-30062			20					60	21.20	22.12	23.14	24.25	26.85
08-00230-30063			24					70	25.37	26.48	27.70	29.04	Free
08-00230-30064			30					70	31.63	33.02	34.54	36.22	Free
08-00230-30065			36					80	37.88	39.56	41.39	43.40	Free
08-00230-30071		R1	12					50	12.83	13.36	13.94	14.58	16.07
08-00230-30072			20					60	21.18	22.08	23.07	24.16	26.69
08-00230-30073			24					70	25.35	26.44	27.63	28.94	Free
08-00230-30074			30					70	31.60	32.97	34.47	36.12	Free
08-00230-30075			36					80	37.86	39.51	41.32	43.30	Free

How to Order When you order, indicate MHR430R (D)×(R)×(ℓ1). ※(γ) is reference value.

MHR430R
MUGEN COATING 4-Flute Long Neck Radius End Mill

Regular Line
MUGEN COATING
Long Neck Type



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
08-00230-40031	4	R0.1	16	3.2	3.8	12°	6	60	17.17	17.93	18.77	19.68	Free
08-00230-40032			24					70	25.51	26.65	27.89	Free	Free
08-00230-40033			32					70	33.85	35.36	37.01	Free	Free
08-00230-40034			48					100	50.54	52.79	Free	Free	Free
08-00230-40041		R0.2	16					60	17.16	17.92	18.75	19.66	Free
08-00230-40042			24					70	25.50	26.64	27.88	Free	Free
08-00230-40043			32					70	33.85	35.35	37.00	Free	Free
08-00230-40044			48					100	50.53	52.78	Free	Free	Free
08-00230-40051		R0.3	16					60	17.16	17.91	18.74	19.65	Free
08-00230-40052			24					70	25.50	26.63	27.86	Free	Free
08-00230-40053			32					70	33.84	35.34	36.99	Free	Free
08-00230-40054			48					100	50.53	52.78	Free	Free	Free
08-00230-40061		R0.5	16					60	17.15	17.89	18.71	19.61	Free
08-00230-40062			24					70	25.49	26.61	27.83	Free	Free
08-00230-40063			32					70	33.83	35.33	36.96	Free	Free
08-00230-40064			48					100	50.52	52.76	Free	Free	Free
08-00230-40071		R1	16					60	17.13	17.85	18.64	19.51	Free
08-00230-40072			24					70	25.47	26.57	27.77	29.08	Free
08-00230-40073			32					70	33.81	35.28	36.89	Free	Free
08-00230-40074			48					100	50.50	52.71	Free	Free	Free
08-00230-50031	5	R0.1	20	4	4.75	12°	6	70	21.46	22.42	Free	Free	Free
08-00230-50032			40					90	42.32	Free	Free	Free	Free
08-00230-50041		R0.2	20					70	21.46	22.41	Free	Free	Free
08-00230-50042			40					90	42.31	Free	Free	Free	Free
08-00230-50051		R0.3	20					70	21.45	22.40	Free	Free	Free
08-00230-50052			40					90	42.31	Free	Free	Free	Free
08-00230-50061		R0.5	20					70	21.44	22.38	Free	Free	Free
08-00230-50062			40					90	42.30	Free	Free	Free	Free
08-00230-50071		R1	20					70	21.42	22.34	Free	Free	Free
08-00230-50072			40					90	42.28	Free	Free	Free	Free
08-00230-60031	6	R0.1	24	5	5.7	–	6	90	Free	Free	Free	Free	Free
08-00230-60032			48					110	Free	Free	Free	Free	Free
08-00230-60041		R0.2	24					90	Free	Free	Free	Free	Free
08-00230-60042			48					110	Free	Free	Free	Free	Free
08-00230-60051		R0.3	24					90	Free	Free	Free	Free	Free
08-00230-60052			48					110	Free	Free	Free	Free	Free
08-00230-60061		R0.5	24					90	Free	Free	Free	Free	Free
08-00230-60062			48					110	Free	Free	Free	Free	Free
08-00230-60071		R1	24					90	Free	Free	Free	Free	Free
08-00230-60072			48					110	Free	Free	Free	Free	Free

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O
Long Neck Corner Radius Coating

MHR430R

Recommended Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (～43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (～55HRC)				Aluminium Alloy・Copper			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
1	0.05 0.1 0.2 0.3	3	16,000	1,800	0.06	0.35	12,800	1,260	0.045	0.3	16,000	1,800	0.2	0.23
		4	16,000	1,500	0.05	0.35	12,800	1,050	0.04	0.3	16,000	1,500	0.15	0.23
		5	16,000	1,410	0.045	0.35	12,800	990	0.035	0.25	16,000	1,410	0.13	0.23
		6	14,500	1,200	0.04	0.25	11,600	840	0.03	0.25	14,500	1,200	0.12	0.2
		8	14,500	870	0.03	0.25	11,600	620	0.02	0.2	14,500	870	0.09	0.2
		10	11,100	660	0.025	0.25	8,900	470	0.015	0.1	11,100	660	0.075	0.15
		12	11,100	300	0.02	0.2	8,900	210	0.01	0.08	11,100	300	0.06	0.15
1.2	0.1 0.2 0.3	5	15,500	1,740	0.06	0.4	12,400	1,220	0.045	0.35	15,500	1,740	0.18	0.28
		10	12,000	1,290	0.04	0.35	9,600	900	0.03	0.25	12,000	1,290	0.12	0.28
		15	10,600	480	0.02	0.25	8,500	330	0.01	0.1	10,600	480	0.07	0.23
1.5	0.1 0.2 0.3 0.5	6	14,000	1,910	0.08	0.53	11,200	1,340	0.05	0.4	14,000	1,910	0.24	0.35
		12	11,500	1,250	0.06	0.42	9,000	870	0.04	0.3	11,500	1,250	0.18	0.3
		18	8,500	560	0.02	0.3	6,800	390	0.01	0.15	8,500	560	0.08	0.25
2	0.1 0.2 0.3 0.5	8	11,100	2,150	0.08	0.6	8,800	1,500	0.05	0.5	11,100	2,150	0.24	0.45
		12	11,100	1,800	0.065	0.6	8,800	1,260	0.045	0.5	11,100	1,800	0.2	0.43
		16	9,600	1,500	0.05	0.5	7,700	1,050	0.04	0.35	9,600	1,500	0.15	0.39
		20	9,600	900	0.03	0.45	7,700	630	0.015	0.25	9,600	900	0.12	0.35
		24	6,400	740	0.02	0.4	5,100	510	0.01	0.2	6,400	740	0.1	0.3
2.5	0.1 0.2 0.3 0.5	10	9,200	2,280	0.1	0.85	7,400	1,590	0.07	0.7	9,200	2,280	0.3	0.5
		20	8,300	1,580	0.08	0.6	6,600	1,110	0.05	0.4	8,300	1,580	0.24	0.43
		30	5,400	710	0.025	0.45	4,300	500	0.01	0.2	5,400	710	0.1	0.33
3	0.1 0.2 0.3 0.5 1	12	8,000	2,400	0.12	0.9	6,400	1,680	0.08	0.8	8,000	2,400	0.36	0.55
		18	7,800	2,000	0.11	0.8	6,200	1,410	0.07	0.7	7,800	2,010	0.33	0.5
		20	7,700	1,850	0.1	0.8	6,200	1,250	0.06	0.6	7,700	1,850	0.3	0.5
		24	7,500	1,620	0.1	0.7	6,000	1,140	0.06	0.5	7,500	1,620	0.3	0.45
		30	6,000	1,050	0.05	0.6	4,800	740	0.03	0.4	6,000	1,050	0.15	0.4
		36	4,200	710	0.03	0.5	3,400	500	0.01	0.3	4,200	710	0.1	0.35
4	0.1 0.2 0.3 0.5 1	16	6,000	2,520	0.15	1.2	4,800	1,770	0.1	1	6,000	2,520	0.45	0.75
		24	5,400	2,030	0.12	1	4,300	1,430	0.085	0.8	5,400	2,030	0.39	0.7
		32	4,800	1,350	0.08	0.9	3,800	950	0.04	0.7	4,800	1,350	0.25	0.6
		48	3,200	570	0.04	0.8	2,600	410	0.01	0.35	3,200	570	0.12	0.5
5	0.1 0.2 0.3 0.5 1	20	5,100	2,300	0.17	1.6	4,100	1,610	0.12	1.2	5,100	2,300	0.52	1
		40	3,200	1,020	0.07	1.2	2,600	720	0.05	0.9	3,200	1,020	0.25	0.8
6	0.1 0.2 0.3 0.5 1	24	3,700	2,100	0.2	2.1	3,000	1,470	0.12	1.5	3,700	2,100	0.6	1.2
		48	2,600	950	0.09	1.5	2,100	660	0.05	1.2	2,600	950	0.32	0.9

Notes

※1 Adjust milling conditions according to milling shape and machine type.
※2 ap : Axial Depth of Cut, ae : Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Recommend to apply helical or ramping for approaching into axial direction.
※5 Adjust feed rate 50% lower and cutting depth(ae) 30% lower for milling deep wall area. When L/D exceeds 8 for stable milling.
※6 For slotting, recommend reciprocating milling by adjusting feed & ap in below 50% of recommended milling condition.
※7 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

MHR430R

Recommended High Speed Milling Conditions

Work Material			Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (～43HRC)				Hardened Steels HPM38・STAVAX・SKD61 (～55HRC)				Hardened Steels SKD11・PD613 (～62HRC)			
Dia.	Corner Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
2	0.5	8	22,000	6,200	0.06	0.4	16,000	4,500	0.04	0.3	12,800	3,000	0.03	0.2
2.5	0.5	10	18,000	6,400	0.08	0.65	13,000	4,600	0.05	0.5	10,200	3,600	0.03	0.3
3	1	12	15,000	7,100	0.1	0.7	11,000	5,100	0.06	0.6	8,500	3,700	0.04	0.4
4	1	16	11,000	7,100	0.13	1	8,000	5,100	0.08	0.8	6,300	3,800	0.05	0.5
5	1	20	9,000	8,200	0.15	1.4	6,500	5,200	0.1	1	5,100	3,700	0.05	0.7
6	1	24	7,500	7,700	0.18	1.8	5,300	5,300	0.1	1.3	4,200	3,100	0.06	0.8

Notes

※1 Adjust milling conditions according to milling shape and machine type.
※2 ap : Axial Depth of Cut, ae : Radial Depth of Cut.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Adjust feed rate 50% lower and cutting depth (ae) 30% lower for milling deep wall area.
※5 Recommend to apply helical or ramping for approaching into axial direction.
※6 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

Regular Line
MUGEN COATING
Long Neck Type

P Carbon Steel
P Alloy Steel
P Prehardened Steel
H ~55 HRC Hardened Steel
M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Long Neck Corner Radius Coating

MSTNR230

Size ϕ 0.2 × R0.05 × neck taper angle1°～ ϕ 3 × R0.5 × neck taper angle1°

≦55 HRC

MUGEN COATING 2-Flute Long Taper Neck Radius End Mill

Total 165 sizes

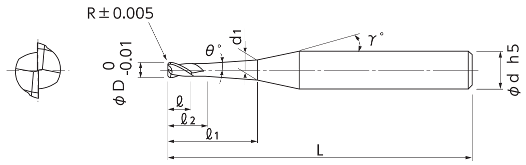
MSTNR230

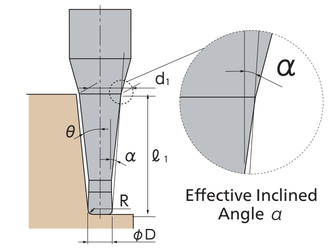
MUGEN COATING 2-Flute Long Taper Neck Radius End Mill

Carbon Steel P ◎
Alloy Steel P ◎
Prehardened Steel P ◎
Hardened Steel ~55 HRC H ○
Stainless Steel M ○
Aluminium Alloy N ○
Copper N ○
Resin O ○

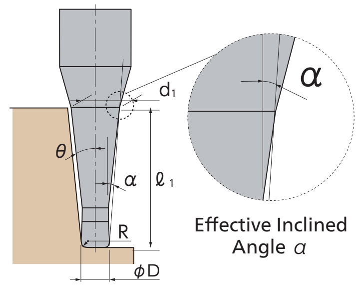
MG　2　30°　Corner R ±0.005　φd h5
Side　Slot　Face

Taper neck design for significant improvement of tool rigidity!
Maximum L/D=35





- Improve surface overall accuracy brought by high speed cutting with minimal chattering in roughing to finishing process.
- High R-Accuracy : ±5μm.
- Better performance in wide range of machining of direct carving on Hardened Steels, Prehardened Steels and Copper Electrode.



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00770-02211	0.2	R0.05	1°	1	0.23	0.15	0.4	12°	0°38′	4	50
08-00770-02212				2	0.26				0°49′		50
08-00770-02231			3°	1	0.27				1°54′		50
08-00770-02232				2	0.37				2°28′		50
08-00770-02251			5°	1	0.31				3°10′		50
08-00770-02252				2	0.48				4°07′		50
08-00770-03211	0.3	R0.05	1°	2	0.35	0.25	0.6	12°	0°43′	4	50
08-00770-03212				3	0.39				0°49′		50
08-00770-03231			3°	2	0.45				2°10′		50
08-00770-03232				3	0.56				2°27′		50
08-00770-03251			5°	2	0.55				3°35′		50
08-00770-03252				3	0.72				4°04′		50
08-00770-04211	0.4	R0.05	1°	3	0.48	0.3	0.8	12°	0°45′	4	50
08-00770-04212				4	0.52				0°49′		50
08-00770-04231			3°	3	0.64				2°14′		50
08-00770-04232				4	0.74				2°26′		50
08-00770-04251			5°	3	0.79				3°44′		50
08-00770-04252				4	0.96				4°03′		50
08-00770-04311		R0.1	1°	3	0.48				0°46′		50
08-00770-04312				4	0.52				0°49′		50
08-00770-04331			3°	3	0.64				2°17′		50
08-00770-04332				4	0.74				2°28′		50
08-00770-04351			5°	3	0.79				3°48′		50
08-00770-04352				4	0.96				4°07′		50
08-00770-05211	0.5	R0.05	1°	3	0.57	0.4	1	12°	0°41′	4	50
08-00770-05212				5	0.64				0°49′		50
08-00770-05213				8	0.75				0°53′		50
08-00770-05214				10	0.82				0°54′		50
08-00770-05215				12	0.89				0°55′		50

How to Order　When you order, indicate MSTNR230 (D)×(R)×(θ)×(ℓ1).　※(γ) is reference value.

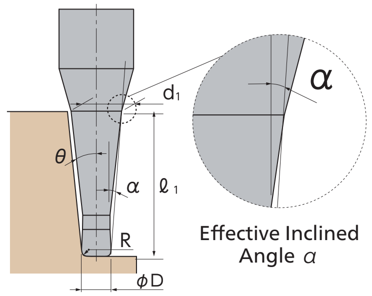
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00770-05231	0.5	R0.05	3°	3	0.71	0.4	1	12°	2°02′	4	50
08-00770-05232				5	0.92				2°25′		50
08-00770-05233				8	1.24				2°38′		50
08-00770-05234				10	1.45				2°43′		50
08-00770-05235				12	1.66				2°46′		50
08-00770-05251			5°	3	0.85				3°23′		50
08-00770-05252				5	1.2				4°02′		50
08-00770-05253				8	1.73				4°25′		50
08-00770-05254				10	2.08				4°32′		50
08-00770-05311		R0.1	1°	3	0.57				0°41′		50
08-00770-05312				5	0.64				0°49′		50
08-00770-05313				8	0.75				0°53′		50
08-00770-05314				10	0.82				0°55′		50
08-00770-05315				12	0.89				0°55′		50
08-00770-05331			3°	3	0.71				2°04′		50
08-00770-05332				5	0.92				2°27′		50
08-00770-05333				8	1.24				2°40′		50
08-00770-05334				10	1.45				2°44′		50
08-00770-05335				12	1.66				2°46′		50
08-00770-05351			5°	3	0.85				3°27′		50
08-00770-05352				5	1.2				4°05′		50
08-00770-05353				8	1.73				4°26′		50
08-00770-05354				10	2.08				4°33′		50
08-00770-08211	0.8	R0.05	1°	5	0.92	0.65	1.6	12°	0°41′	4	50
08-00770-08212				8	1.03				0°48′		50
08-00770-08231			3°	5	1.16				2°04′		50
08-00770-08232				8	1.48				2°25′		50
08-00770-08311		R0.1	1°	5	0.92				0°42′		50
08-00770-08312				8	1.03				0°49′		50
08-00770-08331			3°	5	1.16				2°05′		50
08-00770-08332				8	1.48				2°26′		50
08-00770-08411		R0.2	1°	5	0.92				0°43′		50
08-00770-08412				8	1.03				0°49′		50
08-00770-08431			3°	5	1.16				2°07′		50
08-00770-08432				8	1.48				2°28′		50
08-00770-10211	1	R0.05	1°	6	1.14	0.8	2	12°	0°40′	4	50
08-00770-10212				10	1.28				0°48′		60
08-00770-10213				15	1.46				0°52′		60
08-00770-10214				20	1.63				0°54′		60

Long Neck Tapered Corner Radius Coating

MSTNR230

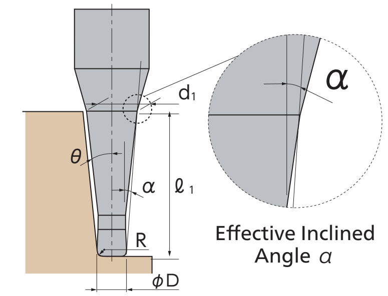
MUGEN COATING 2-Flute Long Taper Neck Radius End Mill



Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00770-10215	1	R0.05	1°	25	1.81	0.8	2	12°	0°55′	4	70
08-00770-10216				30	1.98				0°56′		80
08-00770-10217				35	2.16				0°56′		80
08-00770-10231			3°	6	1.42				2°01′		50
08-00770-10232				10	1.84				2°25′		60
08-00770-10311		R0.1	1°	6	1.14				0°41′		50
08-00770-10312				10	1.28				0°49′		60
08-00770-10313				15	1.46				0°52′		60
08-00770-10314				20	1.63				0°54′		60
08-00770-10315				25	1.81				0°55′		70
08-00770-10316				30	1.98				0°56′		80
08-00770-10317				35	2.16				0°57′		80
08-00770-10331			3°	6	1.42				2°02′		50
08-00770-10332				10	1.84				2°26′		60
08-00770-10411		R0.2	1°	6	1.14				0°41′		50
08-00770-10412				10	1.28				0°49′		60
08-00770-10413				15	1.46				0°53′		60
08-00770-10414				20	1.63				0°55′		60
08-00770-10415				25	1.81				0°56′		70
08-00770-10416				30	1.98				0°56′		80
08-00770-10417				35	2.16				0°57′		80
08-00770-10431			3°	6	1.42				2°04′		50
08-00770-10432				10	1.84				2°27′		60
08-00770-10511		R0.3	1°	6	1.14				0°42′		50
08-00770-10512				10	1.28				0°49′		60
08-00770-10513				15	1.46				0°53′		60
08-00770-10514				20	1.63				0°55′		60
08-00770-10515				25	1.81				0°56′		70
08-00770-10516				30	1.98				0°56′		80
08-00770-10517				35	2.16				0°57′		80
08-00770-10531			3°	6	1.42				2°06′		50
08-00770-10532				10	1.84				2°29′		60
08-00770-15311	1.5	R0.1	1°	10	1.75	1.2	3	12°	0°43′	4	60
08-00770-15312				15	1.92				0°49′		60
08-00770-15313				20	2.1				0°51′		60
08-00770-15314				25	2.27				0°53′		70
08-00770-15315				30	2.45				0°54′		80
08-00770-15331			3°	10	2.24				2°07′		60
08-00770-15332				15	2.76				2°25′		60

How to Order When you order, indicate MSTNR230 (D)×(R)×(θ)×(ℓ1). ※(γ) is reference value.

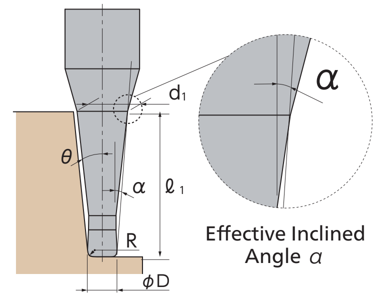


Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00770-15411	1.5	R0.2	1°	10	1.75	1.2	3	12°	0°43′	4	60
08-00770-15412				15	1.92				0°49′		60
08-00770-15413				20	2.1				0°52′		60
08-00770-15414				25	2.27				0°53′		70
08-00770-15415				30	2.45				0°55′		80
08-00770-15431			3°	10	2.24				2°08′		60
08-00770-15432				15	2.76				2°26′		60
08-00770-15511		R0.3	1°	10	1.75				0°43′		60
08-00770-15512				15	1.92				0°49′		60
08-00770-15513				20	2.1				0°52′		60
08-00770-15514				25	2.27				0°53′		70
08-00770-15515				30	2.45				0°55′		80
08-00770-15531			3°	10	2.24				2°10′		60
08-00770-15532				15	2.76				2°27′		60
08-00770-20311	2	R0.1	1°	15	2.39	1.6	4	12°	0°44′	4	60
08-00770-20312				20	2.56				0°48′		60
08-00770-20313				25	2.74				0°50′		70
08-00770-20314				30	2.91				0°52′		80
08-00770-20315				40	3.26				0°54′		80
08-00770-20316				50	3.61				0°55′		100
08-00770-20331			3°	15	3.16				2°13′		60
08-00770-20332				20	3.68				2°25′		60
08-00770-20411		R0.2	1°	15	2.39				0°44′		60
08-00770-20412				20	2.56				0°49′		60
08-00770-20413				25	2.74				0°51′		70
08-00770-20414				30	2.91				0°52′		80
08-00770-20415				40	3.26				0°54′		80
08-00770-20416				50	3.61				0°55′		100
08-00770-20431			3°	15	3.16				2°14′		60
08-00770-20432				20	3.68				2°25′		60
08-00770-20511		R0.3	1°	15	2.39				0°45′		60
08-00770-20512				20	2.56				0°49′		60
08-00770-20513				25	2.74				0°51′		70
08-00770-20514				30	2.91				0°53′		80
08-00770-20515				40	3.26				0°55′		80
08-00770-20516				50	3.61				0°56′		100
08-00770-20531			3°	15	3.16				2°15′		60
08-00770-20532				20	3.68				2°26′		60

MSTNR230

MUGEN COATING 2-Flute Long Taper Neck Radius End Mill



Effective Inclined Angle α

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Neck Taper Angle (θ)	Under Neck Length (ℓ1)	Neck Dia. (d1)	Length of Cut (ℓ)	Under Neck Length 2 (ℓ2)	Neck Taper Angle 2 (γ)	Effective Inclined Angle (α)	Shank Dia. (d)	Overall Length (L)
08-00770-20611	2	R0.5	1°	15	2.39	1.6	4	12°	0°46′	4	60
08-00770-20612				20	2.56				0°49′		60
08-00770-20613				25	2.74				0°52′		70
08-00770-20614				30	2.91				0°53′		80
08-00770-20615				40	3.26				0°55′		80
08-00770-20616				50	3.61				0°56′		100
08-00770-20631			3°	15	3.16				2°17′		60
08-00770-20632				20	3.68				2°28′		60
08-00770-30411	3	R0.2	1°	15	3.32	2.5	6	12°	0°37′	6	60
08-00770-30412				20	3.49				0°43′		60
08-00770-30413				30	3.84				0°49′		80
08-00770-30414				40	4.19				0°51′		80
08-00770-30415				50	4.54				0°53′		100
08-00770-30416				60	4.89				0°54′		110
08-00770-30611		R0.5	1°	15	3.32				0°37′		60
08-00770-30612				20	3.49				0°43′		60
08-00770-30613				30	3.84				0°49′		80
08-00770-30614				40	4.19				0°52′		80
08-00770-30615				50	4.54				0°53′		100
08-00770-30616				60	4.89				0°55′		110

How to Order When you order, indicate MSTNR230 (D)×(R)×(θ)×(ℓ1). ※(γ) is reference value.

MSTNR230

Recommended Milling Conditions

Work Material				Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels SKD11・SKD61・STAVAX・HPM38 (~55HRC)				Copper・Aluminium Alloy			
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
0.2	0.05	1°	1	30,000	200	0.005	0.02	30,000	150	0.005	0.02	30,000	250	0.015	0.06
			2	30,000	200	0.005	0.02	30,000	150	0.005	0.02	30,000	250	0.015	0.06
		3°	1	30,000	300	0.005	0.03	30,000	200	0.005	0.02	30,000	360	0.02	0.06
			2	30,000	300	0.005	0.03	30,000	200	0.005	0.02	30,000	360	0.02	0.06
		5°	1	30,000	350	0.01	0.03	30,000	250	0.01	0.03	30,000	420	0.04	0.06
			2	30,000	350	0.01	0.03	30,000	250	0.01	0.03	30,000	420	0.04	0.06
0.3	0.05	1°	2	30,000	200	0.007	0.03	30,000	150	0.005	0.03	30,000	250	0.02	0.06
			3	30,000	200	0.007	0.03	30,000	150	0.005	0.03	30,000	250	0.02	0.06
		3°	2	30,000	300	0.01	0.05	30,000	200	0.01	0.03	30,000	360	0.03	0.15
			3	30,000	300	0.01	0.05	30,000	200	0.01	0.03	30,000	360	0.03	0.15
		5°	2	30,000	350	0.02	0.06	30,000	250	0.02	0.05	30,000	420	0.06	0.15
			3	30,000	350	0.02	0.06	30,000	250	0.02	0.05	30,000	420	0.06	0.15
0.4	0.05 0.1	1°	3	30,000	300	0.015	0.05	30,000	200	0.01	0.04	30,000	360	0.03	0.15
			4	30,000	300	0.015	0.05	30,000	200	0.01	0.04	30,000	360	0.03	0.15
		3°	3	30,000	350	0.02	0.06	30,000	250	0.02	0.05	30,000	420	0.06	0.15
			4	30,000	350	0.02	0.06	30,000	250	0.02	0.05	30,000	420	0.06	0.15
		5°	3	30,000	450	0.03	0.07	30,000	300	0.03	0.06	30,000	540	0.09	0.15
			4	30,000	450	0.03	0.07	30,000	300	0.03	0.06	30,000	540	0.09	0.15
0.5	0.05 0.1	1°	3	30,000	500	0.02	0.1	30,000	350	0.02	0.1	30,000	600	0.06	0.24
			5	30,000	500	0.015	0.1	30,000	350	0.015	0.1	30,000	600	0.045	0.24
			8	30,000	500	0.01	0.08	30,000	350	0.01	0.05	30,000	600	0.03	0.24
			10	24,000	400	0.007	0.06	24,000	250	0.007	0.04	24,000	480	0.02	0.18
			12	24,000	300	0.005	0.05	24,000	150	0.005	0.03	24,000	360	0.015	0.15
		3°	3	30,000	600	0.03	0.1	30,000	400	0.03	0.1	30,000	700	0.09	0.25
			5	30,000	600	0.02	0.1	30,000	400	0.02	0.1	30,000	700	0.06	0.25
			8	30,000	600	0.02	0.08	30,000	400	0.02	0.05	30,000	700	0.06	0.24
			10	24,000	500	0.015	0.08	24,000	350	0.01	0.05	24,000	600	0.03	0.24
			12	24,000	350	0.015	0.05	24,000	200	0.01	0.03	24,000	420	0.03	0.15
		5°	3	30,000	750	0.05	0.15	30,000	500	0.05	0.1	30,000	900	0.15	0.25
			5	30,000	750	0.03	0.15	30,000	500	0.03	0.1	30,000	900	0.09	0.25
			8	24,000	750	0.03	0.11	24,000	500	0.03	0.08	24,000	900	0.09	0.25
			10	24,000	600	0.02	0.08	24,000	400	0.02	0.06	24,000	720	0.06	0.25
0.8	0.05 0.1 0.2	1°	5	26,000	1,000	0.06	0.2	21,000	700	0.06	0.1	26,000	1,200	0.18	0.3
			8	24,000	800	0.04	0.2	19,000	560	0.04	0.1	24,000	950	0.12	0.3
		3°	5	26,000	1,200	0.08	0.3	21,000	840	0.08	0.3	26,000	1,400	0.24	0.35
			8	24,000	1,000	0.06	0.3	19,000	700	0.06	0.3	24,000	1,200	0.18	0.35

MSTNR230

MSTNR230

Recommended Milling Conditions

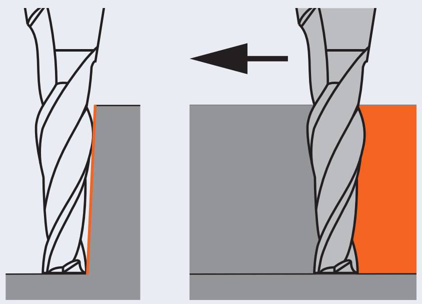
Work Material				Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM1 (~43HRC)				Hardened Steels SKD11・SKD61・STAVAX・HPM38 (~55HRC)				Copper・Aluminium Alloy			
Dia.	Corner Radius	Neck Taper Angle	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
1	0.05 0.1 0.2 0.3	1°	6	22,000	1,300	0.08	0.35	17,000	900	0.06	0.35	22,000	1,500	0.24	0.5
			10	18,000	1,000	0.05	0.35	14,000	700	0.05	0.35	18,000	1,200	0.15	0.5
			15	18,000	850	0.03	0.2	14,000	600	0.03	0.13	18,000	1,000	0.09	0.5
			20	14,000	700	0.025	0.1	11,000	500	0.025	0.06	14,000	850	0.075	0.3
			25	14,000	600	0.02	0.05	11,000	400	0.02	0.03	14,000	700	0.06	0.15
			30	10,000	480	0.015	0.03	8,000	300	0.015	0.02	10,000	600	0.045	0.09
			35	10,000	350	0.01	0.02	8,000	250	0.01	0.01	10,000	400	0.03	0.06
		3°	6	22,000	1,500	0.1	0.35	17,600	1,000	0.1	0.35	22,000	1,800	0.3	0.5
			10	18,000	1,200	0.08	0.35	14,400	800	0.08	0.35	18,000	1,400	0.24	0.5
1.5	0.1 0.2 0.3	1°	10	16,000	1,300	0.1	0.55	12,800	900	0.1	0.55	16,000	1,500	0.3	0.6
			15	14,000	1,000	0.07	0.55	11,200	700	0.07	0.55	14,000	1,200	0.2	0.6
			20	14,000	800	0.05	0.3	11,200	550	0.05	0.2	14,000	900	0.16	0.5
			25	14,000	600	0.03	0.1	11,200	400	0.03	0.06	14,000	700	0.1	0.3
			30	12,000	450	0.03	0.05	9,600	300	0.03	0.03	12,000	550	0.09	0.15
		3°	10	16,000	1,500	0.15	0.55	12,800	1,000	0.15	0.55	16,000	1,800	0.45	0.6
			15	14,000	1,200	0.1	0.55	11,200	850	0.1	0.55	14,000	1,400	0.3	0.6
2	0.1 0.2 0.3 0.5	1°	15	14,000	1,200	0.1	0.7	11,200	850	0.07	0.7	14,000	1,400	0.3	0.7
			20	12,000	1,200	0.07	0.7	9,600	850	0.07	0.7	12,000	1,400	0.2	0.7
			25	12,000	1,000	0.05	0.5	9,600	700	0.04	0.5	12,000	1,200	0.15	0.7
			30	10,000	750	0.04	0.3	8,000	500	0.03	0.3	10,000	900	0.13	0.7
			40	8,000	400	0.03	0.2	6,400	300	0.02	0.2	8,000	500	0.1	0.5
			50	6,000	350	0.015	0.1	4,800	250	0.01	0.1	6,000	400	0.05	0.3
		3°	15	20,000	2,000	0.2	0.7	16,000	1,400	0.2	0.7	20,000	2,400	0.6	0.7
			20	16,000	1,600	0.1	0.7	12,800	1,100	0.1	0.7	16,000	2,000	0.4	0.7
3	0.2 0.5	1°	15	11,000	1,600	0.15	1.05	8,800	1,100	0.1	1.05	11,000	1,900	0.6	1.1
			20	11,000	1,600	0.13	1.05	8,800	1,100	0.1	1.05	11,000	1,900	0.45	1.1
			30	9,000	1,200	0.1	1.05	7,200	850	0.07	1.05	9,000	1,400	0.3	1.1
			40	9,000	1,000	0.07	0.6	7,200	700	0.05	0.6	9,000	1,200	0.21	0.9
			50	8,000	640	0.05	0.35	6,400	450	0.04	0.35	8,000	750	0.15	0.8
			60	8,000	480	0.03	0.2	6,400	300	0.02	0.2	8,000	550	0.1	0.7

Notes

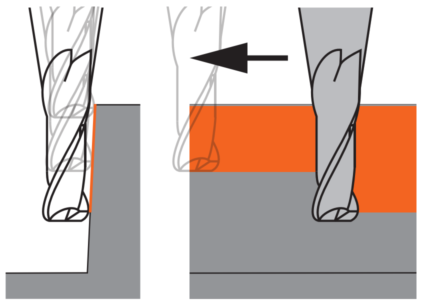
※1 Adjust milling conditions according to machining profile and machine status.
※2 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※3 Recommend to use oil mist coolant for machining hardened steels.
※4 Coolant supply and chip disposal are important for machining deep-rib.

End mills enables tapered machining

Select Tapered end mill according to cutting environment



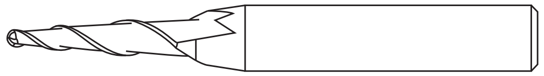
By using large length of cut, even limited spindle speed and feed, it reduces machining time and increases productivity.



Although it is possible to process tapered face by contour line milling using ball end mill and corner radius end mill, machining time would be longer if spindle speed and feed rate has limitation.

Types of tapered end mill

Tapered Square End Mill

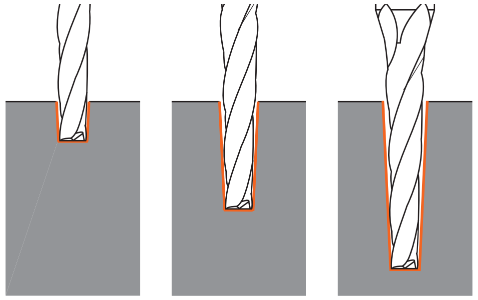


Tapered Ball End Mill

Tapered Corner Radius End Mill

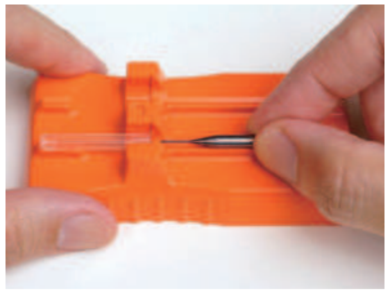
Specialized tool for rib milling

Similarly, ribs in plastic molds can be machined using only grooving by using specialized tools for ribs.

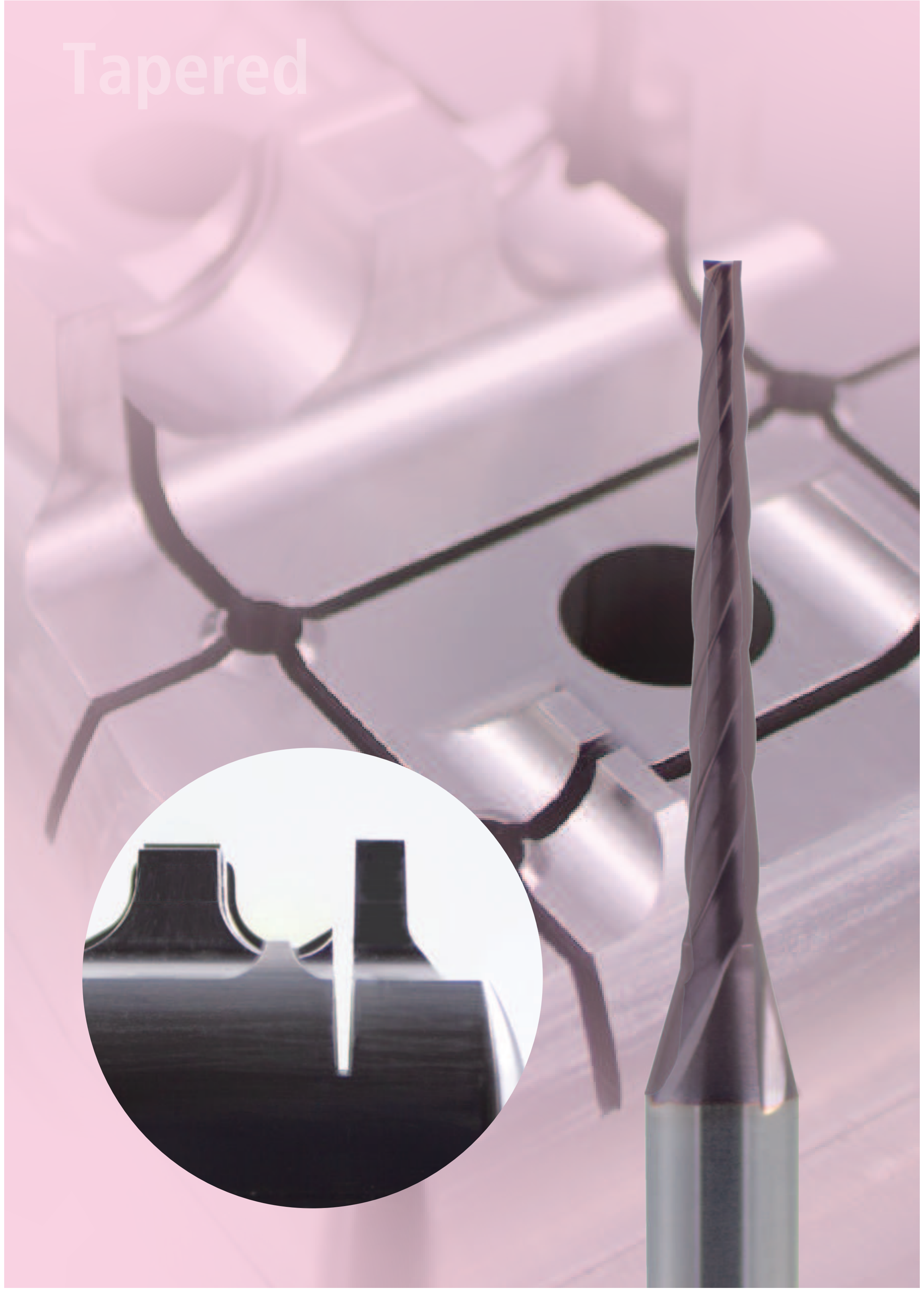


Tool Protection Cap Remover

"Tool Protection Cap Remover" that enables to remove a cutting edge protective cap safely has made by mold in the above picture



Model	Size	Maximum Cutting Depth	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Tapered Square																								
MTE230 	φ0.2×taper angle30' ~ φ10×taper angle5°	4D	∞	2	30°	Side	Slot	-	-	◎	◎	◎	○	-	-	-	-	○	○	○	-	-	189	H-006
Standard type taper end mill. Suitable for various shapes by wide range of size																								
MRT425 	φ0.2×taper angle30' ~ φ3×taper angle2°	≒16D	∞	4	25°	-	Slot	-	-	◎	◎	◎	○	-	-	-	-	-	-	-	-	-	245	H-012
Taper end mill for direct milling on rib shape without pre-processing. Maximum L/D=16																								
Tapered Ball																								
MTB230 	R0.1×taper angle1° ~ R2×taper angle15°	5D	∞	2	30°	Side	Slot	-	3D	◎	◎	◎	○	-	-	-	-	○	○	○	-	-	111	H-016
Line up to maximum neck taper ange 15° of standard type taper ball end mill																								



MTE230

Size ϕ0.2×taper angle30′ ~ ϕ10×taper angle5°

≦55 HRC

MTE230

MUGEN COATING 2-Flute Taper End Mill

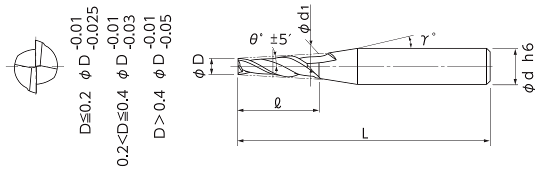
Total 189 sizes

MUGEN COATING 2-Flute Taper End Mill

Carbon Steel	P	◎
Alloy Steel	P	◎
Prehardened Steel	P	◎
Hardened Steel ~55 HRC	H	○
Aluminium Alloy	N	○
Copper	N	○
Resin	O	○

MG 2 30° Side Slot

Standard type tapered end mill
Suitable for various shapes by wide range of size



- MUGEN COATING realizes long tool life at tapered cutting.
- Available from Dia. 0.2 to Dia.10mm and taper angle are from 30′ to 20°.

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00300-00202	0.2	30′	0.8	0.21	9°	4	45
08-00300-00204		1°	0.8	0.23	9°	4	45
08-00300-00205		1°30′	0.8	0.24	9°	4	45
08-00300-00206		2°	0.8	0.26	9°	4	45
08-00300-00208		3°	0.8	0.28	9°	4	45
08-00300-00212		5°	0.8	0.34	9°	4	45
08-00300-00219		10°	0.8	0.48	10°	4	45
08-00300-00302	0.3	30′	1.2	0.32	9°	4	45
08-00300-00304		1°	1.2	0.34	9°	4	45
08-00300-00305		1°30′	1.2	0.36	9°	4	45
08-00300-00306		2°	1.2	0.38	9°	4	45
08-00300-00308		3°	1.2	0.43	9°	4	45
08-00300-00312		5°	1.2	0.51	9°	4	45
08-00300-00319		10°	1.2	0.72	10°	4	45
08-00300-00402	0.4	30′	1.6	0.43	9°	4	45
08-00300-00404		1°	1.6	0.46	9°	4	45
08-00300-00405		1°30′	1.6	0.48	9°	4	45
08-00300-00406		2°	1.6	0.51	9°	4	45
08-00300-00408		3°	1.6	0.57	9°	4	45
08-00300-00412		5°	1.6	0.68	9°	4	45
08-00300-00419		10°	1.6	0.96	10°	4	45
08-00300-00502	0.5	30′	2	0.53	9°	4	45
08-00300-00504		1°	2	0.57	9°	4	45
08-00300-00505		1°30′	2	0.60	9°	4	45
08-00300-00506		2°	2	0.64	9°	4	45
08-00300-00508		3°	2	0.71	9°	4	45
08-00300-00510		4°	2	0.78	9°	4	45
08-00300-00512		5°	2	0.85	9°	4	45
08-00300-00514		6°	2	0.92	9°	4	45
08-00300-00516		7°	2	0.99	9°	4	45
08-00300-00519		10°	2	1.21	10°	4	45
08-00300-00524		15°	2	1.57	15°	4	45
08-00300-00525		20°	2	1.96	15°	4	45

How to Order When you order, indicate MTE230 (D)×(θ). ※(d_1) and (γ) is reference value.

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00300-00602	0.6	30′	2	0.63	9°	4	45
08-00300-00604		1°	2	0.67	9°	4	45
08-00300-00605		1°30′	2	0.70	9°	4	45
08-00300-00606		2°	2	0.74	9°	4	45
08-00300-00608		3°	2	0.81	9°	4	45
08-00300-00610		4°	2	0.88	9°	4	45
08-00300-00612		5°	2	0.95	9°	4	45
08-00300-00614		6°	2	1.02	9°	4	45
08-00300-00616		7°	2	1.09	9°	4	45
08-00300-00619		10°	2	1.31	10°	4	45
08-00300-00624		15°	2	1.67	15°	4	45
08-00300-00625		20°	2	2.06	15°	4	45
08-00300-00702	0.7	30′	2	0.73	9°	4	45
08-00300-00704		1°	2	0.77	9°	4	45
08-00300-00705		1°30′	2	0.80	9°	4	45
08-00300-00706		2°	2	0.84	9°	4	45
08-00300-00708		3°	2	0.91	9°	4	45
08-00300-00710		4°	2	0.98	9°	4	45
08-00300-00712		5°	2	1.05	9°	4	45
08-00300-00714		6°	2	1.12	9°	4	45
08-00300-00716		7°	2	1.19	9°	4	45
08-00300-00719		10°	2	1.41	10°	4	45
08-00300-00724		15°	2	1.77	15°	4	45
08-00300-00725		20°	2	2.16	15°	4	45
08-00300-00802	0.8	30′	3	0.85	9°	4	45
08-00300-00804		1°	3	0.90	9°	4	45
08-00300-00805		1°30′	3	0.96	9°	4	45
08-00300-00806		2°	3	1.01	9°	4	45
08-00300-00808		3°	3	1.11	9°	4	45
08-00300-00810		4°	3	1.21	9°	4	45
08-00300-00812		5°	3	1.32	9°	4	45
08-00300-00814		6°	3	1.43	9°	4	45
08-00300-00816		7°	3	1.54	9°	4	45
08-00300-00819		10°	3	1.86	10°	4	45
08-00300-00824		15°	3	2.41	15°	4	45
08-00300-00825		20°	3	2.98	20°	4	45
08-00300-00902	0.9	30′	3	0.95	9°	4	45
08-00300-00904		1°	3	1.00	9°	4	45
08-00300-00905		1°30′	3	1.06	9°	4	45
08-00300-00906		2°	3	1.11	9°	4	45
08-00300-00908		3°	3	1.21	9°	4	45
08-00300-00910		4°	3	1.32	9°	4	45
08-00300-00912		5°	3	1.42	9°	4	45
08-00300-00914		6°	3	1.53	9°	4	45
08-00300-00916		7°	3	1.64	9°	4	45
08-00300-00919		10°	3	1.96	10°	4	45
08-00300-00924		15°	3	2.51	15°	4	45
08-00300-00925		20°	3	3.08	20°	4	45

MTE230

MUGEN COATING 2-Flute Taper End Mill

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00300-01002	1	30′	4	1.07	9°	4	45
08-00300-01004		1°	4	1.14	9°	4	45
08-00300-01005		1°30′	4	1.21	9°	4	45
08-00300-01006		2°	4	1.28	9°	4	45
08-00300-01008		3°	4	1.42	9°	4	45
08-00300-01010		4°	4	1.56	9°	4	45
08-00300-01012		5°	4	1.70	9°	4	45
08-00300-01014		6°	4	1.84	9°	4	45
08-00300-01016		7°	4	1.98	9°	4	45
08-00300-01019		10°	4	2.41	10°	4	45
08-00300-01024		15°	4	3.14	15°	6	50
08-00300-01025		20°	4	3.91	15°	6	50
08-00300-01502	1.5	30′	5	1.59	9°	4	45
08-00300-01504		1°	5	1.67	9°	4	45
08-00300-01505		1°30′	5	1.76	9°	4	45
08-00300-01506		2°	5	1.85	9°	4	45
08-00300-01508		3°	5	2.02	9°	4	45
08-00300-01510		4°	5	2.20	9°	4	45
08-00300-01512		5°	5	2.37	9°	4	45
08-00300-01514		6°	5	2.55	9°	4	45
08-00300-01516		7°	5	2.73	9°	4	45
08-00300-01519		10°	5	3.26	10°	4	45
08-00300-01524		15°	5	4.18	15°	6	50
08-00300-01525		20°	5	5.14	20°	6	50
08-00300-02002	2	30′	6	2.10	9°	4	45
08-00300-02004		1°	6	2.21	9°	4	45
08-00300-02005		1°30′	6	2.31	9°	4	45
08-00300-02006		2°	6	2.41	9°	4	45
08-00300-02008		3°	6	2.62	9°	4	45
08-00300-02010		4°	6	2.84	9°	4	45
08-00300-02012		5°	6	3.05	9°	4	45
08-00300-02014		6°	6	3.26	9°	4	45
08-00300-02016		7°	6	3.47	7°	4	45
08-00300-02019		10°	6	4.11	10°	6	50
08-00300-02024		15°	6	5.22	15°	6	50
08-00300-02025		20°	6	6.37	–	6	50
08-00300-02502	2.5	30′	8	2.64	9°	4	45
08-00300-02504		1°	8	2.78	9°	4	45
08-00300-02505		1°30′	8	2.91	9°	4	45
08-00300-02506		2°	8	3.05	9°	4	45
08-00300-02508		3°	8	3.33	9°	4	45
08-00300-02510		4°	8	3.62	4°	4	45
08-00300-02512		5°	8	3.90	5°	4	45
08-00300-02514		6°	8	4.18	–	4	50
08-00300-02516		7°	8	4.46	–	4	50
08-00300-02519		10°	8	5.32	10°	6	50
08-00300-02524		15°	8	6.79	–	6	50
08-00300-02525		20°	8	8.32	–	8	60
08-00300-03002	3	30′	10	3.17	9°	6	50
08-00300-03004		1°	10	3.35	9°	6	50
08-00300-03005		1°30′	10	3.52	9°	6	50
08-00300-03006		2°	10	3.69	9°	6	50
08-00300-03008		3°	10	4.05	9°	6	50
08-00300-03010		4°	10	4.40	9°	6	50

How to Order When you order, indicate MTE230 (D)×(θ). ※(d1) and (γ) is reference value.

Tapered

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Aluminium Alloy N
Copper N
Resin O
Tapered Coating

MTE230

MUGEN COATING 2-Flute Taper End Mill

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00300-03012	3	5°	10	4.75	9°	6	50
08-00300-03014		6°	10	5.10	6°	6	50
08-00300-03016		7°	10	5.46	7°	6	50
08-00300-03019		10°	10	6.53	–	6	50
08-00300-03024		15°	10	8.36	–	8	60
08-00300-03025		20°	10	10.30	–	10	70
08-00300-04002	4	30′	15	4.26	9°	6	50
08-00300-04004		1°	15	4.52	9°	6	50
08-00300-04005		1°30′	15	4.79	9°	6	50
08-00300-04006		2°	15	5.04	9°	6	50
08-00300-04008		3°	15	5.57	9°	6	50
08-00300-04010		4°	15	6.10	–	6	55
08-00300-04012		5°	15	6.62	–	6	55
08-00300-04014		6°	15	7.15	–	6	55
08-00300-04016		7°	15	7.68	–	6	55
08-00300-04019		10°	15	9.29	–	8	60
08-00300-04024		15°	15	12.04	–	12	80
08-00300-04025		20°	15	14.92	–	12	80
08-00300-05002	5	30′	20	5.34	9°	6	55
08-00300-05004		1°	20	5.70	9°	6	55
08-00300-05005		1°30′	20	6.04	–	6	55
08-00300-05006		2°	20	6.39	–	6	55
08-00300-05008		3°	20	7.10	–	6	55
08-00300-05010		4°	20	7.80	–	6	60
08-00300-05012		5°	20	8.50	–	8	60
08-00300-05014		6°	20	9.20	–	8	60
08-00300-05016		7°	20	9.91	7°	10	70
08-00300-05019		10°	20	12.05	–	12	80
08-00300-05024		15°	20	15.72	15°	16	90
08-00300-05025		20°	20	19.56	20°	20	100
08-00300-06002	6	30′	20	6.35	–	6	55
08-00300-06004		1°	20	6.70	–	6	55
08-00300-06005		1°30′	20	7.05	–	6	55
08-00300-06006		2°	20	7.40	–	6	55
08-00300-06008		3°	20	8.10	–	8	60
08-00300-06010		4°	20	8.80	–	8	65
08-00300-06012		5°	20	9.50	–	8	65
08-00300-06014		6°	20	10.20	–	10	70
08-00300-06016		7°	20	10.91	–	10	70
08-00300-06019		10°	20	13.05	–	12	80
08-00300-06024		15°	20	16.72	–	16	90
08-00300-06025		20°	20	20.56	–	20	100
08-00300-08002	8	30′	25	8.44	–	8	65
08-00300-08004		1°	25	8.87	–	8	65
08-00300-08005		1°30′	25	9.31	–	8	65
08-00300-08006		2°	25	9.74	–	8	65
08-00300-08008		3°	25	10.62	–	10	70
08-00300-08012		5°	25	12.37	–	12	90
08-00300-10002	10	30′	35	10.61	–	10	85
08-00300-10004		1°	35	11.22	–	10	85
08-00300-10005		1°30′	35	11.83	–	10	85
08-00300-10006		2°	35	12.44	–	12	90
08-00300-10008		3°	35	13.67	–	12	90
08-00300-10012		5°	35	16.12	–	16	90

MTE230

Recommended Milling Conditions

[ϕ0.5～1 Slotting]

Work Material		Carbon Steels・Alloy Steels・Prehardened Steels (～40HRC)		Aluminium Alloy		Copper	
Cutting Speed		40～70m/min		150～300m/min		80～150m/min	
Dia.	Depth of Cut ap	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	mm	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.5	0.005～0.01	38,000	300	50,000	400	25,000	200
0.6	0.01 ～ 0.02	32,000	300	50,000	400	25,000	200
0.7	0.01 ～ 0.03	27,000	300	50,000	500	25,000	250
0.8	0.02 ～ 0.04	24,000	400	50,000	650	25,000	330
0.9	0.03 ～ 0.06	21,000	400	50,000	800	25,000	400
1	0.03 ～ 0.08	19,000	400	50,000	1,000	25,000	500

Notes

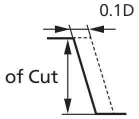
※1 Use cutting fluid.
※2 Adjust spindle speed and feed according to inclined angle.
※3 When corner machining, reduce the feed by approximately 50%～30%.
※4 Adjust spindle speed and feed at the same rate also reduce depth of cut, if the machine spindle speed insufficient.
※5 Recommend reciprocating cutting.

[ϕ1.5～10 Side Milling]

Work Material	Carbon Steels S50C		Alloy Steels・Tool Steels・Prehardened Steels SKD・HPM・NAK		Prehardened Steels NAK80 (～45HRC)	
Cutting Speed	50～70m/min		40～60m/min		30～50m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1.5	12,700	330	10,600	250	8,500	200
2	9,600	400	8,000	300	6,400	270
2.5	7,600	450	6,400	330	5,100	300
3	6,400	450	5,300	330	4,300	300
4	4,800	450	4,000	330	3,200	300
5	3,800	450	3,200	330	2,600	300
6	3,200	450	2,700	330	2,200	300
8	2,400	480	2,000	360	1,600	330
10	1,900	480	1,600	360	1,300	330

Depth of Cut (D: Dia.)

Taper Side Milling



Notes

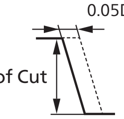
※1 Use cutting fluid.
※2 Adjust spindle speed and feed according to inclined angle.
※3 When corner machining, reduce the feed by approximately 50%～30%.
※4 Adjust spindle speed and feed at the same rate also reduce depth of cut, if the machine spindle speed insufficient.

[ϕ1.5 ～ 10 Side Milling]

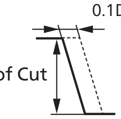
Work Material	Hardened Steels (～55HRC)		Aluminium Alloy		Copper	
Cutting Speed	20m/min		150～300m/min		80～150m/min	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1.5	4,300	110	50,000	1,300	25,000	650
2	3,200	130	48,000	2,000	24,000	1,000
2.5	2,700	150	38,200	2,200	19,100	1,100
3	2,200	150	32,000	2,200	16,000	1,100
4	1,600	150	24,000	2,200	12,000	1,100
5	1,300	150	19,100	2,200	9,600	1,100
6	1,100	150	16,000	2,200	8,000	1,100
8	800	160	12,000	2,200	6,000	1,100
10	650	160	9,600	2,200	4,800	1,100

Depth of Cut (D: Dia.)

Taper Side Milling



Taper Side Milling



Notes

※1 Use cutting fluid.
※2 Adjust spindle speed and feed according to inclined angle.
※3 When corner machining, reduce the feed by approximately 50%～30%.
※4 Adjust spindle speed and feed at the same rate also reduce depth of cut, if the machine spindle speed insufficient.

MRT425

Size ϕ0.2×taper angle30′ ~ ϕ3×taper angle2°

≤55 HRC

MRT425

MUGEN COATING 4-Flute Taper End Mill for Deep Rib

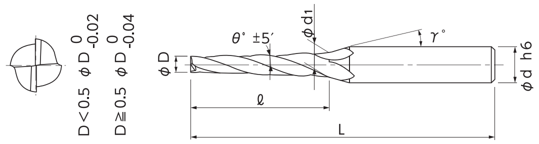
Total 245 sizes

MUGEN COATING 4-Flute Taper End Mill for Deep Rib

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H

MG 4 25° Slot

Taper end mill for direct milling on rib shape without pre-processing. Maximum L/D=16



2 cutting edges on end.

● It is possible for high precision and efficiency cutting by NS TOOL original design.

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00310-02022	0.2	30′	2	0.23	15°	3	40
08-00310-02023		1°		0.27	15°	3	40
08-00310-02024		1°30′		0.30	15°	3	40
08-00310-02025		2°		0.34	15°	3	40
08-00310-03032	0.3	30′	3	0.35	15°	3	40
08-00310-03033		1°		0.40	15°	3	40
08-00310-03034		1°30′		0.46	15°	3	40
08-00310-03035		2°		0.51	15°	3	40
08-00310-04042	0.4	30′	4	0.47	15°	3	40
08-00310-04043		1°		0.54	15°	3	40
08-00310-04044		1°30′		0.61	15°	3	40
08-00310-04045		2°		0.68	15°	3	40
08-00310-05042	0.5	30′	4	0.57	15°	3	40
08-00310-05043		1°		0.64	15°	3	40
08-00310-05044		1°30′		0.71	15°	3	40
08-00310-05045		2°		0.78	15°	3	40
08-00310-05062		30′	6	0.60	15°	3	40
08-00310-05063		1°		0.71	15°	3	40
08-00310-05064		1°30′		0.81	15°	3	40
08-00310-05065		2°		0.92	15°	3	40
08-00310-06042	0.6	30′	4	0.67	15°	3	40
08-00310-06043		1°		0.74	15°	3	40
08-00310-06044		1°30′		0.81	15°	3	40
08-00310-06045		2°		0.88	15°	3	40
08-00310-06062		30′	6	0.70	15°	3	40
08-00310-06063		1°		0.81	15°	3	40
08-00310-06064		1°30′		0.91	15°	3	40
08-00310-06065		2°		1.02	15°	3	40
08-00310-07062	0.7	30′	6	0.80	15°	3	40
08-00310-07063		1°		0.91	15°	3	40
08-00310-07064		1°30′		1.01	15°	3	40
08-00310-07065		2°		1.12	15°	3	40
08-00310-07082		30′	8	0.84	15°	3	45
08-00310-07083		1°		0.98	15°	3	45

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00310-07084	0.7	1°30′	8	1.12	15°	3	45
08-00310-07085		2°		1.26	15°	3	45
08-00310-08041	0.8	15′	4	0.83	15°	4	45
08-00310-08042		30′		0.87	15°	4	45
08-00310-08043		1°		0.94	15°	4	45
08-00310-08044		1°30′		1.01	15°	4	45
08-00310-08045		2°		1.08	15°	4	45
08-00310-08061		15′	6	0.85	15°	4	45
08-00310-08062		30′		0.90	15°	4	45
08-00310-08063		1°		1.01	15°	4	45
08-00310-08064		1°30′		1.11	15°	4	45
08-00310-08065		2°		1.22	15°	4	45
08-00310-08081		15′	8	0.87	15°	4	45
08-00310-08082		30′		0.94	15°	4	45
08-00310-08083		1°		1.08	15°	4	45
08-00310-08084		1°30′		1.22	15°	4	45
08-00310-08085		2°		1.36	15°	4	45
08-00310-08101		15′	10	0.89	15°	4	45
08-00310-08102		30′		0.97	15°	4	45
08-00310-08103		1°		1.15	15°	4	45
08-00310-08104		1°30′		1.32	15°	4	45
08-00310-08105		2°		1.50	15°	4	45
08-00310-08122		30′	12	1.01	15°	4	50
08-00310-08123		1°		1.22	15°	4	50
08-00310-08124		1°30′		1.43	15°	4	50
08-00310-08125		2°		1.64	15°	4	50
08-00310-10061	1	15′	6	1.05	15°	4	45
08-00310-10062		30′		1.10	15°	4	45
08-00310-10063		1°		1.21	15°	4	45
08-00310-10064		1°30′		1.31	15°	4	45
08-00310-10065		2°		1.42	15°	4	45
08-00310-10081		15′	8	1.07	15°	4	45
08-00310-10082		30′		1.14	15°	4	45
08-00310-10083		1°		1.28	15°	4	45

How to Order　When you order, indicate MRT425 (D)×(θ)×(ℓ).　※(d1) and (γ) is reference value.

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00310-10084	1	1°30′	8	1.42	15°	4	45
08-00310-10085		2°		1.56	15°	4	45
08-00310-10101		15′	10	1.09	15°	4	45
08-00310-10102		30′		1.17	15°	4	45
08-00310-10103		1°		1.35	15°	4	45
08-00310-10104		1°30′		1.52	15°	4	45
08-00310-10105		2°		1.70	15°	4	45
08-00310-10121		15′	12	1.10	15°	4	50
08-00310-10122		30′		1.21	15°	4	50
08-00310-10123		1°		1.42	15°	4	50
08-00310-10124		1°30′		1.63	15°	4	50
08-00310-10125		2°		1.84	15°	4	50
08-00310-10163		1°	16	1.56	15°	4	55
08-00310-10164		1°30′		1.84	15°	4	55
08-00310-10165		2°		2.12	15°	4	55
08-00310-12061	1.2	15′	6	1.25	15°	4	45
08-00310-12062		30′		1.30	15°	4	45
08-00310-12063		1°		1.41	15°	4	45
08-00310-12064		1°30′		1.51	15°	4	45
08-00310-12065		2°		1.62	15°	4	45
08-00310-12101		15′	10	1.29	15°	4	45
08-00310-12102		30′		1.37	15°	4	45
08-00310-12103		1°		1.55	15°	4	45
08-00310-12104		1°30′		1.72	15°	4	45
08-00310-12105		2°		1.90	15°	4	45
08-00310-12121		15′	12	1.30	15°	4	50
08-00310-12122		30′		1.41	15°	4	50
08-00310-12123		1°		1.62	15°	4	50
08-00310-12124		1°30′		1.83	15°	4	50
08-00310-12125		2°		2.04	15°	4	50
08-00310-12161		15′	16	1.34	15°	4	55
08-00310-12162		30′		1.48	15°	4	55
08-00310-12163		1°		1.76	15°	4	55
08-00310-12164		1°30′		2.04	15°	4	55
08-00310-12165		2°		2.32	15°	4	55
08-00310-12203		1°	20	1.90	15°	4	55
08-00310-12204		1°30′		2.25	15°	4	55
08-00310-12205		2°		2.60	15°	4	55
08-00310-13122	1.3	30′	12	1.51	15°	4	50
08-00310-13123		1°		1.72	15°	4	50
08-00310-13124		1°30′		1.93	15°	4	50
08-00310-13125		2°		2.14	15°	4	50
08-00310-14122	1.4	30′	12	1.61	15°	4	50
08-00310-14123		1°		1.82	15°	4	50

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00310-14124	1.4	1°30′	12	2.03	15°	4	50
08-00310-14125		2°		2.24	15°	4	50
08-00310-15061	1.5	15′	6	1.55	15°	4	45
08-00310-15062		30′		1.60	15°	4	45
08-00310-15063		1°		1.71	15°	4	45
08-00310-15064		1°30′		1.81	15°	4	45
08-00310-15065		2°		1.92	15°	4	45
08-00310-15081		15′	8	1.57	15°	4	45
08-00310-15082		30′		1.64	15°	4	45
08-00310-15083		1°		1.78	15°	4	45
08-00310-15084		1°30′		1.92	15°	4	45
08-00310-15085		2°		2.06	15°	4	45
08-00310-15101		15′	10	1.59	15°	4	45
08-00310-15102		30′		1.67	15°	4	45
08-00310-15103		1°		1.85	15°	4	45
08-00310-15104		1°30′		2.02	15°	4	45
08-00310-15105		2°		2.20	15°	4	45
08-00310-15121		15′	12	1.60	15°	4	50
08-00310-15122		30′		1.71	15°	4	50
08-00310-15123		1°		1.92	15°	4	50
08-00310-15124		1°30′		2.13	15°	4	50
08-00310-15125		2°		2.34	15°	4	50
08-00310-15161		15′	16	1.64	15°	4	55
08-00310-15162		30′		1.78	15°	4	55
08-00310-15163		1°		2.06	15°	4	55
08-00310-15164		1°30′		2.34	15°	4	55
08-00310-15165		2°		2.62	15°	4	55
08-00310-15201		15′	20	1.67	15°	4	55
08-00310-15202		30′		1.85	15°	4	55
08-00310-15203		1°		2.20	15°	4	55
08-00310-15204		1°30′		2.55	15°	4	55
08-00310-15205		2°		2.90	15°	4	55
08-00310-15253		1°	25	2.37	15°	4	60
08-00310-15254		1°30′		2.81	15°	4	60
08-00310-15255		2°		3.25	15°	4	60
08-00310-16082	1.6	30′	8	1.74	15°	4	45
08-00310-16083		1°		1.88	15°	4	45
08-00310-16084		1°30′		2.02	15°	4	45
08-00310-16085		2°		2.16	15°	4	45
08-00310-16122		30′	12	1.81	15°	4	50
08-00310-16123		1°		2.02	15°	4	50
08-00310-16124		1°30′		2.23	15°	4	50
08-00310-16125		2°		2.44	15°	4	50
08-00310-16162		30′	16	1.88	15°	4	55

Tapered Coating

Tapered Coating

MRT425

MUGEN COATING 4-Flute Taper End Mill for Deep Rib

Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00310-16163	1.6	1°	16	2.16	15°	4	55
08-00310-16164		1°30′		2.44	15°	4	55
08-00310-16165		2°		2.72	15°	4	55
08-00310-16202		30′	20	1.95	15°	4	55
08-00310-16203		1°		2.30	15°	4	55
08-00310-16204		1°30′		2.65	15°	4	55
08-00310-16205		2°		3.00	15°	4	55
08-00310-18081	1.8	15′	8	1.87	15°	4	45
08-00310-18082		30′		1.94	15°	4	45
08-00310-18083		1°		2.08	15°	4	45
08-00310-18084		1°30′		2.22	15°	4	45
08-00310-18085		2°		2.36	15°	4	45
08-00310-18161		15′	16	1.94	15°	4	55
08-00310-18162		30′		2.08	15°	4	55
08-00310-18163		1°		2.36	15°	4	55
08-00310-18164		1°30′		2.64	15°	4	55
08-00310-18165		2°		2.92	15°	4	55
08-00310-18241		15′	24	2.01	15°	4	60
08-00310-18242		30′		2.22	15°	4	60
08-00310-18243		1°		2.64	15°	4	60
08-00310-18244		1°30′		3.06	15°	4	60
08-00310-18245		2°		3.48	15°	4	60
08-00310-20081	2	15′	8	2.07	15°	4	45
08-00310-20082		30′		2.14	15°	4	45
08-00310-20083		1°		2.28	15°	4	45
08-00310-20084		1°30′		2.42	15°	4	45
08-00310-20085		2°		2.56	15°	4	45
08-00310-20101		15′	10	2.09	15°	4	45
08-00310-20102		30′		2.17	15°	4	45
08-00310-20103		1°		2.35	15°	4	45
08-00310-20104		1°30′		2.52	15°	4	45
08-00310-20105		2°		2.70	15°	4	45
08-00310-20121		15′	12	2.10	15°	4	50
08-00310-20122		30′		2.21	15°	4	50
08-00310-20123		1°		2.42	15°	4	50
08-00310-20124		1°30′		2.63	15°	4	50
08-00310-20125		2°		2.84	15°	4	50
08-00310-20127		3°		3.26	15°	4	50
08-00310-20161		15′	16	2.14	15°	4	55
08-00310-20162		30′		2.28	15°	4	55
08-00310-20163		1°		2.56	15°	4	55
08-00310-20164		1°30′		2.84	15°	4	55
08-00310-20165		2°		3.12	15°	4	55
08-00310-20167		3°		3.68	15°	4	55

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00310-20201	2	15′	20	2.17	15°	4	55
08-00310-20202		30′		2.35	15°	4	55
08-00310-20203		1°		2.70	15°	4	55
08-00310-20204		1°30′		3.05	15°	4	55
08-00310-20205		2°		3.40	15°	4	55
08-00310-20207		3°		4.10	15°	6	55
08-00310-20251		15′	25	2.22	15°	4	60
08-00310-20252		30′		2.44	15°	4	60
08-00310-20253		1°		2.87	15°	4	60
08-00310-20254		1°30′		3.31	15°	4	60
08-00310-20255		2°		3.75	15°	4	60
08-00310-20257		3°		4.62	15°	6	60
08-00310-20302		30′	30	2.52	15°	4	65
08-00310-20303		1°		3.05	15°	4	65
08-00310-20304		1°30′		3.57	15°	4	65
08-00310-20305		2°		4.10	15°	6	65
08-00310-20307		3°		5.14	15°	6	65
08-00310-25102	2.5	30′	10	2.67	15°	4	45
08-00310-25103		1°		2.85	15°	4	45
08-00310-25104		1°30′		3.02	15°	4	45
08-00310-25105		2°		3.20	15°	4	45
08-00310-25162		30′	16	2.78	15°	4	50
08-00310-25163		1°		3.06	15°	4	50
08-00310-25164		1°30′		3.34	15°	4	50
08-00310-25165		2°		3.62	15°	4	50
08-00310-25202		30′	20	2.85	15°	4	55
08-00310-25203		1°		3.20	15°	4	55
08-00310-25204		1°30′		3.55	15°	4	55
08-00310-25205		2°		3.90	15°	4	55
08-00310-25252		30′	25	2.94	15°	4	60
08-00310-25253		1°		3.37	15°	4	60
08-00310-25254		1°30′		3.81	15°	4	60
08-00310-25255		2°		4.25	15°	6	60
08-00310-25302		30′	30	3.02	15°	4	65
08-00310-25303		1°		3.55	15°	4	65
08-00310-25304		1°30′		4.07	15°	6	65
08-00310-25305		2°		4.60	15°	6	65
08-00310-30252	3	30′	25	3.44	15°	6	65
08-00310-30253		1°		3.87	15°	6	65
08-00310-30254		1°30′		4.31	15°	6	65
08-00310-30255		2°		4.75	15°	6	65
08-00310-30402		30′	40	3.70	15°	6	80
08-00310-30403		1°		4.40	15°	6	80
08-00310-30404		1°30′		5.09	15°	6	80
08-00310-30405		2°		5.79	15°	6	80

How to Order When you order, indicate MRT425 (D)×(θ)×(ℓ). ※(d1) and (γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels・Prehardened Steels SKD・HPM・NAK (~40HRC)			Hardened Steels SKD61 (45~52HRC)		
Cutting Speed	10~80m/min (φ0.2~φ0.5) 25~100m/min (φ0.6~φ0.8) 40~70m/min (φ1~φ3)			10~80m/min (φ0.2~φ0.5) 25~100m/min (φ0.6~φ0.8) 35~65m/min (φ1~φ3)			10~65m/min (φ0.2~φ0.4) 25~50m/min (φ0.5~φ0.8) 25~40m/min (φ1~φ3)		
Dia.	Spindle Speed	Feed	Depth of Cut ap	Spindle Speed	Feed	Depth of Cut ap	Spindle Speed	Feed	Depth of Cut ap
	min^{-1}	mm/min	mm	min^{-1}	mm/min	mm	min^{-1}	mm/min	mm
0.2	20,000~50,000	300~ 800	0.001~0.002	20,000~50,000	250~700	0.001~0.002	20,000~50,000	200~400	0.001~0.002
0.3	20,000~50,000	300~ 800	0.002~0.003	20,000~50,000	250~700	0.002~0.003	20,000~50,000	200~400	0.002~0.003
0.4	20,000~50,000	300~ 800	0.002~0.004	20,000~50,000	250~700	0.002~0.004	20,000~50,000	200~400	0.002~0.004
0.5	20,000~50,000	300~ 800	0.01 ~0.025	20,000~50,000	250~700	0.01 ~0.025	15,000~30,000	200~400	0.005~0.01
0.6	15,000~40,000	350~ 900	0.012~0.03	15,000~40,000	300~700	0.012~0.03	15,000~30,000	200~400	0.006~0.012
0.7	15,000~40,000	350~ 900	0.014~0.035	15,000~40,000	300~700	0.014~0.035	10,000~20,000	200~400	0.007~0.014
0.8	15,000~40,000	350~ 900	0.016~0.04	15,000~40,000	300~700	0.016~0.04	10,000~20,000	200~400	0.008~0.016
1	14,000~20,000	500~1,000	0.02 ~0.05	12,000~20,000	400~700	0.02 ~0.05	8,000~11,000	200~400	0.01 ~0.02
1.2	12,000~17,000	500~1,000	0.024~0.06	10,000~16,000	400~700	0.024~0.06	7,000~ 9,500	200~400	0.012~0.024
1.3	10,000~16,000	500~1,000	0.026~0.065	9,000~15,000	400~700	0.026~0.065	6,500~ 8,500	200~400	0.013~0.026
1.4	9,000~15,000	500~1,000	0.028~0.07	8,000~14,000	400~700	0.028~0.07	6,000~ 8,000	200~400	0.014~0.028
1.5	8,000~14,000	500~1,000	0.03 ~0.075	7,000~13,000	400~700	0.03 ~0.075	5,500~ 7,500	200~400	0.015~0.03
1.6	7,000~13,000	500~1,000	0.032~0.08	6,000~12,000	400~700	0.032~0.08	5,000~ 7,000	200~400	0.016~0.032
1.8	6,500~12,000	500~1,000	0.036~0.09	5,000~11,000	400~700	0.036~0.09	4,500~ 6,000	200~400	0.018~0.036
2	6,500~11,000	500~1,000	0.04 ~0.1	5,000~10,000	400~700	0.04 ~0.1	4,000~ 5,500	200~400	0.02 ~0.04
2.5	6,000~ 9,000	500~1,000	0.05 ~0.125	4,000~ 8,000	400~700	0.05 ~0.125	3,500~ 4,500	200~400	0.025~0.05
3	5,000~ 7,000	500~1,000	0.06 ~0.15	4,000~ 6,500	400~700	0.06 ~0.15	3,000~ 4,000	200~400	0.03 ~0.06

Notes
※1 When length of cut is long, reduce the conditions listed above.
※2 When cutting at the corner, reduce the feed by 50% from the above values.
※3 Use cutting fluid with smoke retardant.
※4 Recommend reciprocating cutting.

MTB230

Size R0.1×taper angle1°～R2×taper angle15°

≤55 HRC

MUGEN COATING 2-Flute Taper Ball End Mill

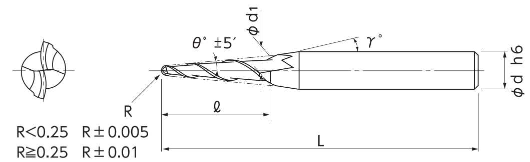
Total 111 sizes

MTB230

MUGEN COATING 2-Flute Taper Ball End Mill

Line up to maximum neck taper angle 15° of standard type taper ball end mill

MG | 2 | 30° | R ±0.005 (R<0.25) | R ±0.01 (R≧0.25) | Side | Slot | 3D



- It is possible to cut both taper and ball simultaneously.
- The available sizes are from radius 0.1 and single angles up to 15°.

Unit : mm

Code No.	Radius (R)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00540-01004	R0.1	1°	1	0.23	9°	4	50
08-00540-01006		2°	1	0.26	9°	4	50
08-00540-01008		3°	1	0.29	9°	4	50
08-00540-01012		5°	1	0.36	9°	4	50
08-00540-01016		7°	1	0.42	9°	4	50
08-00540-01019		10°	1	0.52	10°	4	50
08-00540-01504	R0.15	1°	1.5	0.35	9°	4	50
08-00540-01506		2°	1.5	0.39	9°	4	50
08-00540-01508		3°	1.5	0.44	9°	4	50
08-00540-01512		5°	1.5	0.54	9°	4	50
08-00540-01516		7°	1.5	0.63	9°	4	50
08-00540-01519		10°	1.5	0.78	10°	4	50
08-00540-01524		15°	1.5	1.03	15°	4	50
08-00540-02004	R0.2	1°	2	0.46	9°	4	50
08-00540-02006		2°	2	0.53	9°	4	50
08-00540-02008		3°	2	0.59	9°	4	50
08-00540-02012		5°	2	0.72	9°	4	50
08-00540-02016		7°	2	0.84	9°	4	50
08-00540-02019		10°	2	1.04	10°	4	50
08-00540-02024		15°	2	1.38	15°	4	50
08-00540-02504	R0.25	1°	2.5	0.58	9°	4	50
08-00540-02506		2°	2.5	0.66	9°	4	50
08-00540-02508		3°	2.5	0.74	9°	4	50
08-00540-02512		5°	2.5	0.90	9°	4	50
08-00540-02516		7°	2.5	1.06	9°	4	50
08-00540-02519		10°	2.5	1.30	10°	4	50
08-00540-02524		15°	2.5	1.72	15°	4	50
08-00540-03004	R0.3	1°	3	0.69	9°	4	50
08-00540-03006		2°	3	0.79	9°	4	50
08-00540-03008		3°	3	0.88	9°	4	50
08-00540-03012		5°	3	1.07	9°	4	50
08-00540-03016		7°	3	1.27	9°	4	50
08-00540-03019		10°	3	1.56	10°	4	50
08-00540-03024		15°	3	2.07	15°	4	50
08-00540-03504	R0.35	1°	3.5	0.81	9°	4	50
08-00540-03506		2°	3.5	0.92	9°	4	50
08-00540-03508		3°	3.5	1.03	9°	4	50
08-00540-03512		5°	3.5	1.25	9°	4	50
08-00540-03516		7°	3.5	1.48	9°	4	50
08-00540-03519		10°	3.5	1.82	10°	4	50
08-00540-03524		15°	3.5	2.41	15°	4	50
08-00540-04004	R0.4	1°	4	0.93	9°	4	50
08-00540-04006		2°	4	1.05	9°	4	50
08-00540-04008		3°	4	1.18	9°	4	50
08-00540-04012		5°	4	1.43	9°	4	50
08-00540-04016		7°	4	1.69	9°	4	50
08-00540-04019		10°	4	2.08	10°	4	50
08-00540-04024		15°	4	2.76	15°	4	50

How to Order When you order, indicate MTB230 (R)×(θ). ※(d1) and (γ) is reference value.

Unit : mm

Code No.	Radius (R)	Taper Angle (θ)	Length of Cut (ℓ)	Dia. at Large End (d1)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00540-04504	R0.45	1°	4	1.02	9°	4	50
08-00540-04506		2°	4	1.15	9°	4	50
08-00540-04508		3°	4	1.27	9°	4	50
08-00540-04512		5°	4	1.52	9°	4	50
08-00540-04516		7°	4	1.74	9°	4	50
08-00540-04519		10°	4	2.17	10°	4	50
08-00540-04524		15°	4	2.83	15°	4	50
08-00540-05004	R0.5	1°	4	1.12	9°	4	55
08-00540-05006		2°	4	1.25	9°	4	55
08-00540-05008		3°	4	1.37	9°	4	55
08-00540-05012		5°	4	1.62	9°	4	55
08-00540-05016		7°	4	1.87	9°	4	55
08-00540-05019		10°	4	2.25	10°	4	55
08-00540-05024		15°	4	2.91	15°	4	55
08-00540-06004	R0.6	1°	5	1.35	9°	4	55
08-00540-06006		2°	5	1.50	9°	4	55
08-00540-06008		3°	5	1.66	9°	4	55
08-00540-06012		5°	5	1.97	9°	4	55
08-00540-06016		7°	5	2.29	9°	4	55
08-00540-06019		10°	5	2.77	10°	4	55
08-00540-06024		15°	5	3.60	15°	4	55
08-00540-07504	R0.75	1°	6	1.68	9°	4	55
08-00540-07506		2°	6	1.87	9°	4	55
08-00540-07508		3°	6	2.05	9°	4	55
08-00540-07512		5°	6	2.42	9°	4	55
08-00540-07516		7°	6	2.80	9°	4	55
08-00540-07519		10°	6	3.37	10°	4	55
08-00540-07524		15°	6	4.37	–	4	55
08-00540-08004	R0.8	1°	6	1.78	9°	4	55
08-00540-08006		2°	6	1.96	9°	4	55
08-00540-08008		3°	6	2.15	9°	4	55
08-00540-08012		5°	6	2.52	9°	4	55
08-00540-08016		7°	6	2.89	9°	4	55
08-00540-08019		10°	6	3.46	10°	4	55
08-00540-08024		15°	6	4.44	–	4	55
08-00540-10004	R1	1°	8	2.24	9°	4	60
08-00540-10006		2°	8	2.49	9°	4	60
08-00540-10008		3°	8	2.74	9°	4	60
08-00540-10012		5°	8	3.23	9°	4	60
08-00540-10016		7°	8	3.73	7°	4	60
08-00540-10019		10°	8	4.50	10°	6	60
08-00540-10024		15°	8	5.82	15°	6	60
08-00540-12504	R1.25	1°	10	2.81	9°	4	60
08-00540-12506		2°	10	3.11	9°	4	60
08-00540-12508		3°	10	3.42	9°	4	60
08-00540-12512		5°	10	4.04	9°	6	60
08-00540-12516		7°	10	4.67	9°	6	60
08-00540-12519		10°	10	5.62	10°	6	60
08-00540-12524		15°	10	7.28	–	6	60
08-00540-15004	R1.5	1°	12	3.37	9°	4	60
08-00540-15006		2°	12	3.74	2°	4	60
08-00540-15008		3°	12	4.10	9°	6	60
08-00540-15012		5°	12	4.85	9°	6	60
08-00540-15016		7°	12	5.60	7°	6	60
08-00540-15019		10°	12	6.75	–	6	60
08-00540-15024		15°	12	8.73	–	8	60
08-00540-20004	R2	1°	16	4.49	9°	6	65
08-00540-20006		2°	16	4.98	9°	6	65
08-00540-20008		3°	16	5.47	9°	6	65
08-00540-20012		5°	16	6.46	–	6	65
08-00540-20016		7°	16	7.47	7°	8	65
08-00540-20019		10°	16	9.00	–	8	65
08-00540-20024		15°	16	11.64	–	10	70

MTB230

Recommended Milling Conditions

Work Material		Carbon Steels·Alloy Steels·Prehardened Steels S50C·SKD·NAK			Hardened Steels (52HRC)			Aluminium Alloy·Copper		
		Slotting			Slotting			Slotting		
Radius	Taper Angle	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
R0.1	1°	40,000	90	0.005	40,000	60	0.003	40,000	100	0.006
	2°	40,000	100	0.006	40,000	70	0.004	40,000	110	0.007
	3°	40,000	120	0.006	40,000	80	0.004	40,000	140	0.007
	5°	40,000	130	0.007	40,000	90	0.005	40,000	140	0.008
	7°	40,000	160	0.007	40,000	100	0.005	40,000	180	0.008
	10°	40,000	180	0.008	40,000	120	0.005	40,000	200	0.01
R0.15	1°	40,000	120	0.005	40,000	80	0.004	40,000	140	0.006
	2°	40,000	130	0.005	40,000	90	0.004	40,000	140	0.006
	3°	40,000	140	0.006	40,000	100	0.004	40,000	160	0.007
	5°	40,000	150	0.006	40,000	100	0.005	40,000	170	0.007
	7°	40,000	180	0.007	40,000	120	0.005	40,000	200	0.008
	10°	40,000	210	0.008	40,000	140	0.005	40,000	230	0.01
	15°	40,000	240	0.01	40,000	160	0.007	40,000	260	0.012
R0.2	1°	40,000	390	0.015	40,000	260	0.01	40,000	430	0.018
	2°	40,000	400	0.015	40,000	260	0.01	40,000	440	0.018
	3°	40,000	420	0.02	40,000	280	0.013	40,000	460	0.024
	5°	40,000	430	0.02	40,000	290	0.013	40,000	470	0.024
	7°	40,000	450	0.02	40,000	300	0.013	40,000	500	0.024
	10°	40,000	470	0.02	40,000	310	0.013	40,000	520	0.024
	15°	40,000	500	0.02	37,000	310	0.013	40,000	550	0.024
R0.25	1°	40,000	420	0.015	38,000	260	0.01	40,000	460	0.018
	2°	40,000	430	0.02	37,000	260	0.013	40,000	470	0.024
	3°	40,000	440	0.02	36,000	260	0.013	40,000	490	0.024
	5°	40,000	450	0.025	35,000	260	0.017	40,000	500	0.03
	7°	40,000	480	0.03	34,000	270	0.02	40,000	530	0.036
	10°	40,000	510	0.03	32,000	270	0.02	40,000	560	0.036
	15°	40,000	540	0.03	29,000	270	0.02	40,000	600	0.036
R0.3	1°	40,000	500	0.03	31,000	260	0.02	40,000	550	0.036
	2°	40,000	520	0.035	30,500	260	0.023	40,000	580	0.042
	3°	40,000	530	0.04	30,000	260	0.026	40,000	580	0.05
	5°	40,000	550	0.045	29,000	270	0.03	40,000	610	0.055
	7°	38,000	570	0.05	28,000	280	0.033	40,000	660	0.06
	10°	35,000	580	0.05	27,000	300	0.033	40,000	730	0.06
	15°	32,000	600	0.05	24,000	300	0.033	40,000	820	0.06
R0.35	1°	36,000	720	0.06	27,000	360	0.04	40,000	880	0.07
	2°	35,000	720	0.065	26,500	360	0.043	40,000	900	0.08
	3°	34,000	720	0.07	26,000	360	0.046	40,000	940	0.085
	5°	33,000	720	0.075	25,000	360	0.05	40,000	960	0.09
	7°	32,000	720	0.08	24,000	360	0.053	40,000	990	0.095
	10°	30,000	720	0.085	23,000	360	0.056	40,000	1,060	0.1
	15°	28,000	720	0.09	21,000	360	0.06	40,000	1,140	0.11
R0.4	1°	32,000	900	0.065	23,500	460	0.043	40,000	1,240	0.08
	2°	31,000	900	0.07	23,000	460	0.046	40,000	1,280	0.085
	3°	30,000	900	0.075	22,500	460	0.05	40,000	1,320	0.09
	5°	29,000	900	0.08	22,000	460	0.053	40,000	1,370	0.095
	7°	28,000	900	0.09	21,000	460	0.06	40,000	1,420	0.11
	10°	27,000	900	0.1	20,000	460	0.066	40,000	1,470	0.12
	15°	25,000	900	0.11	18,500	460	0.073	37,000	1,470	0.13

Work Material		Carbon Steels·Alloy Steels·Prehardened Steels S50C·SKD·NAK			Hardened Steels (52HRC)			Aluminium Alloy·Copper		
		Slotting			Slotting			Slotting		
Radius	Taper Angle	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
R0.45	1°	28,000	1,100	0.1	21,000	550	0.065	40,000	1,730	0.12
	2°	27,500	1,100	0.1	20,500	550	0.067	40,000	1,760	0.125
	3°	27,000	1,100	0.11	20,000	550	0.073	40,000	1,790	0.13
	5°	26,000	1,100	0.12	19,500	550	0.08	39,000	1,820	0.145
	7°	25,000	1,100	0.13	19,000	550	0.086	37,500	1,820	0.16
	10°	24,000	1,100	0.14	18,000	550	0.092	36,000	1,820	0.17
	15°	22,000	1,100	0.15	16,500	550	0.1	33,000	1,820	0.18
R0.5	1°	25,000	1,200	0.12	19,000	570	0.08	38,000	2,000	0.145
	2°	24,500	1,200	0.13	18,500	570	0.085	37,000	2,000	0.16
	3°	24,000	1,200	0.14	18,000	570	0.09	36,000	2,000	0.17
	5°	23,000	1,200	0.15	17,500	570	0.1	35,000	2,000	0.18
	7°	22,500	1,200	0.16	17,000	570	0.105	34,000	2,000	0.19
	10°	21,000	1,200	0.17	16,000	570	0.11	32,000	2,000	0.2
	15°	20,000	1,200	0.18	15,000	570	0.12	29,000	2,000	0.21
R0.6	1°	21,000	1,300	0.13	16,000	590	0.085	32,000	2,100	0.16
	2°	20,500	1,300	0.15	15,500	590	0.1	31,000	2,100	0.18
	3°	20,000	1,300	0.16	15,000	590	0.11	30,000	2,100	0.2
	5°	19,500	1,300	0.18	14,500	590	0.12	29,000	2,100	0.22
	7°	19,000	1,300	0.2	14,000	590	0.13	28,000	2,100	0.24
	10°	18,000	1,300	0.22	13,000	590	0.145	27,000	2,100	0.26
	15°	16,000	1,300	0.23	12,000	590	0.15	25,000	2,100	0.28
R0.75	1°	17,000	1,300	0.15	13,000	600	0.1	25,000	2,100	0.17
	2°	16,500	1,300	0.17	12,500	600	0.11	24,500	2,100	0.2
	3°	16,000	1,300	0.18	12,000	600	0.12	24,000	2,100	0.22
	5°	15,500	1,300	0.2	11,500	600	0.13	23,000	2,100	0.24
	7°	15,000	1,300	0.22	11,000	600	0.145	22,500	2,100	0.25
	10°	14,000	1,300	0.24	10,500	600	0.16	21,000	2,100	0.27
	15°	13,000	1,300	0.25	10,000	600	0.165	20,000	2,100	0.29
R0.8	1°	16,000	1,400	0.15	12,500	620	0.105	23,500	2,300	0.19
	2°	15,500	1,400	0.17	12,000	620	0.11	23,000	2,300	0.22
	3°	15,000	1,400	0.18	11,500	620	0.12	22,500	2,300	0.23
	5°	14,500	1,400	0.2	11,000	620	0.13	22,000	2,300	0.25
	7°	14,000	1,400	0.22	10,500	620	0.145	21,000	2,300	0.26
	10°	13,000	1,400	0.24	10,000	620	0.16	20,000	2,300	0.29
	15°	12,000	1,400	0.25	9,500	620	0.165	18,000	2,300	0.3
R1	1°	13,000	1,200	0.18	10,000	600	0.12	19,000	2,000	0.21
	2°	12,500	1,200	0.2	9,500	600	0.13	18,500	2,000	0.24
	3°	12,000	1,200	0.22	9,000	600	0.145	18,000	2,000	0.26
	5°	11,500	1,200	0.24	8,500	600	0.16	17,500	2,000	0.29
	7°	11,000	1,200	0.26	8,000	600	0.17	17,000	2,000	0.31
	10°	10,500	1,200	0.28	7,500	600	0.185	16,000	2,000	0.33
	15°	10,000	1,200	0.3	7,000	600	0.195	15,000	2,000	0.36
R1.25	1°	10,000	1,200	0.2	7,500	600	0.13	15,500	2,000	0.24
	2°	10,000	1,200	0.22	7,500	600	0.145	15,000	2,000	0.26
	3°	9,500	1,200	0.24	7,000	600	0.16	14,500	2,000	0.29
	5°	9,500	1,200	0.26	7,000	600	0.17	14,000	2,000	0.31
	7°	9,000	1,200	0.28	6,500	600	0.185	13,500	2,000	0.33
	10°	8,500	1,200	0.3	6,500	600	0.2	13,000	2,000	0.36
	15°	8,000	1,200	0.32	6,000	600	0.21	12,000	2,000	0.38

Recommended Milling Conditions

Work Material		Carbon Steels・Alloy Steels・Prehardened Steels S50C・SKD・NAK			Hardened Steels (52HRC)			Aluminium Alloy・Copper		
		Slotting			Slotting			Slotting		
Radius	Taper Angle	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut
		min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm
R1.5	1°	8,300	1,200	0.22	6,300	600	0.145	13,000	2,000	0.26
	2°	8,200	1,200	0.24	6,100	600	0.16	12,500	2,000	0.29
	3°	8,100	1,200	0.26	6,000	600	0.17	12,000	2,000	0.31
	5°	7,800	1,200	0.28	5,800	600	0.185	11,500	2,000	0.33
	7°	7,500	1,200	0.3	5,600	600	0.2	11,000	2,000	0.36
	10°	7,100	1,200	0.32	5,300	600	0.21	10,500	2,000	0.38
	15°	6,500	1,200	0.35	4,900	600	0.23	10,000	2,000	0.42
R2	1°	6,300	1,100	0.25	4,700	550	0.165	9,400	1,800	0.3
	2°	6,100	1,100	0.27	4,600	550	0.18	9,200	1,800	0.32
	3°	6,000	1,100	0.29	4,500	550	0.19	9,100	1,800	0.35
	5°	5,800	1,100	0.32	4,400	550	0.21	8,800	1,800	0.38
	7°	5,600	1,100	0.35	4,200	550	0.23	8,400	1,800	0.42
	10°	5,300	1,100	0.37	4,000	550	0.245	8,000	1,800	0.44
	15°	4,900	1,100	0.4	3,700	550	0.265	7,300	1,800	0.48

Notes

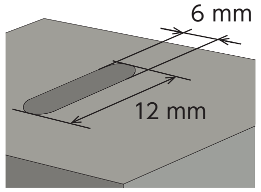
※1 Recommend to use the milling condition as just reference. Adjust milling conditions according to machining shape and machine status.
※2 This cutting condition assumes cutting depth of R×2 from the tip of the tool.
Please adjust both spindle speed and feed when the slotting depth is over 2×R.
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Recommend reciprocating cutting.
※5 Oil mist coolant is recommended for the machining of hardened steels.

High Efficient Milling

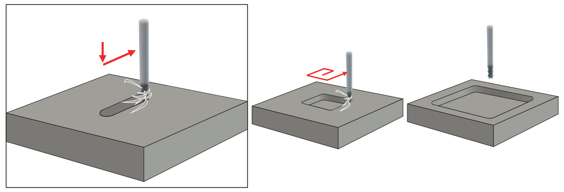
End mill lineup to realize high efficient machining

High efficiency with continuous machining from plunging to grooves to side surfaces

Time comparison for carbon steel S50C between plunging by MSZ345 and grooving by conventional tool



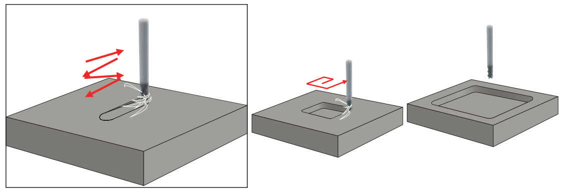
Pocket milling with approach by plunging with MSZ345 ϕ 6



Approach by plunging approx. 1.7 sec

Spindle speed: 4,800 min^{-1}, Feed (Plunging) : 300 mm/min
Feed (Slotting) : 720 mm/min

Pocket milling with approach by grooving with conventional 4-flute tool



Approach by 1.5° lamping approx. 49 sec

Spindle speed: 3,400 min^{-1}, Feed (Lamping) : 580 mm/min

Work Material
M Stainless Steel
S Heat Resistant Alloy

MSUSZ440 MSUSZ440-LN

Work Material
P Prehardened Steel

MSCZ440 MSCZ440-LN

Work Material
P Prehardened Steel
M Stainless Steel

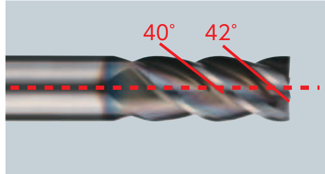
MSZ345

Work Material
N Aluminium Alloy

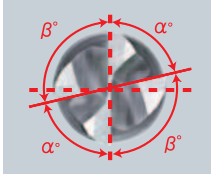
AL3D-345 ALZ345 ALZ345-DLC

High efficient machining with unequal flute spacing and unequal helix angle design to suppress chattering

MSUSZ440 • MSUSZ440-LN



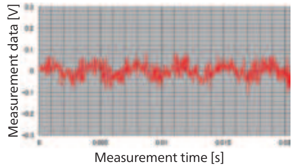
Unequal Helix Angle



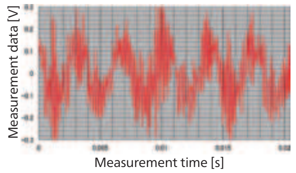
Unequal Flute Spacing

Work material: SUS304
Spindle speed n: 5,500 min^{-1}
Feed vf: 1,300 mm/min
Depth of cut: ap 12 × ae 1.2 mm
Coolant : Water-soluble fluid

Unequal flute spacing
Unequal helix angle



Conventional tool



Work Material
M Stainless Steel
S Heat Resistant Alloy

MSXH440R	MSUSZ440	MSUSZ440-LN
Helix angle	Helix angle	Helix angle
40°/ 42°	40°/ 42°	40°/ 42°

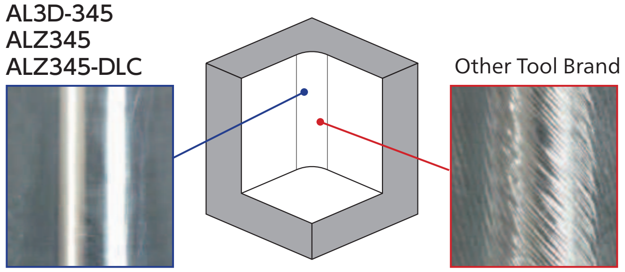
Work Material
P Prehardened Steel

MSCZ440	MSCZ440-LN	MSX440
Helix angle	Helix angle	Helix angle
40°/ 42°	40°/ 42°	35°/ 38°

High efficient machining with unequal peripheral cutting edge design to suppress chattering

Realized no chattering within a wide range cutting speed, 40m/min~360m/min, achieved stable machining even at high cutting load corner part and high speed condition

AL3D-345
ALZ345
ALZ345-DLC



Other Tool Brand

Work Material
N Aluminium Alloy

AL3D-345 ALZ345 ALZ345-DLC

End mill lineup to realize high efficient machining

Model	Size	Maximum Cutting Depth	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunge Milling (There is a depth note in each model)	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55 HRC	H Hardened Steel ～65 HRC	H Hardened Steel ～70 HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																									
MSUSZ440	φ1 ～ φ6	3D	3D	∞ Premium	4	40°/42°	Side	Slot	Face	Plunge	-	-	-	-	-	-	◎	◎	-	-	-	-	-	62	I-006
For machining on stainless steels and heat resistant alloy Continuous machining from plunging to slotting. Unequal flute spacing and unequal helix angle design																									
MSCZ440	φ1 ～ φ6	3D	3D	∞	4	40°/42°	Side	Slot	Face	Plunge	◎	◎	◎	-	-	-	-	-	-	-	-	-	-	62	I-008
High efficient machining on carbon steels. Continuous machining from plunging approach to slotting																									
MSZ345	φ1 ～ φ12	2.4D	≒2.4D	∞	3	45°	Side	Slot	Face	Plunge	◎	◎	◎	-	-	-	○	-	-	-	-	-	-	111	I-010
For machining on steels Continuous machining from plunging without guide-hole and stepping to slotting																									
AL3D-345	φ1 ～ φ12	3D	3D	-	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	◎	○	○	-	-	9	I-014
For machining on aluminium alloy Continuous machining from plunging without guide-hole and stepping to slotting ※Listed at "Aluminium Milling" as well (Page J-022)																									
Long Neck Square																									
MSUSZ440-LN	φ1 ～ φ6	5D	1.5D	∞ Premium	4	40°/42°	Side	Slot	Face	Plunge	-	-	-	-	-	-	◎	◎	-	-	-	-	-	33	I-016
For machining on stainless steels and heat resistant alloy Continuous machining from plunging to slotting Unequal flute spacing and unequal helix angle design																									
MSCZ440-LN	φ1 ～ φ6	5D	1.5D	∞	4	40°/42°	Side	Slot	Face	Plunge	◎	◎	◎	-	-	-	-	-	-	-	-	-	-	33	I-018
High efficient machining on carbon steels. Continuous machining from plunging approach to slotting. Long neck type to prevent interference																									
ALZ345-DLC	φ1 ～ φ12	3D	1.5D	DLC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	◎	○	○	-	-	17	I-020
For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting.DLC coating applied for longer tool life ※Listed at "Aluminium Milling" as well (Page J-030)																									

Model	Size	Maximum Cutting Depth	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunge Milling (There is a depth note in each model)	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55 HRC	H Hardened Steel ～65 HRC	H Hardened Steel ～70 HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square・Long Neck Square																									
ALZ345	φ1 ～ φ12	5D	1.5D	-	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	◎	○	○	-	-	124	I-022
For machining on aluminium alloy Continuous machining from plunging without guide-hole and stepping to slotting ※Listed at "Aluminium Milling" as well (Page J-026)																									
Corner Radius																									
MSXH440R	φ3× R0.3 ～ φ12× R2	2.5D	≒2.5D	∞ Premium	4	40°/42°	Side	Slot	Face	-	-	◎	◎	-	-	-	◎	◎	-	-	-	-	-	19	I-026
For machining on stainless steels and heat resistant alloy High efficient machining with unequal flute spacing and unequal helix angle design to suppress chattering																									
MSX440	φ3× R0.2 ～ φ20× R1	2.5D	≒2.5D	∞	4	35°/38°	Side	Slot	Face	-	◎	◎	◎	-	-	-	◎	-	-	-	-	-	-	16	I-028
Unequal helix angle and flute spacing to minimize chattering. Suitable for steels to stainless steels																									

MSUSZ440

Size ϕ 1 ～ ϕ 6

∞ Premium ≦40 HRC

MUGEN COATING PREMIUM 4-Flute High Efficient "Z" End Mill for Stainless Steels

Total 62 sizes

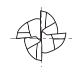
Recommended Milling Conditions

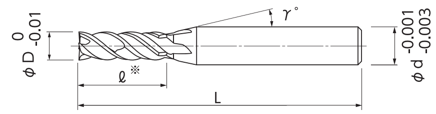
For machining on stainless steels and heat resistant alloy
Continuous machining from plunging to slotting
Unequal flute spacing and unequal helix angle design

MG | 4 | 40°/42° | ϕd −0.001 −0.003

Side | Slot | Face | Plunge

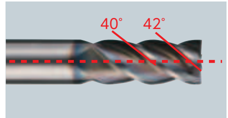
Plunge depth is refered to recommended milling conditions



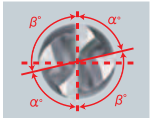


※ The practical Length of Cut is 0.1mm longer than the specification table.

- Unequal flute spacing, unequal helix angle and high rigid end profile design to minimize chatter realize high efficient machining.
- New developed special edge profile realized multi-functional performance of side milling, slot milling and plunging approaches on stainless steel.
- Optimized high heat-resistance MUGEN COATING PREMIUM to realize stable long time machining.
- Total 62 sizes, some sizes line up with L/D=2 or 3.



Unequal Helix Angle



Unequal Flute Spacing

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00152-01020	1	2	12°	4	50
08-00152-01030		3	12°	4	50
08-00152-01120	1.1	2.2	12°	4	50
08-00152-01220	1.2	2.4	12°	4	50
08-00152-01320	1.3	2.6	12°	4	50
08-00152-01420	1.4	2.8	12°	4	50
08-00152-01520	1.5	3	12°	4	50
08-00152-01530		4.5	12°	4	60
08-00152-01620	1.6	3.2	12°	6	50
08-00152-01720	1.7	3.4	12°	6	50
08-00152-01820	1.8	3.6	12°	6	50
08-00152-01920	1.9	3.8	12°	6	50
08-00152-02020	2	4	12°	6	50
08-00152-02030		6	12°	6	60
08-00152-02120	2.1	4.2	12°	6	50
08-00152-02220	2.2	4.4	12°	6	50
08-00152-02320	2.3	4.6	12°	6	50
08-00152-02420	2.4	4.8	12°	6	50
08-00152-02520	2.5	5	12°	6	50
08-00152-02530		7.5	12°	6	60
08-00152-02620	2.6	5.2	12°	6	50
08-00152-02720	2.7	5.4	12°	6	50
08-00152-02820	2.8	5.6	12°	6	50
08-00152-02920	2.9	5.8	12°	6	50
08-00152-03020	3	6	12°	6	50
08-00152-03030		9	12°	6	60
08-00152-03120	3.1	6.2	12°	6	50
08-00152-03220	3.2	6.4	12°	6	50
08-00152-03320	3.3	6.6	12°	6	50
08-00152-03420	3.4	6.8	12°	6	50

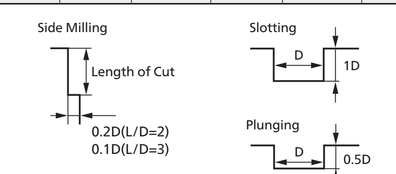
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00152-03520	3.5	7	12°	6	50
08-00152-03530		10.5	12°	6	60
08-00152-03620	3.6	7.2	12°	6	50
08-00152-03720	3.7	7.4	12°	6	50
08-00152-03820	3.8	7.6	12°	6	50
08-00152-03920	3.9	7.8	12°	6	50
08-00152-04020	4	8	12°	6	50
08-00152-04030		12	12°	6	60
08-00152-04120	4.1	8.2	12°	6	50
08-00152-04220	4.2	8.4	12°	6	50
08-00152-04320	4.3	8.6	12°	6	50
08-00152-04420	4.4	8.8	12°	6	50
08-00152-04520	4.5	9	12°	6	50
08-00152-04530		13.5	12°	6	60
08-00152-04620	4.6	9.2	12°	6	50
08-00152-04720	4.7	9.4	12°	6	50
08-00152-04820	4.8	9.6	12°	6	50
08-00152-04920	4.9	9.8	12°	6	50
08-00152-05020	5	10	12°	6	50
08-00152-05030		15	12°	6	60
08-00152-05120	5.1	10.2	12°	6	50
08-00152-05220	5.2	10.4	12°	6	50
08-00152-05320	5.3	10.6	12°	6	50
08-00152-05420	5.4	10.8	12°	6	50
08-00152-05520	5.5	11	12°	6	50
08-00152-05530		16.5	12°	6	60
08-00152-05620	5.6	11.2	12°	6	50
08-00152-05720	5.7	11.4	12°	6	50
08-00152-05820	5.8	11.6	12°	6	50
08-00152-05920	5.9	11.8	12°	6	50
08-00152-06020	6	12	–	6	60
08-00152-06030		18	–	6	60

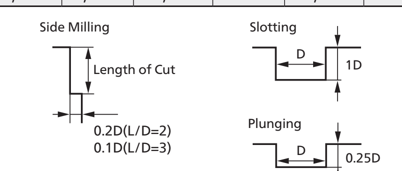
How to Order: When you order, indicate MSUSZ440 (D)×(ℓ).
※(γ) is reference value.

Machining case S-026

Work Material			Stainless Steels SUS304						Titanium Alloy Ti-6Al-4V					
			Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging	
Dia.	Length of Cut	L/D	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
			min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
1	2	2	18,000	600	15,000	200	15,000	50	16,800	600	13,500	200	13,500	50
	3	3	16,000	500	12,000	150	12,000	30	14,900	500	10,800	150	10,800	30
1.5	3	2	12,500	700	11,000	220	11,000	50	11,700	700	10,000	220	10,000	50
	4.5	3	11,000	550	8,500	160	8,500	30	10,300	550	7,700	160	7,700	30
2	4	2	10,000	850	8,600	240	8,600	50	9,300	850	7,800	240	7,800	50
	6	3	8,500	650	7,300	180	7,300	30	7,900	650	6,600	180	6,600	30
2.5	5	2	8,200	1,000	7,600	280	7,600	50	7,600	1,000	6,900	280	6,900	50
	7.5	3	7,100	750	6,300	200	6,300	30	6,600	750	5,700	200	5,700	30
3	6	2	7,200	1,100	6,800	300	6,800	50	6,700	1,100	6,200	300	6,200	50
	9	3	6,000	800	5,400	220	5,400	30	5,600	800	4,900	220	4,900	30
3.5	7	2	6,700	1,150	5,700	330	5,700	50	6,200	1,150	5,200	330	5,200	50
	10.5	3	5,500	900	4,800	230	4,800	30	5,100	900	4,400	230	4,400	30
4	8	2	6,400	1,200	5,300	330	5,300	50	6,000	1,200	4,800	330	4,800	50
	12	3	5,400	920	4,400	230	4,400	30	5,000	920	4,000	230	4,000	30
4.5	9	2	6,000	1,200	4,900	350	4,900	50	5,600	1,200	4,500	350	4,500	50
	13.5	3	5,200	1,000	4,000	240	4,000	30	4,800	1,000	3,700	240	3,700	30
5	10	2	5,600	1,200	4,600	360	4,600	50	5,200	1,200	4,200	360	4,200	50
	15	3	5,000	1,000	3,700	240	3,700	30	4,700	1,000	3,400	240	3,400	30
5.5	11	2	5,300	1,200	4,400	380	4,400	50	4,900	1,200	4,000	380	4,000	50
	16.5	3	4,800	1,000	3,400	250	3,400	30	4,500	1,000	3,100	250	3,100	30
6	12	2	5,000	1,200	4,200	400	4,200	50	4,600	1,200	3,800	400	3,800	50
	18	3	4,500	1,000	3,200	250	3,200	30	4,200	1,000	2,900	250	2,900	30

Depth of Cut (D：Dia.)





Notes

※1 Please choose the short end tooth when measure the tool length.
※2 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※3 Adjust both Spindle Speed and Feed at the same rate.
※4 Water-soluble fluid is recommended.
※5 Please increasing the coolant flow rate and pressure as much as possible, and supply it sufficiently to the machining point and flute.
※6 Please change the Depth of Cut or Feed when chips could not remove smoothly during plunging.
※7 Please be noted there would be a possible tool chipping or breakage when the chip removal is insufficient.
※8 Use a rigid and precise machine and chuck holder.
※9 Overhang of end mill should be as short as possible from spindle nose.

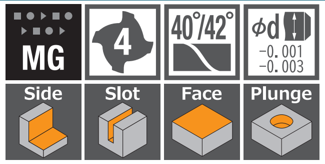
MSCZ440

Size ϕ 1 ～ ϕ 6

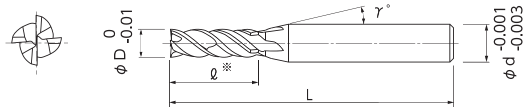
MUGEN COATING 4-Flute High Efficient "Z" End Mill for Carbon Steels

Total 62 sizes

High efficient machining on carbon steels !
Continuous machining from plunging approach to slotting

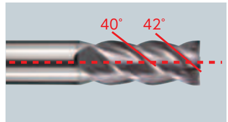


Plunge depth is refered to recommended milling conditions

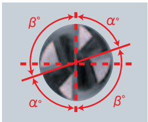


※ The practical Length of Cut is 0.1mm longer than the specification table.

- Unequal flute spacing, unequal helix angle and high rigid end profile design to minimize chatter realize high efficient machining.
- New developed special edge profile realized multi-functional performance of side milling, slot milling and plunging approaches on carbon steels.
- Long time stable machining is realized by adopting MUGEN COATING.
- Total 62 sizes, some sizes line up with L/D=2 or 3.



Unequal Helix Angle



Unequal Flute Spacing

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00135-01020	1	2	12°	4	50
08-00135-01030		3	12°	4	50
08-00135-01120	1.1	2.2	12°	4	50
08-00135-01220	1.2	2.4	12°	4	50
08-00135-01320	1.3	2.6	12°	4	50
08-00135-01420	1.4	2.8	12°	4	50
08-00135-01520	1.5	3	12°	4	50
08-00135-01530		4.5	12°	4	60
08-00135-01620	1.6	3.2	12°	6	50
08-00135-01720	1.7	3.4	12°	6	50
08-00135-01820	1.8	3.6	12°	6	50
08-00135-01920	1.9	3.8	12°	6	50
08-00135-02020	2	4	12°	6	50
08-00135-02030		6	12°	6	60
08-00135-02120	2.1	4.2	12°	6	50
08-00135-02220	2.2	4.4	12°	6	50
08-00135-02320	2.3	4.6	12°	6	50
08-00135-02420	2.4	4.8	12°	6	50
08-00135-02520	2.5	5	12°	6	50
08-00135-02530		7.5	12°	6	60
08-00135-02620	2.6	5.2	12°	6	50
08-00135-02720	2.7	5.4	12°	6	50
08-00135-02820	2.8	5.6	12°	6	50
08-00135-02920	2.9	5.8	12°	6	50
08-00135-03020	3	6	12°	6	50
08-00135-03030		9	12°	6	60
08-00135-03120	3.1	6.2	12°	6	50
08-00135-03220	3.2	6.4	12°	6	50
08-00135-03320	3.3	6.6	12°	6	50
08-00135-03420	3.4	6.8	12°	6	50
08-00135-03520	3.5	7	12°	6	50
08-00135-03530		10.5	12°	6	60
08-00135-03620	3.6	7.2	12°	6	50
08-00135-03720	3.7	7.4	12°	6	50
08-00135-03820	3.8	7.6	12°	6	50
08-00135-03920	3.9	7.8	12°	6	50
08-00135-04020	4	8	12°	6	50
08-00135-04030		12	12°	6	60
08-00135-04120	4.1	8.2	12°	6	50
08-00135-04220	4.2	8.4	12°	6	50
08-00135-04320	4.3	8.6	12°	6	50
08-00135-04420	4.4	8.8	12°	6	50
08-00135-04520	4.5	9	12°	6	50
08-00135-04530		13.5	12°	6	60
08-00135-04620	4.6	9.2	12°	6	50
08-00135-04720	4.7	9.4	12°	6	50
08-00135-04820	4.8	9.6	12°	6	50
08-00135-04920	4.9	9.8	12°	6	50
08-00135-05020	5	10	12°	6	50
08-00135-05030		15	12°	6	60
08-00135-05120	5.1	10.2	12°	6	50
08-00135-05220	5.2	10.4	12°	6	50
08-00135-05320	5.3	10.6	12°	6	50
08-00135-05420	5.4	10.8	12°	6	50
08-00135-05520	5.5	11	12°	6	50
08-00135-05530		16.5	12°	6	60
08-00135-05620	5.6	11.2	12°	6	50
08-00135-05720	5.7	11.4	12°	6	50
08-00135-05820	5.8	11.6	12°	6	50
08-00135-05920	5.9	11.8	12°	6	50
08-00135-06020	6	12	–	6	60
08-00135-06030		18	–	6	60

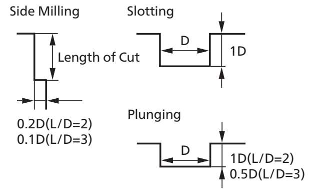
How to Order When you order, indicate MSCZ440 (D)×(ℓ).
※(γ) is reference value.

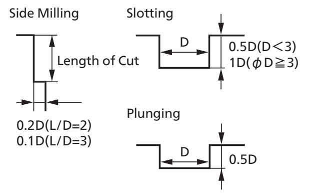
Machining case S-027

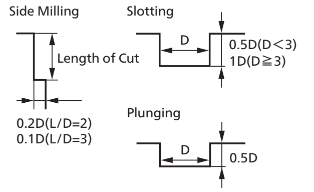
Recommended Milling Conditions

Work Material			Carbon Steels S50C						Alloy Steels SCM･SKD						Prehardened Steels (～40HRC)					
			Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging	
Dia.	Length of Cut	L/D	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
			min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	2	2	20,000	800	18,000	450	18,000	150	19,000	700	16,000	360	16,000	100	16,200	500	12,800	290	12,800	100
	3	3	17,500	700	16,000	350	16,000	100	16,800	580	14,500	250	14,500	50	14,300	430	11,600	200	11,600	50
1.5	3	2	14,800	900	13,500	560	13,500	150	13,500	800	12,500	450	12,500	120	11,500	600	10,100	360	10,100	120
	4.5	3	12,800	770	11,500	420	11,500	100	12,000	650	10,300	300	10,300	75	10,200	500	8,300	240	8,300	75
2	4	2	12,500	1,100	11,000	650	11,000	150	11,000	1,000	9,500	520	9,500	150	9,400	750	7,700	420	7,700	150
	6	3	11,000	900	10,000	500	10,000	100	9,600	750	8,400	360	8,400	100	8,200	580	6,800	290	6,800	100
2.5	5	2	10,900	1,300	9,000	850	9,000	200	9,000	1,120	8,000	680	8,000	150	7,700	850	6,400	540	6,400	150
	7.5	3	9,600	1,050	8,200	600	8,200	150	7,800	920	7,200	430	7,200	120	6,600	700	5,800	340	5,800	120
3	6	2	10,000	1,600	8,600	1,000	8,600	250	8,000	1,300	7,500	720	7,500	200	6,800	900	6,000	580	6,000	200
	9	3	9,000	1,300	7,800	730	7,800	200	6,600	1,000	6,400	530	6,400	150	5,600	720	5,300	420	5,300	150
3.5	7	2	9,200	1,650	7,900	1,000	7,900	250	7,400	1,340	6,900	800	6,900	200	6,300	920	5,500	640	5,500	200
	10.5	3	8,100	1,400	6,900	820	6,900	200	6,000	1,050	5,800	590	5,800	150	5,300	730	4,700	440	4,700	150
4	8	2	8,500	1,700	7,000	1,100	7,000	300	7,200	1,400	6,300	850	6,300	200	6,100	950	5,000	700	5,000	200
	12	3	7,500	1,400	6,100	850	6,100	250	5,900	1,100	5,600	610	5,600	150	5,100	760	4,300	470	4,300	150
4.5	9	2	7,600	1,700	6,300	1,100	6,300	300	6,600	1,500	5,700	880	5,700	200	5,600	1,000	4,600	700	4,600	200
	13.5	3	7,100	1,550	5,500	900	5,500	250	5,800	1,150	5,000	650	5,000	150	4,900	780	3,900	500	3,900	150
5	10	2	7,000	1,900	5,700	1,100	5,700	300	6,300	1,600	5,200	880	5,200	200	5,400	1,100	4,200	700	4,200	200
	15	3	6,500	1,700	5,000	900	5,000	250	5,700	1,250	4,600	650	4,600	150	4,800	800	3,600	520	3,600	150
5.5	11	2	6,400	2,000	5,300	1,100	5,300	300	6,100	1,600	4,800	880	4,800	200	5,200	1,100	3,900	700	3,900	200
	16.5	3	6,000	1,800	4,600	900	4,600	250	5,600	1,250	4,300	650	4,300	150	4,700	800	3,300	520	3,300	150
6	12	2	6,000	2,000	4,900	1,100	4,900	300	5,700	1,600	4,500	880	4,500	200	4,800	1,100	3,600	700	3,600	200
	18	3	5,600	1,800	4,300	900	4,300	250	5,300	1,250	4,000	650	4,000	150	4,500	800	3,100	520	3,100	150

Depth of Cut (D：Dia.)







Notes

※1 Please choose the short end tooth when measure the tool length.
※2 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※3 Adjust both Spindle Speed and Feed at the same rate.
※4 Please increasing the coolant flow rate and pressure as much as possible, and supply it sufficiently to the machining point and flute.
※5 Please change the Depth of Cut or Feed when chips could not remove smoothly during plunging.
※6 Please be noted there would be a possible tool chipping or breakage when the chip removal is insufficient.
※7 Use a rigid and precise machine and chuck holder.
※8 Overhang of end mill should be as short as possible from spindle nose.

MSZ345

Size ϕ 1 ～ ϕ 12

≦40 HRC

MSZ345

MUGEN COATING 3-Flute POWER"Z"End Mill

Total 111 sizes

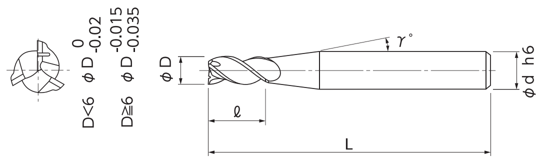
MUGEN COATING 3-Flute POWER"Z"End Mill

Carbon Steel P ◎ | Alloy Steel P ◎ | Prehardened Steel P ◎ | Stainless Steel M ○

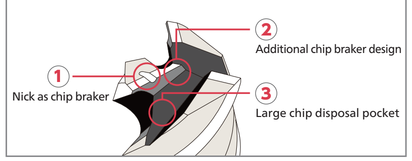
For machining on steels　Continuous machining from plunging without guide-hole and stepping to slotting

MG | 3 | 45°

Side | Slot | Face | Plunge



Unique end teeth design for plunging



- New flute design brought a remarkable shearing ability.
- High efficient machining is realized both for plunge cutting and slotting.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00133-00100	1	1.5	9°	4	45
▌08-00133-00110	1.1	1.7	9°	4	45
▌08-00133-00120	1.2	1.8	9°	4	45
▌08-00133-00130	1.3	2	9°	4	45
▌08-00133-00140	1.4	2.1	9°	4	45
08-00133-00150	1.5	2.3	9°	4	45
▌08-00133-00160	1.6	2.4	9°	4	45
▌08-00133-00170	1.7	2.6	9°	4	45
▌08-00133-00180	1.8	2.7	9°	4	45
▌08-00133-00190	1.9	2.9	9°	4	45
08-00133-00200	2	3	9°	4	45
▌08-00133-00210	2.1	3.2	9°	4	45
▌08-00133-00220	2.2	3.3	9°	4	45
▌08-00133-00230	2.3	3.5	9°	4	45
▌08-00133-00240	2.4	3.6	9°	4	45
08-00133-00250	2.5	3.8	9°	4	45
▌08-00133-00260	2.6	3.9	9°	4	45
▌08-00133-00270	2.7	4.1	9°	4	45
▌08-00133-00280	2.8	4.2	9°	4	45
▌08-00133-00290	2.9	4.5	9°	4	45
08-00133-00300	3	6	9°	6	50
▌08-00133-00310	3.1	6.2	9°	6	50
▌08-00133-00320	3.2	6.4	9°	6	50
▌08-00133-00330	3.3	6.6	9°	6	50
▌08-00133-00340	3.4	6.8	9°	6	50
▌08-00133-00350	3.5	7	9°	6	50

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00133-00360	3.6	7.2	9°	6	50
▌08-00133-00370	3.7	7.4	9°	6	50
▌08-00133-00380	3.8	7.6	9°	6	50
▌08-00133-00390	3.9	7.8	9°	6	50
08-00133-00400	4	8	9°	6	50
▌08-00133-00410	4.1	8.2	9°	6	50
▌08-00133-00420	4.2	8.4	9°	6	50
▌08-00133-00430	4.3	8.6	9°	6	50
▌08-00133-00440	4.4	8.8	9°	6	50
▌08-00133-00450	4.5	9	9°	6	50
▌08-00133-00460	4.6	9.2	9°	6	50
▌08-00133-00470	4.7	9.4	9°	6	50
▌08-00133-00480	4.8	9.6	9°	6	50
▌08-00133-00490	4.9	9.8	9°	6	50
08-00133-00500	5	10	9°	6	50
▌08-00133-00510	5.1	10.2	9°	6	55
▌08-00133-00520	5.2	10.4	9°	6	55
▌08-00133-00530	5.3	10.6	9°	6	55
▌08-00133-00540	5.4	10.8	9°	6	55
▌08-00133-00550	5.5	11.2	9°	6	55
▌08-00133-00560	5.6	11.4	9°	6	55
▌08-00133-00570	5.7	11.6	9°	6	55
▌08-00133-00580	5.8	12	9°	6	55
▌08-00133-00590	5.9	12.4	9°	6	55
08-00133-00600	6	13	–	6	55

How to Order　When you order, indicate MSZ345 (D).　※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00133-00610	6.1	13	9°	8	65
▌08-00133-00620	6.2	13	9°	8	65
▌08-00133-00630	6.3	13.5	9°	8	65
▌08-00133-00640	6.4	13.5	9°	8	65
▌08-00133-00650	6.5	13.5	9°	8	65
▌08-00133-00660	6.6	14	9°	8	65
▌08-00133-00670	6.7	14	9°	8	65
▌08-00133-00680	6.8	15	9°	8	65
▌08-00133-00690	6.9	15	9°	8	65
08-00133-00700	7	16	9°	8	65
▌08-00133-00710	7.1	16	9°	8	65
▌08-00133-00720	7.2	16	9°	8	65
▌08-00133-00730	7.3	16	9°	8	65
▌08-00133-00740	7.4	16	9°	8	65
▌08-00133-00750	7.5	16	9°	8	65
▌08-00133-00760	7.6	17	9°	8	65
▌08-00133-00770	7.7	17	9°	8	65
▌08-00133-00780	7.8	17	9°	8	65
▌08-00133-00790	7.9	17	9°	8	65
08-00133-00800	8	19	–	8	65
▌08-00133-00810	8.1	18	9°	10	75
▌08-00133-00820	8.2	18	9°	10	75
▌08-00133-00830	8.3	18	9°	10	75
▌08-00133-00840	8.4	18	9°	10	75
▌08-00133-00850	8.5	18	9°	10	75
▌08-00133-00860	8.6	19	9°	10	75
▌08-00133-00870	8.7	19	9°	10	75
▌08-00133-00880	8.8	19	9°	10	75
▌08-00133-00890	8.9	19	9°	10	75
08-00133-00900	9	19	9°	10	75

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌08-00133-00910	9.1	20	9°	10	75
▌08-00133-00920	9.2	20	9°	10	75
▌08-00133-00930	9.3	20	9°	10	75
▌08-00133-00940	9.4	20	9°	10	75
▌08-00133-00950	9.5	20	9°	10	75
▌08-00133-00960	9.6	21	9°	10	75
▌08-00133-00970	9.7	21	9°	10	75
▌08-00133-00980	9.8	21	9°	10	75
▌08-00133-00990	9.9	21	9°	10	75
08-00133-01000	10	22	–	10	75
▌08-00133-01010	10.1	22	9°	12	80
▌08-00133-01020	10.2	22	9°	12	80
▌08-00133-01030	10.3	22	9°	12	80
▌08-00133-01040	10.4	22	9°	12	80
▌08-00133-01050	10.5	22	9°	12	80
▌08-00133-01060	10.6	22	9°	12	80
▌08-00133-01070	10.7	22	9°	12	80
▌08-00133-01080	10.8	22	9°	12	80
▌08-00133-01090	10.9	22	9°	12	80
08-00133-01100	11	22	9°	12	80
▌08-00133-01110	11.1	25	9°	12	80
▌08-00133-01120	11.2	25	9°	12	80
▌08-00133-01130	11.3	25	9°	12	80
▌08-00133-01140	11.4	25	9°	12	80
▌08-00133-01150	11.5	25	9°	12	80
▌08-00133-01160	11.6	25	9°	12	80
▌08-00133-01170	11.7	25	9°	12	80
▌08-00133-01180	11.8	25	9°	12	80
▌08-00133-01190	11.9	25	9°	12	80
08-00133-01200	12	26	–	12	80

Square Coating

Square Coating

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Stainless Steel M
Square Coating

Recommended Milling Conditions

Work Material	Carbon Steels S50C				Alloy Steels SKD・SCM				Stainless Steels SUS304				Prehardened Steels HPM・NAK(～40HRC)			
Cutting Speed	90m/min				50m/min				35m/min				55m/min			
Dia.	Spindle Speed	Feed			Spindle Speed	Feed			Spindle Speed	Feed			Spindle Speed	Feed		
		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling
	min^{-1}	mm/min			min^{-1}	mm/min			min^{-1}	mm/min			min^{-1}	mm/min		
1	15,000	70	200	400	15,000	40	100	210	10,000	20	70	200	15,000	50	100	200
1.5	13,000	70	250	500	13,000	40	120	270	7,000	20	70	250	13,000	50	130	250
2	11,000	100	300	600	8,000	50	140	290	5,000	20	75	250	10,000	70	150	300
2.5	10,000	100	400	700	7,000	60	160	330	4,000	20	75	250	8,000	90	170	350
3	9,600	200	550	800	5,300	80	200	400	3,600	20	100	250	5,800	100	250	400
4	7,200	210	650	900	4,000	100	250	400	2,800	30	100	250	4,400	110	250	400
5	5,700	260	700	1,000	3,200	100	250	450	2,200	40	120	300	3,500	120	300	500
6	4,800	300	720	1,200	2,700	130	300	450	1,800	40	120	300	3,000	130	330	600
7	4,100	300	740	1,100	2,300	120	300	450	1,600	40	120	300	2,500	110	330	600
8	3,600	300	760	1,000	2,000	100	300	400	1,400	30	120	300	2,200	100	330	600
9	3,200	300	770	900	1,800	80	250	380	1,200	20	100	300	1,900	90	250	500
10	3,000	300	800	900	1,600	80	200	350	1,100	20	100	300	1,700	80	200	400
11	2,800	300	760	850	1,500	80	200	350	1,000	20	100	280	1,600	80	200	400
12	2,600	280	740	850	1,400	70	180	340	900	20	100	270	1,500	70	180	340

Depth of Cut (D：Dia.)

Side Milling
1.5D
0.3D (SUS304=0.2D)

Slotting
D
a_p

a_p
ϕ1～2.9=0.5D (SKD・SCM・SUS304=0.25D)
ϕ3～12=1D (SKD・SCM・SUS304=0.5D)

Notes

※1 Adjust Depth of Cut according to machine rigidity.
Final milling conditions are subject to machining profile, purpose and machine status.
※2 Adjust both spindle speed and feed at the same rate.
※3 Air blow is recommended.
※4 Water-insoluble fluid is recommended for cutting stainless steels.
※5 Adjust milling condition with caution for chip evacuation and smoke generation when milling with water-insoluble fluid.
※6 Step machining is recommended for plunging stainless steels.
※7 Chip disposal is important.
※8 Use a rigid and precise machine and chuck holder.
※9 Overhang of end mill should be as short as possible from spindle nose.

AL3D-345

Size ϕ 1 ～ ϕ 12

WC

AL3D-345

High Efficient Milling

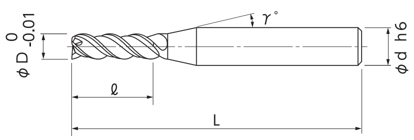
High efficient 3-Flute End Mill for Aluminium L/D=3

Total 9 sizes

For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting

3 45°

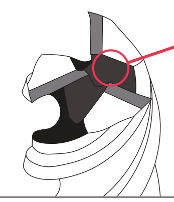
Side Slot Face Plunge



※Listed at "Aluminium Milling" as well（Page J-022）

- AL-series realized a stable and high efficient machining.
- It exhibits stable excellent surface on a wide area and no chattering occurs even during high speed cutting.
- Realized high efficiency machining by adopting 3 flutes.

Unique end teeth design for plunging



Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00639-00100	1	3	12°	4	60
01-00639-00200	2	6	12°	4	60
01-00639-00300	3	9	12°	6	60
01-00639-00400	4	12	12°	6	70
01-00639-00500	5	15	12°	6	80
01-00639-00600	6	18	–	6	80
01-00639-00800	8	24	–	8	90
01-00639-01000	10	30	–	10	100
01-00639-01200	12	36	–	12	110

How to Order　When you order, indicate AL3D-345 (D).　※(γ) is reference value.

Machining case　S-028

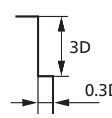
Recommended Milling Conditions

Work Material	Aluminium A1070						Aluminium Alloy A2017･A5052･A7075						Aluminium Cast AC8C					
Cutting Speed	300m/min		220m/min		220m/min		330m/min		240m/min		240m/min		250m/min		160m/min		160m/min	
Dia.	Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	1,200	20,000	500	20,000	100	20,000	1,200	20,000	500	20,000	100	20,000	1,200	20,000	500	20,000	80
2	20,000	1,800	20,000	700	20,000	150	20,000	1,800	20,000	700	20,000	150	20,000	1,800	20,000	700	20,000	130
3	20,000	2,000	20,000	1,000	20,000	150	20,000	2,000	20,000	1,000	20,000	150	20,000	2,000	17,000	850	17,000	130
4	20,000	2,200	17,500	1,100	17,500	150	20,000	2,200	19,000	1,100	19,000	200	20,000	2,200	13,000	850	13,000	100
5	19,000	2,200	14,000	1,100	14,000	150	20,000	2,700	15,500	1,200	15,500	200	16,000	2,200	10,000	850	10,000	80
6	16,000	2,200	11,500	1,100	11,500	150	17,500	3,000	12,500	1,300	12,500	200	13,500	2,200	8,500	850	8,500	80
8	12,000	2,200	9,000	1,200	9,000	100	13,000	3,000	9,500	1,400	9,500	200	10,000	2,300	6,500	850	6,500	60
10	9,500	2,200	7,000	1,300	7,000	70	10,500	3,250	7,500	1,500	7,500	150	8,000	2,500	5,000	900	5,000	50
12	8,000	2,400	6,000	1,400	6,000	70	9,000	3,350	6,500	1,600	6,500	150	6,500	2,600	4,000	1,000	4,000	50

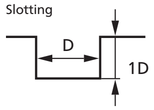
Depth of Cut

(D: Dia.)

Side Milling



Slotting



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 When tending to have chip packing during plunging, step milling is recommended.
※ 5 Water-soluble fluid is recommended.

Aluminium Alloy N
Copper N
Resin O

Square

MSUSZ440-LN

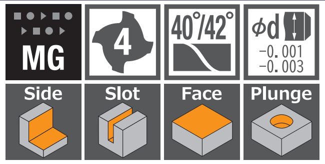
Size ϕ 1 ～ ϕ 6

MUGEN COATING PREMIUM 4-Flute Long Neck High Efficient "Z" End Mill for Stainless Steels

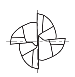
Total 33 sizes

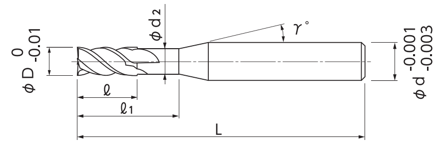
Recommended Milling Conditions

For machining on stainless steels and heat resistant alloy.
Continuous machining from Plunging to slotting
Unequal flute spacing and unequal helix angle design

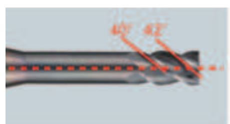


Plunge depth is refered to recommended milling conditions





- Unequal flute spacing, unequal helix angle and high rigid end profile design to minimize chatter realize high efficient machining.
- New developed special edge profile realized multi-functional performance of side milling, slot milling and plunging approaches on stainless steel.
- Optimized high heat-resistance MUGEN COATING PREMIUM to realize stable long time machining.
- Long neck type prevent interference with work material, the Under Neck length lined up with L/D=3 to 5.



Unequal Helix Angle

Unequal Flute Spacing

Stainless Steel M

Titanium Alloy Heat Resistant Alloy S

Long Neck Square Coating

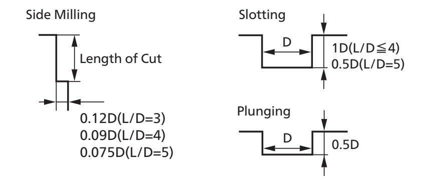
Unit : mm

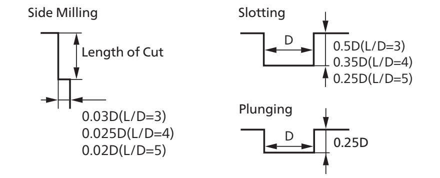
Code No.	Dia. (D)	Length of Cut (ℓ)	Under Neck Length (ℓ1)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00153-01013	1	1.5	3	0.95	12°	4	50
08-00153-01014			4	0.95	12°	4	50
08-00153-01015			5	0.95	12°	4	50
08-00153-01513	1.5	2.3	4.5	1.45	12°	4	50
08-00153-01514			6	1.45	12°	4	50
08-00153-01515			7.5	1.45	12°	4	50
08-00153-02013	2	3	6	1.94	12°	6	50
08-00153-02014			8	1.94	12°	6	50
08-00153-02015			10	1.94	12°	6	50
08-00153-02513	2.5	3.8	7.5	2.4	12°	6	50
08-00153-02514			10	2.4	12°	6	50
08-00153-02515			12.5	2.4	12°	6	60
08-00153-03013	3	4.5	9	2.85	12°	6	50
08-00153-03014			12	2.85	12°	6	50
08-00153-03015			15	2.85	12°	6	60
08-00153-03513	3.5	5.3	10.5	3.35	12°	6	50
08-00153-03514			14	3.35	12°	6	60
08-00153-03515			17.5	3.35	12°	6	60
08-00153-04013	4	6	12	3.8	12°	6	50
08-00153-04014			16	3.8	12°	6	60
08-00153-04015			20	3.8	12°	6	60
08-00153-04513	4.5	6.8	13.5	4.3	12°	6	50
08-00153-04514			18	4.3	12°	6	60
08-00153-04515			22.5	4.3	12°	6	60
08-00153-05013	5	7.5	15	4.8	12°	6	50
08-00153-05014			20	4.8	12°	6	60
08-00153-05015			25	4.8	12°	6	60
08-00153-05513	5.5	8.3	16.5	5.3	12°	6	50
08-00153-05514			22	5.3	12°	6	60
08-00153-05515			27.5	5.3	12°	6	60
08-00153-06013	6	9	18	5.8	–	6	60
08-00153-06014			24	5.8	–	6	60
08-00153-06015			30	5.8	–	6	70

How to Order When you order, indicate MSUSZ440-LN (D)×(ℓ)×(ℓ1). ※(γ) is reference value.

Work Material			Stainless Steels SUS304						Titanium Alloy Ti-6Al-4V					
Dia.	Under Neck Length	L/D	Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging	
			Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
			min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
1	3	3	17,000	600	14,000	180	14,000	30	15,300	600	12,600	180	12,600	30
	4	4	15,000	450	12,000	150	12,000	20	13,500	450	10,800	150	10,800	20
	5	5	12,000	200	10,000	110	10,000	20	10,800	200	9,000	110	9,000	20
1.5	4.5	3	12,000	650	9,600	200	9,600	30	10,800	650	8,700	200	8,700	30
	6	4	10,300	480	8,500	160	8,500	20	9,300	480	7,700	160	7,700	20
	7.5	5	8,500	250	7,300	120	7,300	20	7,700	250	6,600	120	6,600	20
2	6	3	9,400	780	8,000	210	8,000	30	8,500	780	7,200	210	7,200	30
	8	4	8,000	520	7,200	170	7,200	20	7,200	520	6,500	170	6,500	20
	10	5	7,000	280	6,000	140	6,000	20	6,300	280	5,400	140	5,400	20
2.5	7.5	3	7,700	900	6,800	240	6,800	30	7,000	900	6,100	240	6,100	30
	10	4	6,500	580	6,100	180	6,100	20	5,900	580	5,500	180	5,500	20
	12.5	5	5,800	330	5,200	140	5,200	20	5,200	330	4,700	140	4,700	20
3	9	3	6,500	950	6,200	270	6,200	30	5,900	950	5,600	270	5,600	30
	12	4	5,500	650	5,200	200	5,200	20	5,000	650	4,700	200	4,700	20
	15	5	5,000	350	4,400	150	4,400	20	4,500	350	4,000	150	4,000	20
3.5	10.5	3	6,000	1,000	5,400	300	5,400	30	5,400	1,000	4,900	300	4,900	30
	14	4	5,000	700	4,500	210	4,500	20	4,500	700	4,000	210	4,000	20
	17.5	5	4,500	350	3,800	150	3,800	20	4,100	350	3,400	150	3,400	20
4	12	3	5,800	1,050	4,800	300	4,800	30	5,300	1,050	4,300	300	4,300	30
	16	4	4,600	700	4,000	210	4,000	20	4,200	700	3,600	210	3,600	20
	20	5	4,200	380	3,400	150	3,400	20	6,800	380	3,100	150	3,100	20
4.5	13.5	3	5,600	1,100	4,500	300	4,500	30	5,000	1,100	4,000	300	4,000	30
	18	4	4,400	720	3,600	220	3,600	20	4,000	720	3,200	220	3,200	20
	22.5	5	4,000	380	3,100	150	3,100	20	3,600	380	2,800	150	2,800	20
5	15	3	5,400	1,100	4,100	300	4,100	30	4,900	1,100	3,700	300	3,700	30
	20	4	4,300	720	3,300	220	3,300	20	3,900	720	3,000	220	3,000	20
	25	5	3,900	400	2,800	150	2,800	20	3,500	400	2,500	150	2,500	20
5.5	16.5	3	5,100	1,100	3,900	300	3,900	30	4,600	1,100	3,500	300	3,500	30
	22	4	4,200	750	3,000	220	3,000	20	3,800	750	2,700	220	2,700	20
	27.5	5	3,700	400	2,600	150	2,600	20	3,300	400	2,300	150	2,300	20
6	18	3	4,800	1,100	3,600	300	3,600	30	4,300	1,100	3,200	300	3,200	30
	24	4	4,000	750	2,800	220	2,800	20	3,600	750	2,500	220	2,500	20
	30	5	3,600	400	2,400	150	2,400	20	3,200	400	2,200	150	2,200	20

Depth of Cut (D: Dia.)





Notes

※1 Please choose the short end tooth when measure the tool length.
※2 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※3 Adjust both Spindle Speed and Feed at the same rate.
※4 Water-soluble fluid is recommended.
※5 Please increasing the coolant flow rate and pressure as much as possible, and supply it sufficiently to the machining point and flute.
※6 Please change the Depth of Cut or Feed when chips could not remove smoothly during plunging.
※7 Please be noted there would be a possible tool chipping or breakage when the chip removal is insufficient.
※8 Use a rigid and precise machine and chuck holder.
※9 Overhang of end mill should be as short as possible from spindle nose.

MSCZ440-LN

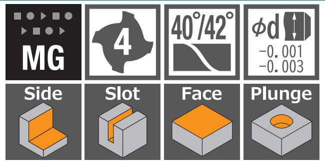
Size ϕ 1 ～ ϕ 6

∞ ≦40 HRC

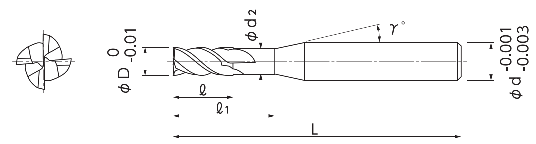
MUGEN COATING 4-Flute Long Neck High Efficient "Z" End Mill for Carbon Steels

Total 33 sizes

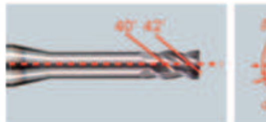
High efficient machining on carbon steels.
Continuous machining from plunging approach to slotting.
Long neck type to prevent interference



Plunge depth is refered to recommended milling conditions



- Unequal flute spacing, unequal helix angle and high rigid end profile design to minimize chatter realize high efficient machining.
- New developed special edge profile realized multi-functional performance of side milling, slot milling and plunging approaches on carbon steels.
- Long time stable machining is realized by adopting MUGEN COATING.
- Long neck type prevent interference with work material, the Under neck length lined up with L/D=3 to 5.



Unequal Helix Angle

Unequal Flute Spacing

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under Neck Length (ℓ1)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00136-01013	1	1.5	3	0.95	12°	4	50
08-00136-01014			4	0.95	12°	4	50
08-00136-01015			5	0.95	12°	4	50
08-00136-01513	1.5	2.3	4.5	1.45	12°	4	50
08-00136-01514			6	1.45	12°	4	50
08-00136-01515			7.5	1.45	12°	4	50
08-00136-02013	2	3	6	1.94	12°	6	50
08-00136-02014			8	1.94	12°	6	50
08-00136-02015			10	1.94	12°	6	50
08-00136-02513	2.5	3.8	7.5	2.4	12°	6	50
08-00136-02514			10	2.4	12°	6	50
08-00136-02515			12.5	2.4	12°	6	60
08-00136-03013	3	4.5	9	2.85	12°	6	50
08-00136-03014			12	2.85	12°	6	50
08-00136-03015			15	2.85	12°	6	60
08-00136-03513	3.5	5.3	10.5	3.35	12°	6	50
08-00136-03514			14	3.35	12°	6	60
08-00136-03515			17.5	3.35	12°	6	60
08-00136-04013	4	6	12	3.8	12°	6	50
08-00136-04014			16	3.8	12°	6	60
08-00136-04015			20	3.8	12°	6	60
08-00136-04513	4.5	6.8	13.5	4.3	12°	6	50
08-00136-04514			18	4.3	12°	6	60
08-00136-04515			22.5	4.3	12°	6	60
08-00136-05013	5	7.5	15	4.8	12°	6	50
08-00136-05014			20	4.8	12°	6	60
08-00136-05015			25	4.8	12°	6	60
08-00136-05513	5.5	8.3	16.5	5.3	12°	6	50
08-00136-05514			22	5.3	12°	6	60
08-00136-05515			27.5	5.3	12°	6	60
08-00136-06013	6	9	18	5.8	–	6	60
08-00136-06014			24	5.8	–	6	60
08-00136-06015			30	5.8	–	6	70

How to Order When you order, indicate MSCZ440-LN (D)×(ℓ)×(ℓ1).

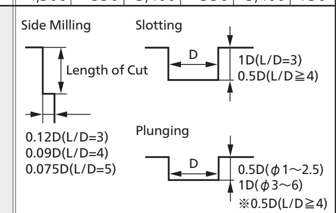
※(γ) is reference value.

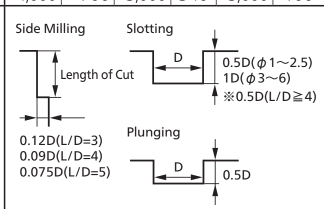
MSCZ440-LN

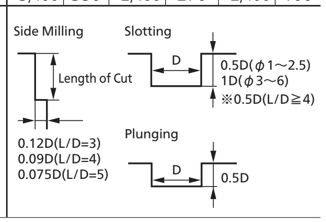
Recommended Milling Conditions

Work Material			Carbon Steels S50C						Alloy Steels SCM･SKD						Prehardened Steels (～40HRC)					
Dia.	Under Neck Length	L/D	Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging	
			Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
			min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	3	3	18,900	760	17,000	400	17,000	100	18,100	650	15,300	300	15,300	50	15,400	470	12,300	240	12,300	50
	4	4	16,700	600	15,000	320	15,000	70	16,200	520	13,500	220	13,500	40	13,800	400	10,800	170	10,800	40
	5	5	13,300	400	12,000	200	12,000	50	12,900	350	10,900	130	10,900	30	11,000	180	8,800	100	8,800	30
1.5	4.5	3	14,200	860	12,500	480	12,500	120	13,000	750	11,300	360	11,300	100	11,100	560	9,100	290	9,100	100
	6	4	12,200	660	11,000	380	11,000	100	11,600	580	9,500	260	9,500	70	9,900	430	7,600	210	7,600	70
	7.5	5	10,000	450	9,000	240	9,000	70	9,600	400	7,600	160	7,600	50	8,200	200	6,100	130	6,100	50
2	6	3	11,800	1,000	10,600	580	10,600	150	10,400	870	8,900	440	8,900	100	8,900	680	7,200	350	7,200	100
	8	4	10,400	810	9,400	460	9,400	120	9,100	660	8,000	310	8,000	70	7,700	460	6,400	250	6,400	70
	10	5	8,400	560	7,600	290	7,600	100	8,000	480	6,500	190	6,500	50	6,800	230	5,200	150	5,200	50
2.5	7.5	3	10,100	1,200	8,600	770	8,600	200	8,400	1,000	7,600	580	7,600	150	7,200	780	6,100	460	6,100	150
	10	4	8,600	900	7,400	530	7,400	150	7,400	780	6,600	360	6,600	100	6,300	500	5,300	290	5,300	100
	12.5	5	7,100	650	6,200	370	6,200	120	6,800	560	5,400	240	5,400	70	5,800	270	4,300	190	4,300	70
3	9	3	9,600	1,500	8,300	840	8,300	250	7,100	1,150	7,200	620	7,200	150	6,200	800	5,800	500	5,800	150
	12	4	8,000	1,150	6,900	640	6,900	200	6,200	900	6,000	440	6,000	120	5,300	530	4,800	350	4,800	120
	15	5	6,800	740	5,900	420	5,900	150	5,800	620	5,100	270	5,100	100	4,900	300	4,100	220	4,100	100
3.5	10.5	3	8,700	1,540	7,500	920	7,500	250	6,800	1,200	6,600	690	6,600	150	5,800	840	5,200	530	5,200	150
	14	4	7,500	1,180	6,400	720	6,400	200	5,600	950	5,400	490	5,400	120	4,800	540	4,300	380	4,300	120
	17.5	5	6,300	820	5,400	460	5,400	150	5,200	650	4,700	300	4,700	100	4,400	300	3,600	230	3,600	100
4	12	3	8,100	1,600	6,800	1,000	6,800	250	6,600	1,250	5,900	750	5,900	150	5,600	860	4,700	600	4,700	150
	16	4	6,800	1,200	5,600	760	5,600	200	5,500	950	5,000	520	5,000	120	4,700	560	3,900	400	3,900	120
	20	5	5,700	850	4,800	500	4,800	150	4,800	700	4,200	320	4,200	100	4,100	320	3,300	250	3,300	100
4.5	13.5	3	7,400	1,640	6,100	1,000	6,100	250	6,400	1,300	5,300	750	5,300	150	5,400	900	4,300	600	4,300	150
	18	4	6,500	1,200	5,100	800	5,100	200	5,400	950	4,500	550	4,500	120	4,600	600	3,600	400	3,600	120
	22.5	5	5,200	850	4,300	520	4,300	150	4,600	700	3,800	340	3,800	100	3,900	320	3,000	270	3,000	100
5	15	3	6,800	1,840	5,500	1,000	5,500	250	6,100	1,400	4,800	750	4,800	150	5,200	950	3,900	600	3,900	150
	20	4	6,000	1,250	4,800	800	4,800	200	5,200	1,000	4,200	550	4,200	120	4,400	600	3,300	400	3,300	120
	25	5	4,900	850	3,900	520	3,900	150	4,400	700	3,500	340	3,500	100	3,700	340	2,800	270	2,800	100
5.5	16.5	3	6,200	1,900	5,100	1,000	5,100	250	5,900	1,400	4,400	750	4,400	150	5,000	950	3,600	600	3,600	150
	22	4	5,600	1,250	4,400	800	4,400	200	4,900	1,000	3,900	550	3,900	120	4,200	620	3,100	400	3,100	120
	27.5	5	4,600	850	3,700	550	3,700	150	4,200	700	3,200	340	3,200	100	3,600	350	2,600	270	2,600	100
6	18	3	5,800	1,900	4,700	1,000	4,700	250	5,500	1,400	4,100	750	4,100	150	4,700	950	3,400	600	3,400	150
	24	4	5,200	1,250	4,100	800	4,100	200	4,600	1,000	3,700	550	3,700	120	3,900	620	2,900	400	2,900	120
	30	5	4,300	850	3,400	550	3,400	150	4,000	700	3,000	340	3,000	100	3,400	350	2,400	270	2,400	100

Depth of Cut (D : Dia.)







Notes

※1 Please choose the short end tooth when measure the tool length.
※2 Adjust milling condition conforming with machine rigidity and clamping condition.
Final milling conditions are subject to machining profile, purpose and machine status.
※3 Adjust both Spindle Speed and Feed at the same rate.
※4 Please increasing the coolant flow rate and pressure as much as possible, and supply it sufficiently to the machining point and flute.
※5 Please change the Depth of Cut or Feed when chips could not remove smoothly during plunging.
※6 Please be noted there would be a possible tool chipping or breakage when the chip removal is insufficient.
※7 Use a rigid and precise machine and chuck holder.
※8 Overhang of end mill should be as short as possible from spindle nose.

ALZ345-DLC

Size φ 1 ~ φ 12 DLC

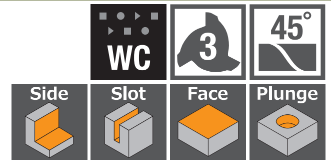
ALZ345-DLC

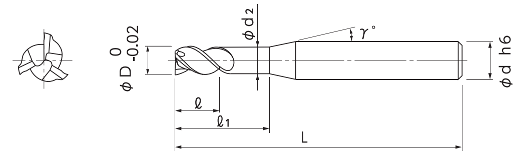
High Efficient Milling

DLC COATING high efficient 3-Flute End Mill for Aluminium L/D=1.5

Total 17 sizes

For machining on aluminium alloy.
Continuous machining from plunging without guide-hole and stepping to slotting.DLC coating applied for longer tool life

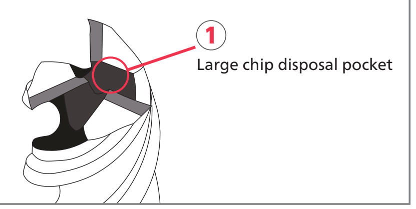




● Adopted NS TOOL original DLC COATING that suitable for long time machining.

※Listed at "Aluminium Milling" as well (Page J-030)

Unique end teeth design for plunging



Unit : mm

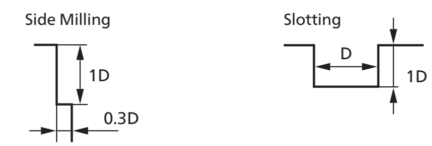
Code No.	Dia. (D)	Length of Cut (ℓ)	Under Neck Length (ℓ1)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00666-00100	1	1.5	3	0.95	12°	4	45
01-00666-00150	1.5	2.3	4.5	1.45	12°	4	45
01-00666-00200	2	3	6	1.94	12°	4	45
01-00666-00250	2.5	3.8	7.5	2.4	12°	4	45
01-00666-00300	3	4.5	9	2.85	12°	6	55
01-00666-00350	3.5	5.3	10.5	3.35	12°	6	55
01-00666-00400	4	6	12	3.8	12°	6	55
01-00666-00450	4.5	6.8	13.5	4.3	12°	6	55
01-00666-00500	5	7.5	15	4.8	12°	6	55
01-00666-00550	5.5	8.3	16.5	5.3	12°	6	55
01-00666-00600	6	9	18	5.8	–	6	60
01-00666-00700	7	10.5	21	6.8	12°	8	70
01-00666-00800	8	12	24	7.8	–	8	70
01-00666-00900	9	13.5	27	8.8	12°	10	75
01-00666-01000	10	15	30	9.8	–	10	75
01-00666-01100	11	16.5	33	10.8	12°	12	80
01-00666-01200	12	18	36	11.8	–	12	80

How to Order When you order, indicate ALZ345-DLC (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Aluminium A1070				Aluminium Alloy A2017･A5052･A7075				Aluminium Cast AC8C			
Cutting Speed	310m/min				350m/min				230m/min			
Dia.	Spindle Speed	Feed			Spindle Speed	Feed			Spindle Speed	Feed		
		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling
	min-1	mm/min			min-1	mm/min			min-1	mm/min		
1	20,000	200	600	1,100	20,000	200	600	1,100	20,000	150	600	1,100
2	20,000	300	900	1,500	20,000	300	900	1,500	20,000	250	900	1,500
3	20,000	300	1,200	2,000	20,000	300	1,400	2,200	20,000	250	1,200	2,200
4	20,000	300	1,400	2,200	20,000	400	1,800	2,500	18,300	200	1,400	2,300
5	19,700	300	1,500	2,500	20,000	400	2,200	3,100	14,600	150	1,400	2,100
6	16,500	300	1,600	2,500	18,600	400	2,500	3,500	12,200	150	1,400	2,100
7	14,100	200	1,600	2,500	15,900	400	2,500	3,500	10,500	140	1,400	2,100
8	12,300	200	1,700	2,500	13,900	400	2,600	3,500	9,200	120	1,400	2,200
9	11,000	200	1,700	2,500	12,400	300	2,600	3,500	8,100	120	1,400	2,200
10	9,900	100	1,700	2,500	11,100	300	2,600	3,800	7,300	80	1,400	2,200
11	9,000	100	1,800	2,600	10,100	300	2,600	4,100	6,700	80	1,400	2,200
12	8,200	100	1,900	2,700	9,300	300	2,600	4,100	6,100	60	1,500	2,200

Depth of Cut (D:Dia.)



Notes

※1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※2 Use a rigid and precise machine and chuck holder.
※3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※4 When tending to have chip packing during plunging, step milling is recommended.
※5 Water-soluble fluid is recommended.

◎ Aluminium Alloy N
○ Copper N
○ Resin O

Long Neck Square Coating

ALZ345

Size ϕ1 ~ ϕ12 WC

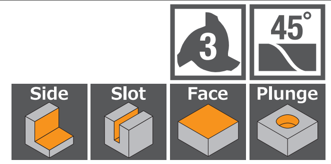
ALZ345

High efficient 3-Flute End Mill for Aluminium L/D=1.5

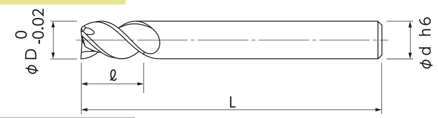
Total 124 sizes

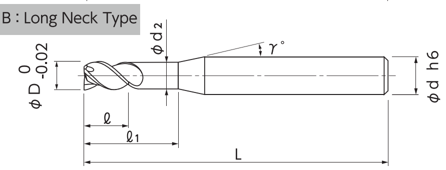
High efficient 3-Flute End Mill for Aluminium L/D=1.5

For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting



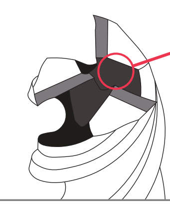
※Listed at "Aluminium Milling" as well (Page J-026)





- AL-series realized a stable and high efficient machining.
- Improved plunging capacity!
- High performance with better chip disposal.
- Add new 5D Under neck length type and long shank type to become 124 sizes.

Unique end teeth design for plunging



◎ Aluminium Alloy N
○ Copper N
○ Resin O

Square
Long Neck Square

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00636-00100	1	3	1.5	B	0.95	12°	4	45
01-00636-00102	1	5	1.5	B	0.95	12°	4	60
▌01-00636-00110	1.1	3.3	1.7	B	1.05	12°	4	45
▌01-00636-00120	1.2	3.6	1.8	B	1.15	12°	4	45
▌01-00636-00130	1.3	3.9	2	B	1.25	12°	4	45
▌01-00636-00140	1.4	4.2	2.1	B	1.35	12°	4	45
01-00636-00150	1.5	4.5	2.3	B	1.45	12°	4	45
▌01-00636-00160	1.6	4.8	2.4	B	1.55	12°	4	45
▌01-00636-00170	1.7	5.1	2.6	B	1.65	12°	4	45
▌01-00636-00180	1.8	5.4	2.7	B	1.74	12°	4	45
▌01-00636-00190	1.9	5.7	2.9	B	1.84	12°	4	45
01-00636-00200	2	6	3	B	1.94	12°	4	45
01-00636-00202	2	10	3	B	1.94	12°	4	60
▌01-00636-00210	2.1	6.3	3.2	B	2	12°	4	45
▌01-00636-00220	2.2	6.6	3.3	B	2.1	12°	4	45
▌01-00636-00230	2.3	6.9	3.5	B	2.2	12°	4	45
▌01-00636-00240	2.4	7.2	3.6	B	2.3	12°	4	45
01-00636-00250	2.5	7.5	3.8	B	2.4	12°	4	45
▌01-00636-00260	2.6	7.8	3.9	B	2.45	12°	6	55
▌01-00636-00270	2.7	8.1	4.1	B	2.55	12°	6	55
▌01-00636-00280	2.8	8.4	4.2	B	2.65	12°	6	55
▌01-00636-00290	2.9	8.7	4.4	B	2.75	12°	6	55
01-00636-00300	3	9	4.5	B	2.85	12°	6	55
01-00636-00302	3	15	4.5	B	2.85	12°	6	60
▌01-00636-00310	3.1	9.3	4.7	B	2.95	12°	6	55
▌01-00636-00320	3.2	9.6	4.8	B	3.05	12°	6	55

How to Order When you order, indicate ALZ345 (D)[×(ℓ1)]. Indicate (L) for Type A. ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌01-00636-00330	3.3	9.9	5	B	3.15	12°	6	55
▌01-00636-00340	3.4	10.2	5.1	B	3.25	12°	6	55
01-00636-00350	3.5	10.5	5.3	B	3.35	12°	6	55
▌01-00636-00360	3.6	10.8	5.4	B	3.45	12°	6	55
▌01-00636-00370	3.7	11.1	5.6	B	3.55	12°	6	55
▌01-00636-00380	3.8	11.4	5.7	B	3.65	12°	6	55
▌01-00636-00390	3.9	11.7	5.9	B	3.75	12°	6	55
01-00636-00400	4	12	6	B	3.8	12°	6	55
01-00636-00402	4	20	6	B	3.8	12°	6	70
▌01-00636-00410	4.1	12.3	6.2	B	3.9	12°	6	55
▌01-00636-00420	4.2	12.6	6.3	B	4	12°	6	55
▌01-00636-00430	4.3	12.9	6.5	B	4.1	12°	6	55
▌01-00636-00440	4.4	13.2	6.6	B	4.2	12°	6	55
01-00636-00450	4.5	13.5	6.8	B	4.3	12°	6	55
▌01-00636-00460	4.6	13.8	6.9	B	4.4	12°	6	55
▌01-00636-00470	4.7	14.1	7.1	B	4.5	12°	6	55
▌01-00636-00480	4.8	14.4	7.2	B	4.6	12°	6	55
▌01-00636-00490	4.9	14.7	7.4	B	4.7	12°	6	55
01-00636-00500	5	15	7.5	B	4.8	12°	6	55
01-00636-00502	5	25	7.5	B	4.8	12°	6	80
▌01-00636-00510	5.1	15.3	7.7	B	4.9	12°	6	55
▌01-00636-00520	5.2	15.6	7.8	B	5	12°	6	55
▌01-00636-00530	5.3	15.9	8	B	5.1	12°	6	55
▌01-00636-00540	5.4	16.2	8.1	B	5.2	12°	6	55
01-00636-00550	5.5	16.5	8.3	B	5.3	12°	6	55
▌01-00636-00560	5.6	16.8	8.4	B	5.4	12°	6	55
▌01-00636-00570	5.7	17.1	8.6	B	5.5	12°	6	55
▌01-00636-00580	5.8	17.4	8.7	B	5.6	12°	6	55
▌01-00636-00590	5.9	17.7	8.9	B	5.7	12°	6	55
01-00636-00603	6	–	9	A	–	–	6	110
01-00636-00600	6	18	9	B	5.8	–	6	60
01-00636-00602	6	30	9	B	5.8	–	6	80
▌01-00636-00610	6.1	18.3	9.2	B	5.9	12°	8	70
▌01-00636-00620	6.2	18.6	9.3	B	6	12°	8	70
▌01-00636-00630	6.3	18.9	9.5	B	6.1	12°	8	70
▌01-00636-00640	6.4	19.2	9.6	B	6.2	12°	8	70
▌01-00636-00650	6.5	19.5	9.8	B	6.3	12°	8	70
▌01-00636-00660	6.6	19.8	9.9	B	6.4	12°	8	70
▌01-00636-00670	6.7	20.1	10.1	B	6.5	12°	8	70
▌01-00636-00680	6.8	20.4	10.2	B	6.6	12°	8	70
▌01-00636-00690	6.9	20.7	10.4	B	6.7	12°	8	70
01-00636-00700	7	21	10.5	B	6.8	12°	8	70
▌01-00636-00710	7.1	21.3	10.7	B	6.9	12°	8	70
▌01-00636-00720	7.2	21.6	10.8	B	7	12°	8	70
▌01-00636-00730	7.3	21.9	11	B	7.1	12°	8	70
▌01-00636-00740	7.4	22.2	11.1	B	7.2	12°	8	70
▌01-00636-00750	7.5	22.5	11.3	B	7.3	12°	8	70
▌01-00636-00760	7.6	22.8	11.4	B	7.4	12°	8	70
▌01-00636-00770	7.7	23.1	11.6	B	7.5	12°	8	70
▌01-00636-00780	7.8	23.4	11.7	B	7.6	12°	8	70

N Aluminium Alloy ◎
N Copper ○
O Resin ○

Square
Long Neck Square

High efficient 3-Flute End Mill for Aluminium L/D=1.5

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌01-00636-00790	7.9	23.7	11.9	B	7.7	12°	8	70
01-00636-00803	8	–	12	A	–	–	8	120
01-00636-00800	8	24	12	B	7.8	–	8	70
01-00636-00802	8	40	12		7.8	–	8	90
▌01-00636-00810	8.1	24.3	12.2		7.9	12°	10	75
▌01-00636-00820	8.2	24.6	12.3		8	12°	10	75
▌01-00636-00830	8.3	24.9	12.5		8.1	12°	10	75
▌01-00636-00840	8.4	25.2	12.6		8.2	12°	10	75
▌01-00636-00850	8.5	25.5	12.8		8.3	12°	10	75
▌01-00636-00860	8.6	25.8	12.9		8.4	12°	10	75
▌01-00636-00870	8.7	26.1	13.1		8.5	12°	10	75
▌01-00636-00880	8.8	26.4	13.2		8.6	12°	10	75
▌01-00636-00890	8.9	26.7	13.4		8.7	12°	10	75
01-00636-00900	9	27	13.5		8.8	12°	10	75
▌01-00636-00910	9.1	27.3	13.7		8.9	12°	10	75
▌01-00636-00920	9.2	27.6	13.8		9	12°	10	75
▌01-00636-00930	9.3	27.9	14		9.1	12°	10	75
▌01-00636-00940	9.4	28.2	14.1		9.2	12°	10	75
▌01-00636-00950	9.5	28.5	14.3		9.3	12°	10	75
▌01-00636-00960	9.6	28.8	14.4		9.4	12°	10	75
▌01-00636-00970	9.7	29.1	14.6		9.5	12°	10	75
▌01-00636-00980	9.8	29.4	14.7		9.6	12°	10	75
▌01-00636-00990	9.9	29.7	14.9		9.7	12°	10	75
01-00636-01003	10	–	15	A	–	–	10	130
01-00636-01000	10	30	15	B	9.8	–	10	75
01-00636-01002	10	50	15		9.8	–	10	100
▌01-00636-01010	10.1	30.3	15.2		9.9	12°	12	80
▌01-00636-01020	10.2	30.6	15.3		10	12°	12	80
▌01-00636-01030	10.3	30.9	15.5		10.1	12°	12	80
▌01-00636-01040	10.4	31.2	15.6		10.2	12°	12	80
▌01-00636-01050	10.5	31.5	15.8		10.3	12°	12	80
▌01-00636-01060	10.6	31.8	15.9		10.4	12°	12	80
▌01-00636-01070	10.7	32.1	16.1		10.5	12°	12	80
▌01-00636-01080	10.8	32.4	16.2		10.6	12°	12	80
▌01-00636-01090	10.9	32.7	16.4		10.7	12°	12	80
01-00636-01100	11	33	16.5		10.8	12°	12	80
▌01-00636-01110	11.1	33.3	16.7		10.9	12°	12	80
▌01-00636-01120	11.2	33.6	16.8		11	12°	12	80
▌01-00636-01130	11.3	33.9	17		11.1	12°	12	80
▌01-00636-01140	11.4	34.2	17.1		11.2	12°	12	80
▌01-00636-01150	11.5	34.5	17.3		11.3	12°	12	80
▌01-00636-01160	11.6	34.8	17.4		11.4	12°	12	80
▌01-00636-01170	11.7	35.1	17.6		11.5	12°	12	80
▌01-00636-01180	11.8	35.4	17.7		11.6	12°	12	80
▌01-00636-01190	11.9	35.7	17.9		11.7	12°	12	80
01-00636-01203	12	–	18	A	–	–	12	150
01-00636-01200	12	36	18	B	11.8	–	12	80
01-00636-01202	12	60	18		11.8	–	12	110

How to Order When you order, indicate ALZ345 (D)[×(ℓ1)]. Indicate (L) for TypeA . ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Recommended Milling Conditions

Work Material		Aluminium A1070				Aluminium Alloy A2017·A5052·A7075				Aluminium Cast AC8C			
Cutting Speed		310m/min				350m/min				230m/min			
Dia.	Under neck Length	Spindle Speed	Feed			Spindle Speed	Feed			Spindle Speed	Feed		
			Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling
		min^{-1}	mm/min			min^{-1}	mm/min			min^{-1}	mm/min		
1	3	20,000	200	600	1,100	20,000	200	600	1,100	20,000	150	600	1,100
	5	16,000	160	500	900	16,000	160	500	900	16,000	120	500	900
2	6	20,000	300	900	1,500	20,000	300	900	1,500	20,000	250	900	1,500
	10	16,000	240	800	1,200	16,000	240	800	1,200	16,000	200	800	1,200
3	9	20,000	300	1,200	2,000	20,000	300	1,400	2,200	20,000	250	1,200	2,200
	15	16,000	240	1,000	1,600	16,000	240	1,200	1,800	16,000	200	1,000	1,800
4	12	20,000	300	1,400	2,200	20,000	400	1,800	2,500	18,300	200	1,400	2,300
	20	16,000	240	1,200	1,800	16,000	320	1,500	2,000	14,600	160	1,200	1,900
5	15	19,700	300	1,500	2,500	20,000	400	2,200	3,100	14,600	150	1,400	2,100
	25	15,700	240	1,200	2,000	16,000	320	1,800	2,500	11,700	120	1,200	1,700
6	–	16,500	300	1,600	2,500	18,600	400	2,500	3,500	12,200	150	1,400	2,100
	18	16,500	300	1,600	2,500	18,600	400	2,500	3,500	12,200	150	1,400	2,100
	30	13,200	240	1,300	2,000	14,800	320	2,000	2,800	9,700	120	1,200	1,700
7	21	14,100	200	1,600	2,500	15,900	400	2,500	3,500	10,500	140	1,400	2,100
8	–	12,300	200	1,700	2,500	13,900	400	2,600	3,500	9,200	120	1,400	2,200
	24	12,300	200	1,700	2,500	13,900	400	2,600	3,500	9,200	120	1,400	2,200
	40	9,800	160	1,400	2,000	11,100	320	2,100	2,800	7,300	100	1,200	1,800
9	27	11,000	200	1,700	2,500	12,400	300	2,600	3,500	8,100	120	1,400	2,200
10	–	9,900	100	1,700	2,500	11,100	300	2,600	3,800	7,300	80	1,400	2,200
	30	9,900	100	1,700	2,500	11,100	300	2,600	3,800	7,300	80	1,400	2,200
	50	7,900	80	1,400	2,000	8,800	240	2,100	3,000	5,800	70	1,200	1,800
11	33	9,000	100	1,800	2,600	10,100	300	2,600	4,100	6,700	80	1,400	2,200
12	–	8,200	100	1,900	2,700	9,300	300	2,600	4,100	6,100	60	1,500	2,200
	36	8,200	100	1,900	2,700	9,300	300	2,600	4,100	6,100	60	1,500	2,200
	60	6,500	80	1,500	2,200	7,400	240	2,100	3,200	4,800	50	1,200	1,800

Depth of Cut (D：Dia.)

Notes

※1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※2 TYPE A : Recommended milling conditions for full length of cut type are at overhang 3D. Adjust spindle speed and feed rate at 80% for overhang 5D, and 50% for 7D.
※3 Use a rigid and precise machine and chuck holder.
※4 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※5 When tending to have chip packing during plunging, step milling is recommended.
※6 Water-soluble fluid is recommended.

MSXH440R

Size ϕ3 × R0.3 ～ ϕ12 × R2

Premium ≦40 HRC

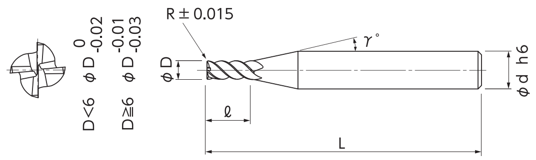
High Efficient Milling

MUGEN COATING PREMIUM Power Radius End Mill

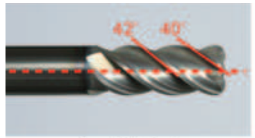
Total 19 sizes

For machining on stainless steels and heat resistant alloy.
High efficient machining with unequal flute spacing and unequal helix angle design to suppress chattering

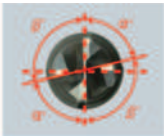
MG 4 40°/42°
Side Slot Face



- Improved designs of unequal helix angle and flute spacing. Suppression from chattering to realize stable milling progression.
- Original spiral design at corner radius flutes improves cutting edge performance!
- Designed for high rigidity to suppress corner radius flute breakage even on rough milling stresses.
- Adopted MUGEN COATING PREMIUM for improvement heat resistance and cutting edge strength to protect from milling heat influence.



Unequal Helix Angle


Unequal Flute Spacing

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00150-03003	3	R0.3	8	12°	6	60
08-00150-03005		R0.5	8	12°	6	60
08-00150-04003	4	R0.3	11	12°	6	60
08-00150-04005		R0.5	11	12°	6	60
08-00150-04010		R1	11	12°	6	60
08-00150-05003	5	R0.3	13	12°	6	60
08-00150-05005		R0.5	13	12°	6	60
08-00150-05010		R1	13	12°	6	60
08-00150-06005	6	R0.5	13	–	6	60
08-00150-06010		R1	13	–	6	60
08-00150-08005	8	R0.5	19	–	8	65
08-00150-08010		R1	19	–	8	65
08-00150-10005	10	R0.5	22	–	10	75
08-00150-10010		R1	22	–	10	75
08-00150-10020		R2	22	–	10	75
08-00150-10030		R3	22	–	10	75
08-00150-12005	12	R0.5	26	–	12	80
08-00150-12010		R1	26	–	12	80
08-00150-12020		R2	26	–	12	80

How to Order When you order, indicate MSXH440R (D)×(R). ※(γ) is reference value.

Recommended Milling Conditions

Work Material		Alloy Steels SKD・SCM				Stainless Steels SUS304				Titanium Alloy Ti-6Al-4V				Heat Resistance Alloy Inconel®718			
Dia.	Corner Radius	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
		Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min	Spindle Speed min⁻¹	Feed mm/min
3	0.3	17,600	1,430	8,600	700	6,000	750	6,000	600	5,600	750	5,600	600	3,600	250	2,500	140
	0.5	17,600	1,430	8,600	700	6,000	750	6,000	550	5,600	750	5,600	550	3,600	250	2,500	140
4	0.3	13,200	1,540	6,500	780	5,200	800	5,200	650	4,800	800	4,800	650	3,100	250	2,200	150
	0.5	13,200	1,540	6,500	780	5,200	800	5,200	600	4,800	800	4,800	600	3,100	250	2,200	150
	1	13,200	1,540	6,500	780	5,200	800	5,200	550	4,800	800	4,800	550	3,100	250	2,200	150
5	0.3	10,500	1,650	5,500	760	4,600	900	4,600	700	4,200	900	4,200	700	2,600	300	1,900	160
	0.5	10,500	1,650	5,500	760	4,600	900	4,600	650	4,200	900	4,200	650	2,600	300	1,900	160
	1	10,500	1,650	5,500	760	4,600	900	4,600	600	4,200	900	4,200	600	2,600	300	1,900	160
6	0.5	8,800	2,420	4,300	630	4,200	1,000	4,000	400	3,800	1,000	3,600	400	2,100	300	1,300	170
	1	8,800	2,420	4,300	630	4,200	1,000	4,000	350	3,800	1,000	3,600	350	2,100	300	1,300	170
8	0.5	6,600	1,980	3,300	560	3,600	850	3,200	350	3,200	850	2,800	350	1,700	300	1,100	170
	1	6,600	1,980	3,300	560	3,600	850	3,200	300	3,200	850	2,800	300	1,700	300	1,100	170
10	0.5	5,300	1,430	2,600	550	3,000	600	2,500	300	2,600	600	2,100	300	1,300	250	900	160
	1	5,300	1,430	2,600	550	3,000	600	2,500	300	2,600	600	2,100	300	1,300	250	900	160
	2	5,300	1,430	2,600	550	3,000	600	2,500	250	2,600	600	2,100	250	1,300	250	900	160
	3	5,300	1,430	2,600	550	3,000	600	2,500	200	2,600	600	2,100	200	1,300	250	900	160
12	0.5	4,400	1,100	2,200	480	2,500	500	2,000	200	2,100	500	1,600	200	900	200	700	150
	1	4,400	1,100	2,200	480	2,500	500	2,000	200	2,100	500	1,600	200	900	200	700	150
	2	4,400	1,100	2,200	480	2,500	500	2,000	150	2,100	500	1,600	150	900	200	700	150
Depth of Cut (D:Dia.)		0.2D 1.5D		D ϕ3～5=0.5D ϕ6～12=1D		0.2D 1.5D		D ϕ3～5=0.5D ϕ6～12=1D		0.2D 1.5D		D ϕ3～5=0.5D ϕ6～12=1D		0.05D 1.5D		D 0.2D	
Notes		※1 Adjust milling condition conforming with machine rigidity and clamping condition. ※2 The recommended milling conditions are based on milling with water-soluble fluid. ※3 Adjust milling condition with caution for chip evacuation and smoke generation when milling with water-insoluble fluid. ※4 Use a rigid machine and holder. ※5 Overhang of end mill should be as short as possible from spindle nose. (The recommended milling conditions are reference values under the overhang L/D: 5D(ϕ3～5), 4D(ϕ6～8), 3D(ϕ10～12))															

MSX440

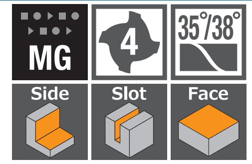
Size ϕ3 × R0.2 ～ ϕ20 × R1

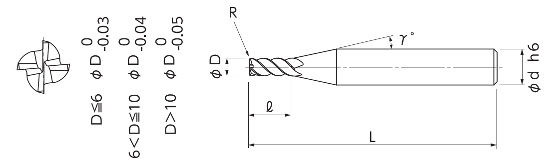
≤40 HRC

MUGEN COATING Power Radius End Mill

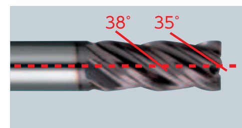
Total 16 sizes

Unequal helix angle and flute spacing to minimize chattering
Suitable for steels to stainless steels

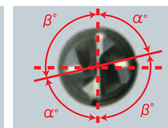




- It is very suitable for roughing and semi-finishing on stainless steels and tough materials by unequal flute design.
- High performance for reducing roughing time.



Unequal Helix Angle



Unequal Flute Spacing

▲ Discontinued Products

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Corner Radius (R)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
08-00144-00300	3	8	R0.2	12°	6	55
08-00144-00400	4	11	R0.2	12°	6	55
08-00144-00500	5	13	R0.2	12°	6	55
08-00144-00600	6	13	R0.3	–	6	55
08-00144-00700	7	19	R0.3	12°	8	60
08-00144-00800	8	19	R0.3	–	8	60
08-00144-00900	9	22	R0.3	12°	10	70
08-00144-01000	10	22	R0.3	–	10	70
08-00144-01100	11	26	R0.3	12°	12	80
08-00144-01200	12	26	R0.3	–	12	80
▲ 08-00144-01300	13	26	R0.7	12°	16	90
▲ 08-00144-01400	14	26	R0.7	12°	16	90
▲ 08-00144-01500	15	32	R1	12°	16	90
▲ 08-00144-01600	16	32	R1	–	16	90
▲ 08-00144-01800	18	32	R1	12°	20	105
▲ 08-00144-02000	20	38	R1	–	20	105

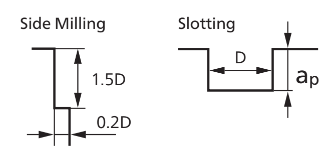
How to Order When you order, indicate MSX440 (D). ※(γ) is reference value.

▲ Discontinued products. The marked sizes will no longer be on sale after the stock runs out.

Recommended Milling Conditions

Work Material	Carbon Steels・Prehardened Steels S50C・NAK55・NAK80・HPM-1				Stainless Steels SUS304			
Cutting Speed	100～150m/min		50～70m/min		50～70m/min		30～55m/min	
Dia.	Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
3	16,000	1,300	7,000	300	8,500	680	5,600	100
4	12,000	1,400	5,300	300	6,400	770	4,000	100
5	9,500	1,500	4,200	300	5,000	800	3,000	100
6	8,000	2,200	3,500	400	4,200	840	2,800	100
8	6,000	1,800	2,600	400	3,200	630	1,800	150
10	4,800	1,300	2,000	400	2,500	560	1,600	150
12	4,000	1,000	1,700	400	2,100	470	1,200	150
14	3,400	900	1,500	300	1,800	400	1,000	120
16	3,000	800	1,400	300	1,600	390	800	120
18	2,600	700	950	250	1,400	350	800	100
20	2,400	650	950	250	1,200	330	700	100

Depth of Cut (D:Dia.)

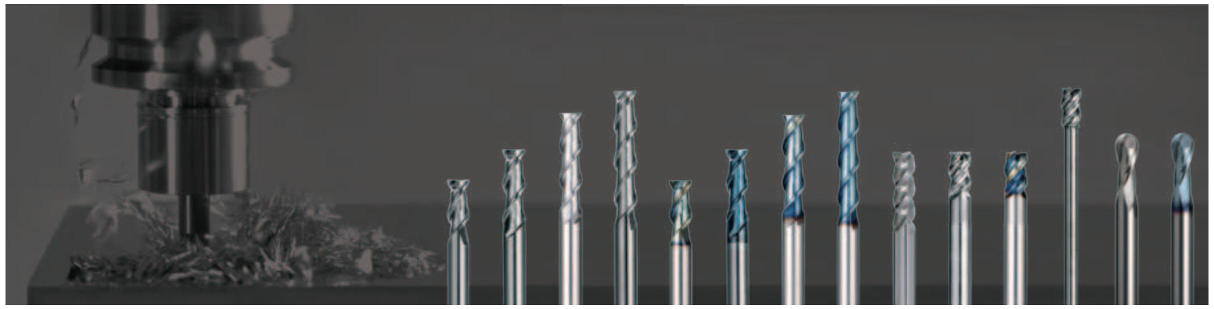


ap
ϕ3～5=0.5D (SUS:ϕ3～6=0.5D)
ϕ6～12=1D (SUS:ϕ8～12=1D)
ϕ13～16=0.5D
ϕ18～20=0.3D

Notes

※1 Adjust Depth of Cut according to machine rigidity.
Final milling conditions are subject to machining profile, purpose and machine status.
※2 Adjust both spindle speed and feed at the same rate.
※3 Water-insoluble fluid is recommended for cutting stainless steels.
※4 Adjust milling condition with caution for chip evacuation and smoke generation when milling with water-insoluble fluid.
※5 Chip disposal is important for slotting.
※6 Use a rigid and precise machine and chuck holder.
※7 Overhang of end mill should be as short as possible from spindle nose.

Reducing chattering by specialized cutting edge design for aluminium



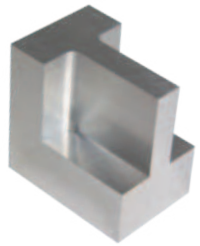
High efficiency due to chatter suppression by special cutting edge design

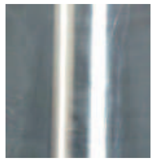
Performance

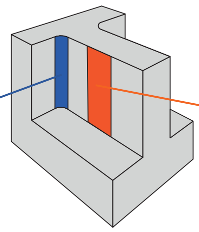
AL5D-2 O. D. Cutting edge

Work Material : A5052

Machined Size :
12.5 × 35 × 30mm



NS TOOL AL5D-2	Othre tool brand
	
No chattering	Chattering



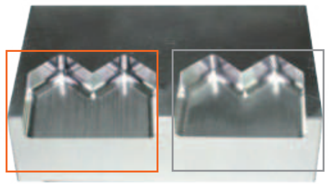
NS TOOL AL5D-2	Othre tool brand
	
No chattering	Chattering

L/D=5 length of cut realizes stable machining in corners with high machining load and high-speed conditions

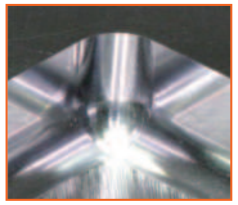
Performance

ALB225 R and O. D.
Cutting edge

Work Material : A5052

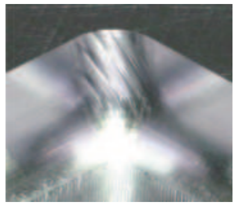


ALB225 Other tool brand



ALB225

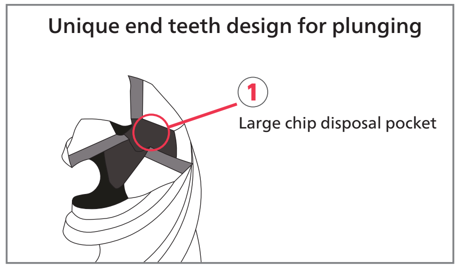
ALB225 achieves good machining surface and no chattering at the corner



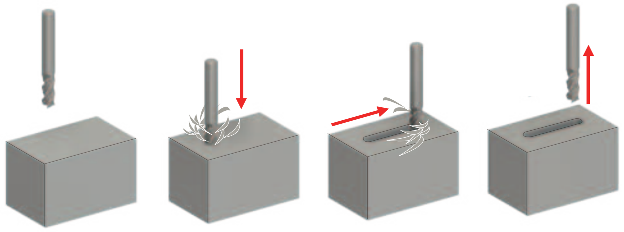
Other tool brand

Chattering occurred at the corner part after machinedby other brand tool

Continuous machining available from plunging to grooves to side surfaces

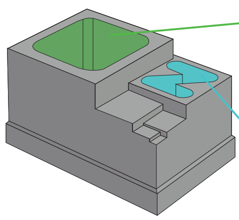


AL3D-345 ALZ345 ALZ345-DLC



Plunging on Aluminium alloy with 3-flute, continuous grooving / pocket machining

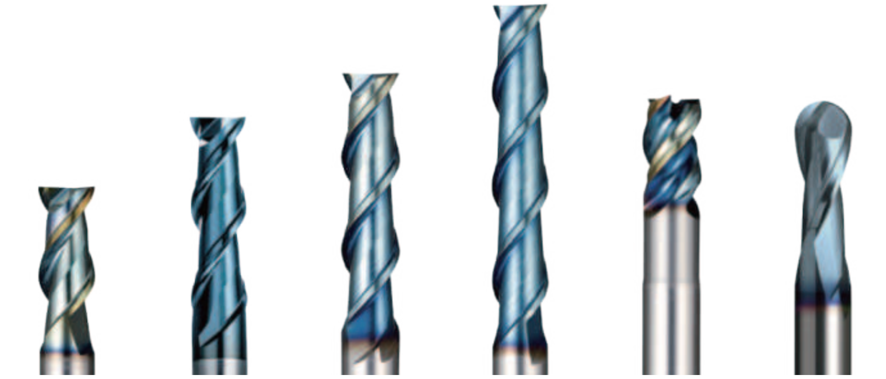
Work Material : A5052



A Pocket ALZ345 ϕ10
Spindle speed: 11,000 min^{-1},
Feed (Plunging): 300 mm/min

B Groove ALZ345 ϕ6
Spindle speed: 18,600 min^{-1},
Feed (Plunging): 400 mm/min

Long tool life with DLC COATING specially designed for aluminium



AL2D-2DLC AL3D-2DLC AL4D-2DLC AL5D-2DLC ALZ345-DLC ALB225-DLC

Sharp cutting to realize high speed machining without chattering

Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																								
AL2D-2	ϕ0.5 ～ ϕ12	2D	-	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	38	J-006
2-flute end mill for aluminium. L/D=2. Reducing chattering and burr by specialized cutting edge design for aluminium																								
AL2D-2DLC	ϕ0.5 ～ ϕ12	2D	DLC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	22	J-008
2-flute end mill for aluminium. L/D=2. DLC coating applied for longer tool life																								
AL3D-2	ϕ1 ～ ϕ12	3D	-	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	14	J-010
2-flute end mill for aluminium. L/D=3. Reducing chattering and burr by specialized cutting edge design for aluminium																								
AL3D-2DLC	ϕ1 ～ ϕ12	3D	DLC	2	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	14	J-012
2-flute end mill for aluminium. L/D=3. DLC coating applied for longer tool life																								
AL4D-2	ϕ1 ～ ϕ12	4D	-	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	14	J-014
2-flute end mill for aluminium. L/D=4. Reducing chattering and burr by specialized cutting edge design for aluminium																								
AL4D-2DLC	ϕ1 ～ ϕ12	4D	DLC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	14	J-016
2-flute end mill for aluminium. L/D=4. DLC coating applied for longer tool life																								
AL5D-2	ϕ1 ～ ϕ12	5D	-	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	14	J-018
2-flute end mill for aluminium. L/D=5. Reducing chattering and burr by specialized cutting edge design for aluminium																								
AL5D-2DLC	ϕ1 ～ ϕ12	5D	DLC	2	45°	Side	-	Face	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	14	J-020
2-flute end mill for aluminium. L/D=5. DLC coating applied for longer tool life																								
AL3D-345	ϕ1 ～ ϕ12	3D	-	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	◎	○	○	-	-	9	J-022
For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting ※ Listed at "High Efficient Milling" as well (Page I-014)																								

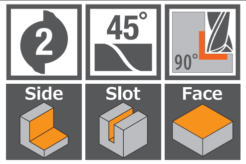
Model	Size	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	Plunging Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																									
AL-3LS	ϕ5 ～ ϕ12	1.5D	-	3	45°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	5	J-024
3-flute long shank end mill for aluminium for deeper area milling																									
Square・Long Neck Square																									
ALZ345	ϕ1 ～ ϕ12	1.5D	-	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	124	J-026
For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting ※ Listed at "High Efficient Milling" as well (Page I-022)																									
Long Neck Square																									
ALZ345-DLC	ϕ1 ～ ϕ12	1.5D	DLC	3	45°	Side	Slot	Face	Plunge	-	-	-	-	-	-	-	-	-	◎	○	○	-	-	17	J-030
For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting ※ Listed at "High Efficient Milling" as well (Page I-020)																									
Ball・Long Neck Ball																									
ALB225	R0.3 ～ R6	≒2D	-	2	25°	-	-	-	-	3D	-	-	-	-	-	-	-	-	◎	○	○	-	-	26	J-032
Ball end mill for aluminium. Reducing chattering even for milling at corner and curved surface																									
ALB225-DLC	R0.3 ～ R6	≒2D	DLC	2	25°	-	-	-	-	3D	-	-	-	-	-	-	-	-	◎	○	○	-	-	26	J-034
Ball end mill for aluminium. DLC coating applied for longer tool life																									

AL2D-2

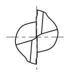
Size ϕ 0.5 ~ ϕ 12 WC

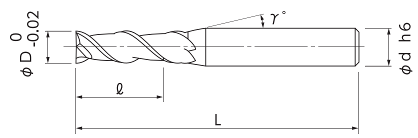
2-Flute L/D=2 End Mill for Aluminium

Total 38 sizes



2-flute end mill for aluminium. L/D=2
Reducing chattering and burr by specialized cutting edge design for aluminium





- AL-series realized a stable and high efficient machining.
- L/D=2 to increase rigidity and realize best cost performance.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00631-00050	0.5	1	9°	4	45
01-00631-00060	0.6	1.2	9°	4	45
01-00631-00070	0.7	1.4	9°	4	45
01-00631-00080	0.8	1.6	9°	4	45
01-00631-00090	0.9	1.8	9°	4	45
01-00631-00100	1	2	9°	4	45
01-00631-00110	1.1	2.2	9°	4	45
01-00631-00120	1.2	2.4	9°	4	45
01-00631-00130	1.3	2.6	9°	4	45
01-00631-00140	1.4	2.8	9°	4	45
01-00631-00150	1.5	3	9°	4	45
01-00631-00160	1.6	3.2	9°	4	45
01-00631-00170	1.7	3.4	9°	4	45
01-00631-00180	1.8	3.6	9°	4	45
01-00631-00190	1.9	3.8	9°	4	45
01-00631-00200	2	4	9°	4	45
01-00631-00210	2.1	4.2	9°	4	45
01-00631-00220	2.2	4.4	9°	4	45
01-00631-00230	2.3	4.6	9°	4	45
01-00631-00240	2.4	4.8	9°	4	45
01-00631-00250	2.5	5	9°	4	45
01-00631-00260	2.6	5.2	9°	4	45
01-00631-00270	2.7	5.4	9°	4	45
01-00631-00280	2.8	5.6	9°	4	45
01-00631-00290	2.9	5.8	9°	6	50
01-00631-00300	3	6	9°	6	50
01-00631-00350	3.5	7	9°	6	50

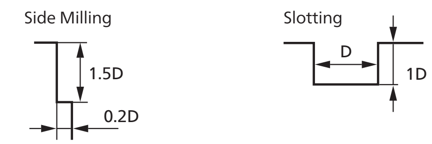
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00631-00400	4	8	9°	6	50
01-00631-00450	4.5	9	9°	6	55
01-00631-00500	5	10	9°	6	55
01-00631-00550	5.5	11	9°	6	55
01-00631-00600	6	12	–	6	55
01-00631-00700	7	14	9°	8	70
01-00631-00800	8	16	–	8	70
01-00631-00900	9	18	9°	10	75
01-00631-01000	10	20	–	10	75
01-00631-01100	11	22	9°	12	80
01-00631-01200	12	24	–	12	80

How to Order When you order, indicate AL2D-2 (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Aluminium A1070				Aluminium Alloy A2017·A5052·A7075				Aluminium Cast AC8C			
Cutting Speed	340m/min		270m/min		380m/min		300m/min		280m/min		200m/min	
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
0.5	20,000	400	20,000	200	20,000	400	20,000	300	20,000	400	20,000	300
1	20,000	700	20,000	400	20,000	700	20,000	400	20,000	700	20,000	400
1.5	20,000	800	20,000	500	20,000	800	20,000	500	20,000	800	20,000	500
2	20,000	1,000	20,000	600	20,000	1,000	20,000	600	20,000	1,000	20,000	600
2.5	20,000	1,200	20,000	700	20,000	1,200	20,000	700	20,000	1,200	20,000	700
3	20,000	1,300	20,000	800	20,000	1,500	20,000	900	20,000	1,500	20,000	800
4	20,000	1,500	20,000	900	20,000	1,700	20,000	1,100	20,000	1,700	15,900	800
5	20,000	1,700	17,200	900	20,000	2,000	19,100	1,300	17,800	1,700	12,700	800
6	18,000	1,800	14,300	900	20,000	2,200	15,900	1,300	14,900	1,700	10,600	800
7	15,500	1,800	12,300	900	17,300	2,300	13,600	1,300	12,700	1,700	9,100	800
8	13,500	1,800	10,700	1,000	15,100	2,400	11,900	1,300	11,100	1,800	8,000	800
9	12,000	1,800	9,600	1,000	13,400	2,400	10,600	1,300	9,900	1,800	7,100	800
10	10,800	1,800	8,600	1,000	12,100	2,400	9,600	1,300	8,900	1,800	6,400	800
11	9,800	1,900	7,800	1,000	11,000	2,500	8,700	1,300	8,100	1,800	5,800	800
12	9,000	2,000	7,200	1,100	10,100	2,500	8,000	1,400	7,400	1,800	5,300	900

Depth of Cut (D:Dia.)



Notes

※ 1 Adjust both the spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur according to the rigidity of the machine and the chuck holder, or work clamping condition.
※ 4 Water-soluble fluid is recommended.

AL2D-2DLC

Size ϕ 0.5 ～ ϕ 12

DLC

AL2D-2DLC

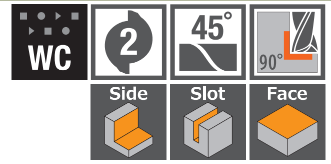
Aluminium Milling

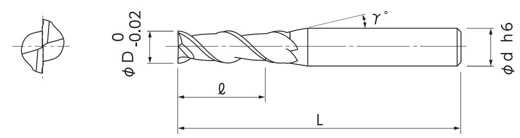
DLC COATING 2-Flute L/D=2 End Mill for Aluminium

Total 22 sizes

Recommended Milling Conditions

2-flute end mill for aluminium. L/D=2
DLC coating applied for longer tool life





Aluminium Alloy N ◎
Copper N ○
Resin O ○

● Adopted NS TOOL original DLC COATING that suitable for long time machining.

Square Coating

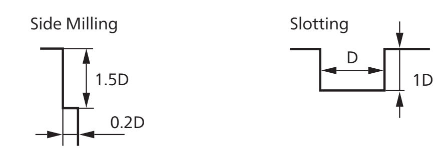
Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00661-00050	0.5	1	9°	4	45
01-00661-00060	0.6	1.2	9°	4	45
01-00661-00070	0.7	1.4	9°	4	45
01-00661-00080	0.8	1.6	9°	4	45
01-00661-00090	0.9	1.8	9°	4	45
01-00661-00100	1	2	9°	4	45
01-00661-00150	1.5	3	9°	4	45
01-00661-00200	2	4	9°	4	45
01-00661-00250	2.5	5	9°	4	45
01-00661-00300	3	6	9°	6	50
01-00661-00350	3.5	7	9°	6	50
01-00661-00400	4	8	9°	6	50
01-00661-00450	4.5	9	9°	6	55
01-00661-00500	5	10	9°	6	55
01-00661-00550	5.5	11	9°	6	55
01-00661-00600	6	12	–	6	55
01-00661-00700	7	14	9°	8	70
01-00661-00800	8	16	–	8	70
01-00661-00900	9	18	9°	10	75
01-00661-01000	10	20	–	10	75
01-00661-01100	11	22	9°	12	80
01-00661-01200	12	24	–	12	80

How to Order When you order, indicate AL2D-2DLC (D). ※(γ) is reference value.

Work Material	Aluminium A1070				Aluminium Alloy A2017･A5052･A7075				Aluminium Cast AC8C			
Cutting Speed	340m/min		270m/min		380m/min		300m/min		280m/min		200m/min	
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
0.5	20,000	400	20,000	200	20,000	400	20,000	300	20,000	400	20,000	300
1	20,000	700	20,000	400	20,000	700	20,000	400	20,000	700	20,000	400
1.5	20,000	800	20,000	500	20,000	800	20,000	500	20,000	800	20,000	500
2	20,000	1,000	20,000	600	20,000	1,000	20,000	600	20,000	1,000	20,000	600
2.5	20,000	1,200	20,000	700	20,000	1,200	20,000	700	20,000	1,200	20,000	700
3	20,000	1,300	20,000	800	20,000	1,500	20,000	900	20,000	1,500	20,000	800
4	20,000	1,500	20,000	900	20,000	1,700	20,000	1,100	20,000	1,700	15,900	800
5	20,000	1,700	17,200	900	20,000	2,000	19,100	1,300	17,800	1,700	12,700	800
6	18,000	1,800	14,300	900	20,000	2,200	15,900	1,300	14,900	1,700	10,600	800
7	15,500	1,800	12,300	900	17,300	2,300	13,600	1,300	12,700	1,700	9,100	800
8	13,500	1,800	10,700	1,000	15,100	2,400	11,900	1,300	11,100	1,800	8,000	800
9	12,000	1,800	9,600	1,000	13,400	2,400	10,600	1,300	9,900	1,800	7,100	800
10	10,800	1,800	8,600	1,000	12,100	2,400	9,600	1,300	8,900	1,800	6,400	800
11	9,800	1,900	7,800	1,000	11,000	2,500	8,700	1,300	8,100	1,800	5,800	800
12	9,000	2,000	7,200	1,100	10,100	2,500	8,000	1,400	7,400	1,800	5,300	900

Depth of Cut (D：Dia.)



Notes

※ 1 Adjust both the spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur according to the rigidity of the machine and the chuck holder, or work clamping condition.
※ 4 Water-soluble fluid is recommended.

N Aluminium Alloy ◎
N Copper ○
O Resin ○

Square Coating

AL3D-2

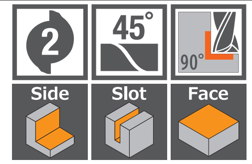
Size φ1 ~ φ12 WC

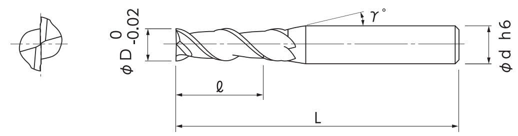
2-Flute L/D=3 End Mill for Aluminium

Total 14 sizes

Recommended Milling Conditions

2-flute end mill for aluminium. L/D=3
Reducing chattering and burr cutting edge design for aluminium





- AL-series realized a stable and high efficient machining.
- It exhibits stable excellent surface on a wide area and no chattering occurs even during high speed cutting.

Aluminium Alloy N
Copper N
Resin O
Square

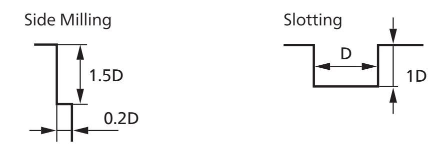
Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00632-00100	1	3	9°	4	45
01-00632-00150	1.5	4.5	9°	4	45
01-00632-00200	2	6	9°	4	45
01-00632-00250	2.5	7.5	9°	4	45
01-00632-00300	3	9	9°	6	50
01-00632-00400	4	12	9°	6	50
01-00632-00500	5	15	9°	6	55
01-00632-00600	6	18	–	6	60
01-00632-00700	7	21	9°	8	70
01-00632-00800	8	24	–	8	70
01-00632-00900	9	27	9°	10	75
01-00632-01000	10	30	–	10	75
01-00632-01100	11	33	9°	12	90
01-00632-01200	12	36	–	12	90

How to Order When you order, indicate AL3D-2 (D). ※(γ) is reference value.

Work Material	Aluminium A1070				Aluminium Alloy A2017・A5052・A7075				Aluminium Cast AC8C			
Cutting Speed	300m/min		220m/min		330m/min		240m/min		250m/min		160m/min	
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	400	20,000	300	20,000	400	20,000	300	20,000	400	20,000	300
1.5	20,000	500	20,000	400	20,000	500	20,000	400	20,000	500	20,000	400
2	20,000	600	20,000	400	20,000	600	20,000	400	20,000	600	20,000	400
2.5	20,000	700	20,000	500	20,000	700	20,000	500	20,000	700	20,000	500
3	20,000	900	20,000	600	20,000	900	20,000	600	20,000	900	17,000	500
4	20,000	1,000	17,500	700	20,000	1,000	19,000	750	20,000	1,000	13,000	500
5	19,000	1,000	14,000	700	20,000	1,200	15,500	750	16,000	1,000	10,000	500
6	16,000	1,100	11,500	700	17,500	1,400	12,500	750	13,500	1,000	8,500	500
7	13,500	1,100	10,000	750	15,000	1,500	11,000	800	11,500	1,100	7,300	500
8	12,000	1,100	8,800	750	13,000	1,600	9,600	800	9,900	1,200	6,400	500
9	11,000	1,100	7,800	750	11,700	1,600	8,500	800	8,800	1,200	5,700	500
10	9,600	1,100	7,000	800	10,500	1,700	7,600	850	8,000	1,300	5,100	550
11	8,700	1,100	6,400	800	9,600	1,700	6,900	850	7,200	1,300	4,600	550
12	8,000	1,200	5,800	800	8,800	1,700	6,400	900	6,600	1,300	4,200	600

Depth of Cut (D：Dia.)



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 Water-soluble fluid is recommended.

N Aluminium Alloy
N Copper
O Resin
Square

AL3D-2DLC

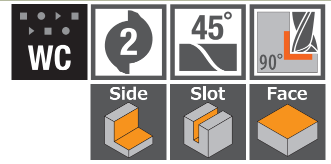
Size ϕ 1 ～ ϕ 12

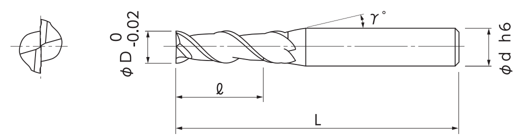
DLC

DLC COATING 2-Flute L/D=3 End Mill for Aluminium

Total 14 sizes

2-flute end mill for aluminium. L/D=3
DLC coating applied for longer tool life





- AL-series realized a stable and high efficient machining.
- Adopted NS TOOL original DLC COATING that suitable for long time machining.

Aluminium Alloy N
Copper N
Resin O
Square Coating

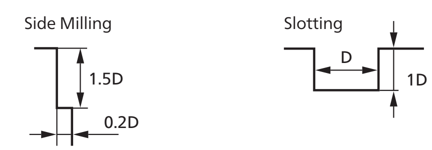
Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00635-00100	1	3	9°	4	45
01-00635-00150	1.5	4.5	9°	4	45
01-00635-00200	2	6	9°	4	45
01-00635-00250	2.5	7.5	9°	4	45
01-00635-00300	3	9	9°	6	50
01-00635-00400	4	12	9°	6	50
01-00635-00500	5	15	9°	6	55
01-00635-00600	6	18	–	6	60
01-00635-00700	7	21	9°	8	70
01-00635-00800	8	24	–	8	70
01-00635-00900	9	27	9°	10	75
01-00635-01000	10	30	–	10	75
01-00635-01100	11	33	9°	12	90
01-00635-01200	12	36	–	12	90

How to Order When you order, indicate AL3D-2DLC (D). ※(γ) is reference value.

Work Material	Aluminium A1070				Aluminium Alloy A2017･A5052･A7075				Aluminium Cast AC8C			
Cutting Speed	300m/min		220m/min		330m/min		240m/min		250m/min		160m/min	
Dia.	Side Milling		Slotting		Side Milling		Slotting		Side Milling		Slotting	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	400	20,000	300	20,000	400	20,000	300	20,000	400	20,000	300
1.5	20,000	500	20,000	400	20,000	500	20,000	400	20,000	500	20,000	400
2	20,000	600	20,000	400	20,000	600	20,000	400	20,000	600	20,000	400
2.5	20,000	700	20,000	500	20,000	700	20,000	500	20,000	700	20,000	500
3	20,000	900	20,000	600	20,000	900	20,000	600	20,000	900	17,000	500
4	20,000	1,000	17,500	700	20,000	1,000	19,000	750	20,000	1,000	13,000	500
5	19,000	1,000	14,000	700	20,000	1,200	15,500	750	16,000	1,000	10,000	500
6	16,000	1,100	11,500	700	17,500	1,400	12,500	750	13,500	1,000	8,500	500
7	13,500	1,100	10,000	750	15,000	1,500	11,000	800	11,500	1,100	7,300	500
8	12,000	1,100	8,800	750	13,000	1,600	9,600	800	9,900	1,200	6,400	500
9	11,000	1,100	7,800	750	11,700	1,600	8,500	800	8,800	1,200	5,700	500
10	9,600	1,100	7,000	800	10,500	1,700	7,600	850	8,000	1,300	5,100	550
11	8,700	1,100	6,400	800	9,600	1,700	6,900	850	7,200	1,300	4,600	550
12	8,000	1,200	5,800	800	8,800	1,700	6,400	900	6,600	1,300	4,200	600

Depth of Cut (D：Dia.)



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 Water-soluble fluid is recommended.

N Aluminium Alloy
N Copper
O Resin
Square Coating

AL4D-2

Size ϕ 1 ～ ϕ 12

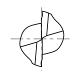
WC

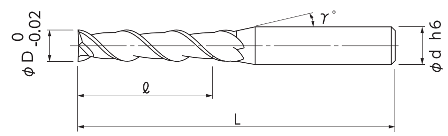
2-Flute L/D=4 End Mill for Aluminium

Total 14 sizes

2-flute end mill for aluminium. L/D=4
Reducing chattering and burr by cutting edge design for aluminium

2 | 45° | 90° | Side | Face





● It exhibits stable excellent surface on a wide area and no chattering occurs even during high speed cutting.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00633-00100	1	4	9°	4	50
01-00633-00150	1.5	6	9°	4	50
01-00633-00200	2	8	9°	4	50
01-00633-00250	2.5	10	9°	4	50
01-00633-00300	3	12	9°	6	55
01-00633-00400	4	16	9°	6	60
01-00633-00500	5	20	9°	6	65
01-00633-00600	6	24	–	6	75
01-00633-00700	7	28	9°	8	90
01-00633-00800	8	32	–	8	90
01-00633-00900	9	36	9°	10	100
01-00633-01000	10	40	–	10	100
01-00633-01100	11	44	9°	12	110
01-00633-01200	12	48	–	12	110

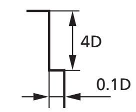
How to Order When you order, indicate AL4D-2 (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Aluminium A1070		Aluminium Alloy A2017·A5052·A7075		Aluminium Cast AC8C	
Cutting Speed	190m/min		280m/min		150m/min	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	220	20,000	220	20,000	220
1.5	20,000	270	20,000	270	20,000	320
2	20,000	320	20,000	320	20,000	340
2.5	20,000	430	20,000	430	18,500	400
3	20,000	570	20,000	570	15,000	520
4	15,500	650	20,000	840	11,500	520
5	12,000	840	17,500	900	9,100	520
6	10,200	840	14,500	1,050	7,700	520
7	8,800	840	12,600	1,150	6,600	580
8	7,700	840	11,000	1,150	5,800	650
9	6,800	900	9,700	1,300	5,200	720
10	6,100	900	8,800	1,300	4,600	720
11	5,500	980	8,000	1,450	4,200	720
12	5,200	1,050	7,300	1,450	3,800	780

Depth of Cut (D : Dia.)

Side Milling



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 Water-soluble fluid is recommended.

AL4D-2DLC

Size ϕ 1 ～ ϕ 12

DLC

AL4D-2DLC

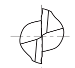
Aluminium Milling

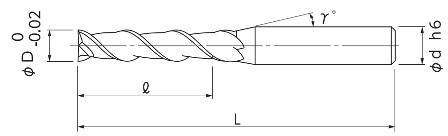
DLC COATING 2-Flute L/D=4 End Mill for Aluminium

Total 14 sizes

WC 2 45° 90° Side Face

2-flute end mill for aluminium.
L/D=4. DLC coating applied for longer tool life





- Adopted NS TOOL original DLC COATING that suitable for long time machining.

Aluminium Alloy N
Copper N
Resin O

Square Coating

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00663-00100	1	4	9°	4	50
01-00663-00150	1.5	6	9°	4	50
01-00663-00200	2	8	9°	4	50
01-00663-00250	2.5	10	9°	4	50
01-00663-00300	3	12	9°	6	55
01-00663-00400	4	16	9°	6	60
01-00663-00500	5	20	9°	6	65
01-00663-00600	6	24	–	6	75
01-00663-00700	7	28	9°	8	90
01-00663-00800	8	32	–	8	90
01-00663-00900	9	36	9°	10	100
01-00663-01000	10	40	–	10	100
01-00663-01100	11	44	9°	12	110
01-00663-01200	12	48	–	12	110

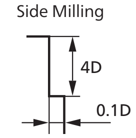
How to Order　When you order, indicate AL4D-2DLC (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Aluminium A1070		Aluminium Alloy A2017･A5052･A7075		Aluminium Cast AC8C	
Cutting Speed	190m/min		280m/min		150m/min	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	220	20,000	220	20,000	220
1.5	20,000	270	20,000	270	20,000	320
2	20,000	320	20,000	320	20,000	340
2.5	20,000	430	20,000	430	18,500	400
3	20,000	570	20,000	570	15,000	520
4	15,500	650	20,000	840	11,500	520
5	12,000	840	17,500	900	9,100	520
6	10,200	840	14,500	1,050	7,700	520
7	8,800	840	12,600	1,150	6,600	580
8	7,700	840	11,000	1,150	5,800	650
9	6,800	900	9,700	1,300	5,200	720
10	6,100	900	8,800	1,300	4,600	720
11	5,500	980	8,000	1,450	4,200	720
12	5,200	1,050	7,300	1,450	3,800	780

Depth of Cut (D：Dia.)

Side Milling



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 Water-soluble fluid is recommended.

N Aluminium Alloy
N Copper
O Resin

Square Coating

AL5D-2

Size ϕ 1 ～ ϕ 12

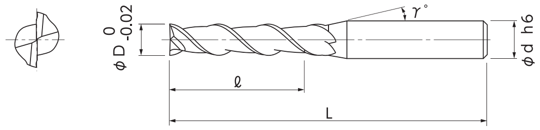
WC

2-Flute L/D=5 End Mill for Aluminium

Total 14 sizes

2-flute end mill for aluminium. L/D=5
Reducing chattering and burr by cutting edge design for aluminium

2 45° 90° Side Face



- AL-series realized a stable and high efficient machining.
- It exhibits stable excellent surface on a wide area and no chattering occurs even during high speed cutting.

Aluminium Alloy N ◎
Copper N ○
Resin O ○

Square

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00634-00100	1	5	9°	4	50
01-00634-00150	1.5	7.5	9°	4	50
01-00634-00200	2	10	9°	4	50
01-00634-00250	2.5	12.5	9°	4	50
01-00634-00300	3	15	9°	6	55
01-00634-00400	4	20	9°	6	60
01-00634-00500	5	25	9°	6	65
01-00634-00600	6	30	–	6	75
01-00634-00700	7	35	9°	8	90
01-00634-00800	8	40	–	8	90
01-00634-00900	9	45	9°	10	100
01-00634-01000	10	50	–	10	100
01-00634-01100	11	55	9°	12	110
01-00634-01200	12	60	–	12	110

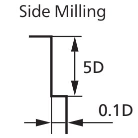
How to Order　When you order, indicate AL5D-2 (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Aluminium A1070		Aluminium Alloy A2017･A5052･A7075		Aluminium Cast AC8C	
Cutting Speed	160m/min		230m/min		120m/min	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	200	20,000	200	20,000	200
1.5	20,000	250	20,000	250	20,000	300
2	20,000	300	20,000	300	19,000	300
2.5	20,000	400	20,000	400	15,300	300
3	17,000	450	20,000	450	12,700	400
4	12,700	500	18,000	700	9,600	400
5	10,000	650	14,600	700	7,600	400
6	8,500	650	12,000	800	6,400	400
7	7,300	650	10,500	900	5,500	450
8	6,400	650	9,100	900	4,800	500
9	5,700	700	8,100	1,000	4,300	550
10	5,100	700	7,300	1,000	3,800	550
11	4,600	750	6,700	1,100	3,500	550
12	4,300	800	6,100	1,100	3,200	600

Depth of Cut (D：Dia.)

Side Milling



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 Water-soluble fluid is recommended.

N Aluminium Alloy ◎
N Copper ○
O Resin ○

Square

AL5D-2DLC

Size ϕ 1 ～ ϕ 12

DLC

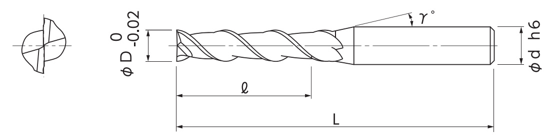
DLC COATING 2-Flute L/D=5 End Mill for Aluminium

Total 14 sizes

Recommended Milling Conditions

WC 2 45° 90° Side Face

2-flute end mill for aluminium. L/D=5.
DLC coating applied for longer tool life



- Adopted NS TOOL original DLC COATING that suitable for long time machining.

Unit : mm

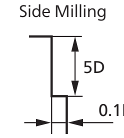
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00664-00100	1	5	9°	4	50
01-00664-00150	1.5	7.5	9°	4	50
01-00664-00200	2	10	9°	4	50
01-00664-00250	2.5	12.5	9°	4	50
01-00664-00300	3	15	9°	6	55
01-00664-00400	4	20	9°	6	60
01-00664-00500	5	25	9°	6	65
01-00664-00600	6	30	–	6	75
01-00664-00700	7	35	9°	8	90
01-00664-00800	8	40	–	8	90
01-00664-00900	9	45	9°	10	100
01-00664-01000	10	50	–	10	100
01-00664-01100	11	55	9°	12	110
01-00664-01200	12	60	–	12	110

How to Order　When you order, indicate AL5D-2DLC (D).　※(γ) is reference value.

Work Material	Aluminium A1070		Aluminium Alloy A2017･A5052･A7075		Aluminium Cast AC8C	
Cutting Speed	160m/min		230m/min		120m/min	
Dia.	Side Milling		Side Milling		Side Milling	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	200	20,000	200	20,000	200
1.5	20,000	250	20,000	250	20,000	300
2	20,000	300	20,000	300	19,000	300
2.5	20,000	400	20,000	400	15,300	300
3	17,000	450	20,000	450	12,700	400
4	12,700	500	18,000	700	9,600	400
5	10,000	650	14,600	700	7,600	400
6	8,500	650	12,000	800	6,400	400
7	7,300	650	10,500	900	5,500	450
8	6,400	650	9,100	900	4,800	500
9	5,700	700	8,100	1,000	4,300	550
10	5,100	700	7,300	1,000	3,800	550
11	4,600	750	6,700	1,100	3,500	550
12	4,300	800	6,100	1,100	3,200	600

Depth of Cut (D：Dia.)

Side Milling



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 Water-soluble fluid is recommended.

AL3D-345

Size ϕ 1 ～ ϕ 12

WC

AL3D-345

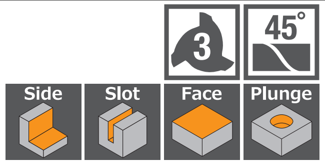
Aluminium Milling

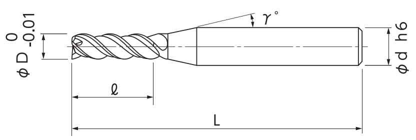
High efficient 3-Flute End Mill for Aluminium L/D=3

Total 9 sizes

Recommended Milling Conditions

For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting





※Listed at "High Efficient Milling" as well（Page I-014）

- AL-series realized a stable and high efficient machining.
- It exhibits stable excellent surface on a wide area and no chattering occurs even during high speed cutting.
- Realized high efficiency machining by adopting 3 flutes.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00639-00100	1	3	12°	4	60
01-00639-00200	2	6	12°	4	60
01-00639-00300	3	9	12°	6	60
01-00639-00400	4	12	12°	6	70
01-00639-00500	5	15	12°	6	80
01-00639-00600	6	18	–	6	80
01-00639-00800	8	24	–	8	90
01-00639-01000	10	30	–	10	100
01-00639-01200	12	36	–	12	110

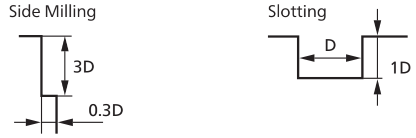
How to Order When you order, indicate AL3D-345 (D). ※(γ) is reference value.

Machining case S-028

Work Material	Aluminium A1070						Aluminium Alloy A2017･A5052･A7075						Aluminium Cast AC8C					
Cutting Speed	300m/min		220m/min		220m/min		330m/min		240m/min		240m/min		250m/min		160m/min		160m/min	
	Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging		Side Milling		Slotting		Plunging	
Dia.	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
1	20,000	1,200	20,000	500	20,000	100	20,000	1,200	20,000	500	20,000	100	20,000	1,200	20,000	500	20,000	80
2	20,000	1,800	20,000	700	20,000	150	20,000	1,800	20,000	700	20,000	150	20,000	1,800	20,000	700	20,000	130
3	20,000	2,000	20,000	1,000	20,000	150	20,000	2,000	20,000	1,000	20,000	150	20,000	2,000	17,000	850	17,000	130
4	20,000	2,200	17,500	1,100	17,500	150	20,000	2,200	19,000	1,100	19,000	200	20,000	2,200	13,000	850	13,000	100
5	19,000	2,200	14,000	1,100	14,000	150	20,000	2,700	15,500	1,200	15,500	200	16,000	2,200	10,000	850	10,000	80
6	16,000	2,200	11,500	1,100	11,500	150	17,500	3,000	12,500	1,300	12,500	200	13,500	2,200	8,500	850	8,500	80
8	12,000	2,200	9,000	1,200	9,000	100	13,000	3,000	9,500	1,400	9,500	200	10,000	2,300	6,500	850	6,500	60
10	9,500	2,200	7,000	1,300	7,000	70	10,500	3,250	7,500	1,500	7,500	150	8,000	2,500	5,000	900	5,000	50
12	8,000	2,400	6,000	1,400	6,000	70	9,000	3,350	6,500	1,600	6,500	150	6,500	2,600	4,000	1,000	4,000	50

Depth of Cut

(D：Dia.)



Notes

※ 1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※ 2 Use a rigid and precise machine and chuck holder.
※ 3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※ 4 When tending to have chip packing during plunging, step milling is recommended.
※ 5 Water-soluble fluid is recommended.

Aluminium Alloy N
Copper N
Resin O
Square

N Aluminium Alloy
N Copper
O Resin
Square

AL-3LS

Size φ5～φ12

WC

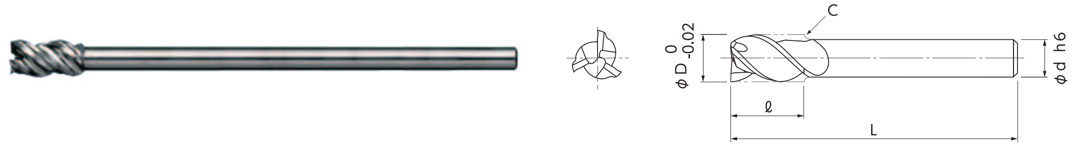
3-Flute Long Shank End Mill for Aluminium

Total 5 sizes

3-flute long shank end mill for aluminium for deeper area milling

3 45°

Side Slot Face



- Slimmed shank suits side milling.
- Corner-C at flute end effects an accurate side step milling.

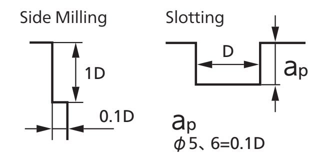
Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Shank Dia. (d)	Overall Length (L)
01-00637-00500	5	7.5	4	80
01-00637-00600	6	9	4	80
01-00637-00800	8	12	6	110
01-00637-01000	10	15	8	130
01-00637-01200	12	18	10	150

How to Order — When you order, indicate AL-3LS (D).

Work Material	Aluminium A1070			Aluminium Alloy A2017･A5052･A7075			Aluminium Cast AC8C		
Cutting Speed	100～250m/min			150～300m/min			100～200m/min		
Dia.	Spindle Speed	Feed		Spindle Speed	Feed		Spindle Speed	Feed	
		Slotting	Side Milling		Slotting	Side Milling		Slotting	Side Milling
	min^{-1}	mm/min		min^{-1}	mm/min		min^{-1}	mm/min	
5	16,000	1,200	1,700	19,000	1,700	2,300	13,000	1,200	1,600
6	13,000	1,000	1,400	16,000	1,400	1,900	10,600	900	1,100
8	10,000	1,350	1,800	12,000	2,000	2,500	8,000	1,200	1,500
10	8,000	1,450	1,900	9,500	1,850	2,500	6,300	1,200	1,700
12	6,600	1,400	1,700	7,900	1,750	2,800	5,300	1,200	1,600

Depth of Cut (D：Dia.)



ap
φ5、6=0.1D
φ8=0.2D
φ10、12=0.3D

Above recommended milling conditions are based on 4D overhang.
In case of more than 4D overhang, refer to the below table.

Overhang	Spindle Speed	Feed		Depth of Cut	
		Slotting	Side Milling	Slotting	Side Milling
5D	70%	70%	60%	ap 1D×ae 0.05D	
6D	50%	50%	40%	ap 1D×ae 0.03D	
7D	30%	30%	20%	ap 1D×ae 0.015D	

Notes

※1 Adjust both spindle speed and feed at the same rate.
※2 Use a rigid and precise machine and chuck holder.
※3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※4 Water-soluble fluid is recommended.

ALZ345

Size ϕ1 ～ ϕ12

WC

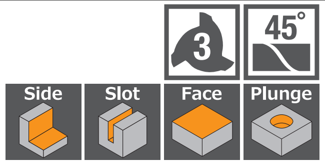
ALZ345

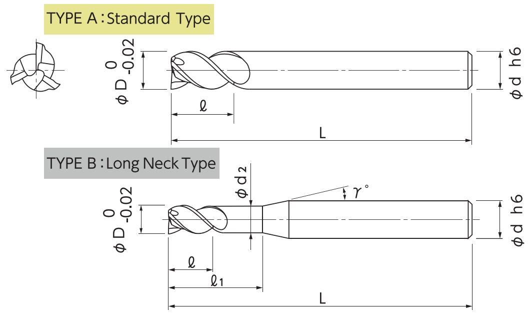
High efficient 3-Flute End Mill for Aluminium L/D=1.5

Total 124 sizes

High efficient 3-Flute End Mill for Aluminium L/D=1.5

For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting





※Listed at "High Efficient Milling" as well (Page I-022)

- AL-series realized a stable and high efficient machining.
- Improved plunging capacity!
- High performance with better chip disposal.

Aluminium Alloy N ◎
Copper N ○
Resin O ○

Square
Long Neck Square

Unit : mm

Code No.	Dia. (D)	Under neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00636-00100	1	3	1.5	B	0.95	12°	4	45
01-00636-00102	1	5	1.5	B	0.95	12°	4	60
▌01-00636-00110	1.1	3.3	1.7	B	1.05	12°	4	45
▌01-00636-00120	1.2	3.6	1.8	B	1.15	12°	4	45
▌01-00636-00130	1.3	3.9	2	B	1.25	12°	4	45
▌01-00636-00140	1.4	4.2	2.1	B	1.35	12°	4	45
01-00636-00150	1.5	4.5	2.3	B	1.45	12°	4	45
▌01-00636-00160	1.6	4.8	2.4	B	1.55	12°	4	45
▌01-00636-00170	1.7	5.1	2.6	B	1.65	12°	4	45
▌01-00636-00180	1.8	5.4	2.7	B	1.74	12°	4	45
▌01-00636-00190	1.9	5.7	2.9	B	1.84	12°	4	45
01-00636-00200	2	6	3	B	1.94	12°	4	45
01-00636-00202	2	10	3	B	1.94	12°	4	60
▌01-00636-00210	2.1	6.3	3.2	B	2	12°	4	45
▌01-00636-00220	2.2	6.6	3.3	B	2.1	12°	4	45
▌01-00636-00230	2.3	6.9	3.5	B	2.2	12°	4	45
▌01-00636-00240	2.4	7.2	3.6	B	2.3	12°	4	45
01-00636-00250	2.5	7.5	3.8	B	2.4	12°	4	45
▌01-00636-00260	2.6	7.8	3.9	B	2.45	12°	6	55
▌01-00636-00270	2.7	8.1	4.1	B	2.55	12°	6	55
▌01-00636-00280	2.8	8.4	4.2	B	2.65	12°	6	55
▌01-00636-00290	2.9	8.7	4.4	B	2.75	12°	6	55
01-00636-00300	3	9	4.5	B	2.85	12°	6	55
01-00636-00302	3	15	4.5	B	2.85	12°	6	60
▌01-00636-00310	3.1	9.3	4.7	B	2.95	12°	6	55
▌01-00636-00320	3.2	9.6	4.8	B	3.05	12°	6	55

How to Order When you order, indicate ALZ345 (D)[×(ℓ1)]. Indicate (L) for Type A. ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Dia. (D)	Under neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌01-00636-00330	3.3	9.9	5	B	3.15	12°	6	55
▌01-00636-00340	3.4	10.2	5.1	B	3.25	12°	6	55
01-00636-00350	3.5	10.5	5.3	B	3.35	12°	6	55
▌01-00636-00360	3.6	10.8	5.4	B	3.45	12°	6	55
▌01-00636-00370	3.7	11.1	5.6	B	3.55	12°	6	55
▌01-00636-00380	3.8	11.4	5.7	B	3.65	12°	6	55
▌01-00636-00390	3.9	11.7	5.9	B	3.75	12°	6	55
01-00636-00400	4	12	6	B	3.8	12°	6	55
01-00636-00402	4	20	6	B	3.8	12°	6	70
▌01-00636-00410	4.1	12.3	6.2	B	3.9	12°	6	55
▌01-00636-00420	4.2	12.6	6.3	B	4	12°	6	55
▌01-00636-00430	4.3	12.9	6.5	B	4.1	12°	6	55
▌01-00636-00440	4.4	13.2	6.6	B	4.2	12°	6	55
01-00636-00450	4.5	13.5	6.8	B	4.3	12°	6	55
▌01-00636-00460	4.6	13.8	6.9	B	4.4	12°	6	55
▌01-00636-00470	4.7	14.1	7.1	B	4.5	12°	6	55
▌01-00636-00480	4.8	14.4	7.2	B	4.6	12°	6	55
▌01-00636-00490	4.9	14.7	7.4	B	4.7	12°	6	55
01-00636-00500	5	15	7.5	B	4.8	12°	6	55
01-00636-00502	5	25	7.5	B	4.8	12°	6	80
▌01-00636-00510	5.1	15.3	7.7	B	4.9	12°	6	55
▌01-00636-00520	5.2	15.6	7.8	B	5	12°	6	55
▌01-00636-00530	5.3	15.9	8	B	5.1	12°	6	55
▌01-00636-00540	5.4	16.2	8.1	B	5.2	12°	6	55
01-00636-00550	5.5	16.5	8.3	B	5.3	12°	6	55
▌01-00636-00560	5.6	16.8	8.4	B	5.4	12°	6	55
▌01-00636-00570	5.7	17.1	8.6	B	5.5	12°	6	55
▌01-00636-00580	5.8	17.4	8.7	B	5.6	12°	6	55
▌01-00636-00590	5.9	17.7	8.9	B	5.7	12°	6	55
01-00636-00603	6	–	9	A	–	–	6	110
01-00636-00600	6	18	9	B	5.8	–	6	60
01-00636-00602	6	30	9	B	5.8	–	6	80
▌01-00636-00610	6.1	18.3	9.2	B	5.9	12°	8	70
▌01-00636-00620	6.2	18.6	9.3	B	6	12°	8	70
▌01-00636-00630	6.3	18.9	9.5	B	6.1	12°	8	70
▌01-00636-00640	6.4	19.2	9.6	B	6.2	12°	8	70
▌01-00636-00650	6.5	19.5	9.8	B	6.3	12°	8	70
▌01-00636-00660	6.6	19.8	9.9	B	6.4	12°	8	70
▌01-00636-00670	6.7	20.1	10.1	B	6.5	12°	8	70
▌01-00636-00680	6.8	20.4	10.2	B	6.6	12°	8	70
▌01-00636-00690	6.9	20.7	10.4	B	6.7	12°	8	70
01-00636-00700	7	21	10.5	B	6.8	12°	8	70
▌01-00636-00710	7.1	21.3	10.7	B	6.9	12°	8	70
▌01-00636-00720	7.2	21.6	10.8	B	7	12°	8	70
▌01-00636-00730	7.3	21.9	11	B	7.1	12°	8	70
▌01-00636-00740	7.4	22.2	11.1	B	7.2	12°	8	70
▌01-00636-00750	7.5	22.5	11.3	B	7.3	12°	8	70
▌01-00636-00760	7.6	22.8	11.4	B	7.4	12°	8	70
▌01-00636-00770	7.7	23.1	11.6	B	7.5	12°	8	70
▌01-00636-00780	7.8	23.4	11.7	B	7.6	12°	8	70

N Aluminium Alloy ◎
N Copper ○
O Resin ○

Square
Long Neck Square

ALZ345

High efficient 3-Flute End Mill for Aluminium L/D=1.5

Unit : mm

Code No.	Dia. (D)	Under neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌01-00636-00790	7.9	23.7	11.9	B	7.7	12°	8	70
01-00636-00803	8	–	12	A	–	–	8	120
01-00636-00800	8	24	12	B	7.8	–	8	70
01-00636-00802	8	40	12	B	7.8	–	8	90
▌01-00636-00810	8.1	24.3	12.2	B	7.9	12°	10	75
▌01-00636-00820	8.2	24.6	12.3	B	8	12°	10	75
▌01-00636-00830	8.3	24.9	12.5	B	8.1	12°	10	75
▌01-00636-00840	8.4	25.2	12.6	B	8.2	12°	10	75
▌01-00636-00850	8.5	25.5	12.8	B	8.3	12°	10	75
▌01-00636-00860	8.6	25.8	12.9	B	8.4	12°	10	75
▌01-00636-00870	8.7	26.1	13.1	B	8.5	12°	10	75
▌01-00636-00880	8.8	26.4	13.2	B	8.6	12°	10	75
▌01-00636-00890	8.9	26.7	13.4	B	8.7	12°	10	75
01-00636-00900	9	27	13.5	B	8.8	12°	10	75
▌01-00636-00910	9.1	27.3	13.7	B	8.9	12°	10	75
▌01-00636-00920	9.2	27.6	13.8	B	9	12°	10	75
▌01-00636-00930	9.3	27.9	14	B	9.1	12°	10	75
▌01-00636-00940	9.4	28.2	14.1	B	9.2	12°	10	75
▌01-00636-00950	9.5	28.5	14.3	B	9.3	12°	10	75
▌01-00636-00960	9.6	28.8	14.4	B	9.4	12°	10	75
▌01-00636-00970	9.7	29.1	14.6	B	9.5	12°	10	75
▌01-00636-00980	9.8	29.4	14.7	B	9.6	12°	10	75
▌01-00636-00990	9.9	29.7	14.9	B	9.7	12°	10	75
01-00636-01003	10	–	15	A	–	–	10	130
01-00636-01000	10	30	15	B	9.8	–	10	75
01-00636-01002	10	50	15	B	9.8	–	10	100
▌01-00636-01010	10.1	30.3	15.2	B	9.9	12°	12	80
▌01-00636-01020	10.2	30.6	15.3	B	10	12°	12	80
▌01-00636-01030	10.3	30.9	15.5	B	10.1	12°	12	80
▌01-00636-01040	10.4	31.2	15.6	B	10.2	12°	12	80
▌01-00636-01050	10.5	31.5	15.8	B	10.3	12°	12	80
▌01-00636-01060	10.6	31.8	15.9	B	10.4	12°	12	80
▌01-00636-01070	10.7	32.1	16.1	B	10.5	12°	12	80
▌01-00636-01080	10.8	32.4	16.2	B	10.6	12°	12	80
▌01-00636-01090	10.9	32.7	16.4	B	10.7	12°	12	80
01-00636-01100	11	33	16.5	B	10.8	12°	12	80
▌01-00636-01110	11.1	33.3	16.7	B	10.9	12°	12	80
▌01-00636-01120	11.2	33.6	16.8	B	11	12°	12	80
▌01-00636-01130	11.3	33.9	17	B	11.1	12°	12	80
▌01-00636-01140	11.4	34.2	17.1	B	11.2	12°	12	80
▌01-00636-01150	11.5	34.5	17.3	B	11.3	12°	12	80
▌01-00636-01160	11.6	34.8	17.4	B	11.4	12°	12	80
▌01-00636-01170	11.7	35.1	17.6	B	11.5	12°	12	80
▌01-00636-01180	11.8	35.4	17.7	B	11.6	12°	12	80
▌01-00636-01190	11.9	35.7	17.9	B	11.7	12°	12	80
01-00636-01203	12	–	18	A	–	–	12	150
01-00636-01200	12	36	18	B	11.8	–	12	80
01-00636-01202	12	60	18	B	11.8	–	12	110

How to Order When you order, indicate ALZ345 (D)[×(ℓ1)]. Indicate (L) for TypeA . ※(γ) is reference value.

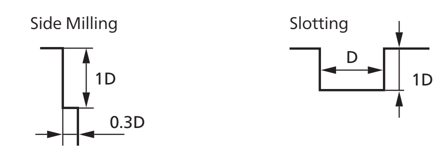
▌Semi-standard products, please inquire for price and delivery.

Recommended Milling Conditions

Work Material		Aluminium A1070				Aluminium Alloy A2017･A5052･A7075				Aluminium Cast AC8C			
Cutting Speed		310m/min				350m/min				230m/min			
Dia.	Under neck Length	Spindle Speed	Feed			Spindle Speed	Feed			Spindle Speed	Feed		
			Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling
		min⁻¹	mm/min			min⁻¹	mm/min			min⁻¹	mm/min		
1	3	20,000	200	600	1,100	20,000	200	600	1,100	20,000	150	600	1,100
1	5	16,000	160	500	900	16,000	160	500	900	16,000	120	500	900
2	6	20,000	300	900	1,500	20,000	300	900	1,500	20,000	250	900	1,500
2	10	16,000	240	800	1,200	16,000	240	800	1,200	16,000	200	800	1,200
3	9	20,000	300	1,200	2,000	20,000	300	1,400	2,200	20,000	250	1,200	2,200
3	15	16,000	240	1,000	1,600	16,000	240	1,200	1,800	16,000	200	1,000	1,800
4	12	20,000	300	1,400	2,200	20,000	400	1,800	2,500	18,300	200	1,400	2,300
4	20	16,000	240	1,200	1,800	16,000	320	1,500	2,000	14,600	160	1,200	1,900
5	15	19,700	300	1,500	2,500	20,000	400	2,200	3,100	14,600	150	1,400	2,100
5	25	15,700	240	1,200	2,000	16,000	320	1,800	2,500	11,700	120	1,200	1,700
6	–	16,500	300	1,600	2,500	18,600	400	2,500	3,500	12,200	150	1,400	2,100
6	18	16,500	300	1,600	2,500	18,600	400	2,500	3,500	12,200	150	1,400	2,100
6	30	13,200	240	1,300	2,000	14,800	320	2,000	2,800	9,700	120	1,200	1,700
7	21	14,100	200	1,600	2,500	15,900	400	2,500	3,500	10,500	140	1,400	2,100
8	–	12,300	200	1,700	2,500	13,900	400	2,600	3,500	9,200	120	1,400	2,200
8	24	12,300	200	1,700	2,500	13,900	400	2,600	3,500	9,200	120	1,400	2,200
8	40	9,800	160	1,400	2,000	11,100	320	2,100	2,800	7,300	100	1,200	1,800
9	27	11,000	200	1,700	2,500	12,400	300	2,600	3,500	8,100	120	1,400	2,200
10	–	9,900	100	1,700	2,500	11,100	300	2,600	3,800	7,300	80	1,400	2,200
10	30	9,900	100	1,700	2,500	11,100	300	2,600	3,800	7,300	80	1,400	2,200
10	50	7,900	80	1,400	2,000	8,800	240	2,100	3,000	5,800	70	1,200	1,800
11	33	9,000	100	1,800	2,600	10,100	300	2,600	4,100	6,700	80	1,400	2,200
12	–	8,200	100	1,900	2,700	9,300	300	2,600	4,100	6,100	60	1,500	2,200
12	36	8,200	100	1,900	2,700	9,300	300	2,600	4,100	6,100	60	1,500	2,200
12	60	6,500	80	1,500	2,200	7,400	240	2,100	3,200	4,800	50	1,200	1,800

Depth of Cut

(D : Dia.)



Notes

※1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※2 TYPE A : Recommended milling conditions for standard type are at overhang 3D. Adjust spindle speed and feed rate at 80% for overhang 5D, and 50% for 7D.
※3 Use a rigid and precise machine and chuck holder.
※4 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※5 When tending to have chip packing during plunging, step milling is recommended.
※6 Water-soluble fluid is recommended.

ALZ345-DLC

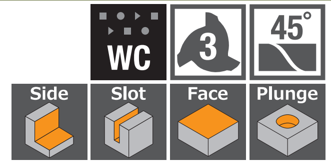
Size φ1 ～ φ12 DLC

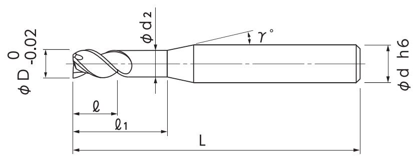
ALZ345-DLC

DLC COATING high efficient 3-Flute End Mill for Aluminium L/D=1.5

Total 17 sizes

For machining on aluminium alloy. Continuous machining from plunging without guide-hole and stepping to slotting





※Listed at "High Efficient Milling" as well（Page I-020）

◎ Aluminium Alloy N
○ Copper N
○ Resin O

- Adopted NS TOOL original DLC COATING that suitable for long time machining.

Long Neck Square Coating

Unit : mm

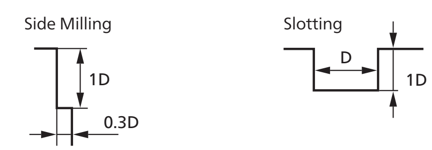
Code No.	Dia. (D)	Under neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00666-00100	1	3	1.5	0.95	12°	4	45
01-00666-00150	1.5	4.5	2.3	1.45	12°	4	45
01-00666-00200	2	6	3	1.94	12°	4	45
01-00666-00250	2.5	7.5	3.8	2.4	12°	4	45
01-00666-00300	3	9	4.5	2.85	12°	6	55
01-00666-00350	3.5	10.5	5.3	3.35	12°	6	55
01-00666-00400	4	12	6	3.8	12°	6	55
01-00666-00450	4.5	13.5	6.8	4.3	12°	6	55
01-00666-00500	5	15	7.5	4.8	12°	6	55
01-00666-00550	5.5	16.5	8.3	5.3	12°	6	55
01-00666-00600	6	18	9	5.8	–	6	60
01-00666-00700	7	21	10.5	6.8	12°	8	70
01-00666-00800	8	24	12	7.8	–	8	70
01-00666-00900	9	27	13.5	8.8	12°	10	75
01-00666-01000	10	30	15	9.8	–	10	75
01-00666-01100	11	33	16.5	10.8	12°	12	80
01-00666-01200	12	36	18	11.8	–	12	80

How to Order　When you order, indicate ALZ345-DLC (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Aluminium A1070				Aluminium Alloy A2017･A5052･A7075				Aluminium Cast AC8C			
Cutting Speed	310m/min				350m/min				230m/min			
Dia.	Spindle Speed	Feed			Spindle Speed	Feed			Spindle Speed	Feed		
		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling		Plunging	Slotting	Side Milling
	min⁻¹	mm/min			min⁻¹	mm/min			min⁻¹	mm/min		
1	20,000	200	600	1,100	20,000	200	600	1,100	20,000	150	600	1,100
2	20,000	300	900	1,500	20,000	300	900	1,500	20,000	250	900	1,500
3	20,000	300	1,200	2,000	20,000	300	1,400	2,200	20,000	250	1,200	2,200
4	20,000	300	1,400	2,200	20,000	400	1,800	2,500	18,300	200	1,400	2,300
5	19,700	300	1,500	2,500	20,000	400	2,200	3,100	14,600	150	1,400	2,100
6	16,500	300	1,600	2,500	18,600	400	2,500	3,500	12,200	150	1,400	2,100
7	14,100	200	1,600	2,500	15,900	400	2,500	3,500	10,500	140	1,400	2,100
8	12,300	200	1,700	2,500	13,900	400	2,600	3,500	9,200	120	1,400	2,200
9	11,000	200	1,700	2,500	12,400	300	2,600	3,500	8,100	120	1,400	2,200
10	9,900	100	1,700	2,500	11,100	300	2,600	3,800	7,300	80	1,400	2,200
11	9,000	100	1,800	2,600	10,100	300	2,600	4,100	6,700	80	1,400	2,200
12	8,200	100	1,900	2,700	9,300	300	2,600	4,100	6,100	60	1,500	2,200

Depth of Cut (D：Dia.)



Notes

※1 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※2 Use a rigid and precise machine and chuck holder.
※3 Adjust milling conditions when vibration and abnormal sounds occur by the conditions of the machine, chuck holder and work clamping.
※4 When tending to have chip packing during plunging, step milling is recommended.
※5 Water-soluble fluid is recommended.

N Aluminium Alloy ◎
N Copper ○
O Resin ○

Long Neck Square Coating

ALB225

Size R0.3 ～ R6

WC

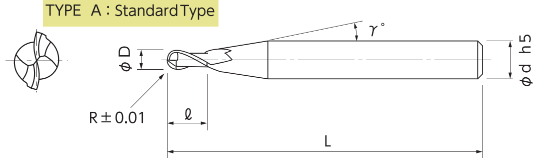
Ball End Mill for Aluminium

Total 26 sizes

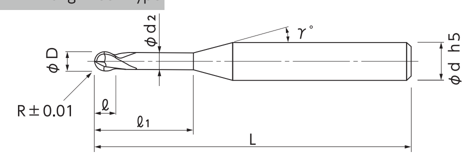
2 | 25° | ϕd h5 | 3D

Ball end mill for aluminium.
Reducing chattering even for milling at corner and curved surface

TYPE A : Standard Type



TYPE B : Long Neck Type



- NS TOOL unique flute design reduces chattering at corner and side milling.

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00638-03001	R0.3	0.45	3	B	0.6	0.56	12°	4	60
01-00638-04001	R0.4	0.6	4	B	0.8	0.76	12°	4	60
01-00638-05001	R0.5	2	–	A	1	–	12°	4	60
01-00638-05011		0.75	5	B	1	0.95	12°	4	60
01-00638-05013			10	B	1	0.95	12°	4	60
01-00638-07501	R0.75	3	–	A	1.5	–	12°	4	60
01-00638-07511		1.1	7.5	B	1.5	1.45	12°	4	60
01-00638-07513			15	B	1.5	1.45	12°	4	60
01-00638-10001	R1	4	–	A	2	–	12°	4	60
01-00638-10011		1.5	10	B	2	1.94	12°	4	60
01-00638-10013			20	B	2	1.94	12°	4	60
01-00638-15001	R1.5	6	–	A	3	–	12°	6	60
01-00638-15011		2.5	15	B	3	2.85	12°	6	60
01-00638-15013			30	B	3	2.85	12°	6	70
01-00638-20001	R2	8	–	A	4	–	12°	6	70
01-00638-20011		3	20	B	4	3.8	12°	6	80
01-00638-20013			40	B	4	3.8	12°	6	90
01-00638-25001	R2.5	10	–	A	5	–	12°	6	80
01-00638-25011		3.5	25	B	5	4.8	12°	6	80
01-00638-25013			50	B	5	4.8	12°	6	100
01-00638-30001	R3	12	–	A	6	–	–	6	90
01-00638-30011		6	30	B	6	5.8	–	6	90
01-00638-30013			60	B	6	5.8	–	6	120
01-00638-40001	R4	16	–	A	8	–	–	8	90
01-00638-50001	R5	20	–	A	10	–	–	10	100
01-00638-60001	R6	24	–	A	12	–	–	12	110

How to Order: When you order, indicate ALB225 (R)×(ℓ) [×(ℓ1)]. ※(γ) is reference value.

ALB225 Recommended Milling Conditions

Work Material			Aluminium Alloy A2017・A5052・A7075							
			Normal Speed				High Speed			
Tool Overhung			L / D≧10				L / D＜10			
Radius	Length of Cut	Under neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
0.3	0.45	3	20,000	1,000	0.1	0.2	40,000	2,000	0.1	0.2
0.4	0.6	4	20,000	1,000	0.1	0.2	40,000	2,000	0.1	0.2
0.5	2	–	20,000	2,000	0.3	0.3	40,000	4,000	0.3	0.3
	0.75	5	20,000	1,500	0.3	0.3	30,000	3,000	0.3	0.3
	0.75	10	10,000	1,000	0.2	0.2	20,000	2,000	0.2	0.2
0.75	3	–	20,000	2,000	0.3	0.5	40,000	4,000	0.3	0.5
	1.1	7.5	16,000	1,600	0.3	0.5	30,000	3,000	0.3	0.5
	1.1	15	10,000	1,000	0.2	0.3	20,000	2,000	0.2	0.3
1	4	–	20,000	2,000	0.5	0.5	30,000	4,000	0.5	0.5
	1.5	10	15,000	1,500	0.3	0.5	20,000	3,000	0.3	0.5
	1.5	20	12,000	1,200	0.2	0.5	15,000	2,000	0.2	0.5
1.5	6	–	18,000	2,000	0.6	1	25,000	4,000	0.6	1
	2.5	15	15,000	1,600	0.6	1	20,000	3,000	0.6	1
	2.5	30	12,000	1,200	0.3	1	15,000	2,000	0.3	1
2	8	–	14,000	2,000	0.5	1.5	20,000	4,000	0.5	1.5
	3	20	12,000	1,500	0.5	1.5	16,000	3,000	0.5	1.5
	3	40	8,000	1,000	0.3	1.5	12,000	2,000	0.3	1.5
2.5	10	–	12,000	3,000	0.8	1.8	20,000	5,000	0.8	1.8
	3.5	25	8,000	2,000	0.8	1.8	15,000	3,000	0.8	1.8
	3.5	50	5,000	1,500	0.5	1.8	10,000	2,000	0.5	1.8
3	12	–	12,000	3,000	1	2	20,000	5,000	1	2
	6	30	8,000	2,000	1	2	15,000	4,000	1	2
	6	60	5,000	1,200	0.6	2	10,000	2,000	0.6	2
4	16	–	10,000	2,000	1	2	15,000	3,000	1	2
5	20	–	8,000	2,000	2	3	12,000	3,000	2	3
6	24	–	6,000	2,000	3	4	10,000	3,000	3	4

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※3 Use a rigid and precise machine and chuck holder.
※4 Adjust milling conditions when vibration and abnormal sounds occur according to the rigidity of the machine and the chuck holder, or work clamping condition.
※5 Water-soluble fluid is recommended.

ALB225-DLC

Size R0.3 ～ R6

DLC

ALB225-DLC

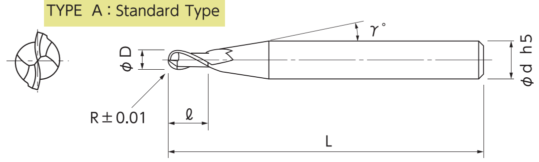
DLC COATING Ball End Mill for Aluminium

Total 26 sizes

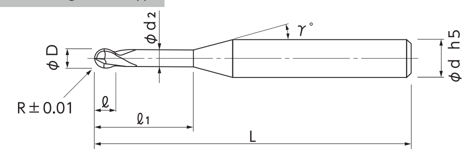
Ball end mill for aluminium. DLC coating applied for longer tool life

WC 2 25° φd h5 3D

TYPE A : Standard Type



TYPE B : Long Neck Type



- Adopted NS TOOL original DLC COATING that suitable for long time machining.

◎ Aluminium Alloy N
○ Copper N
○ Resin O

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00668-03001	R0.3	0.45	3	B	0.6	0.56	12°	4	60
01-00668-04001	R0.4	0.6	4	B	0.8	0.76	12°	4	60
01-00668-05001	R0.5	2	–	A	1	–	12°	4	60
01-00668-05011		0.75	5	B	1	0.95	12°	4	60
01-00668-05013			10	B	1	0.95	12°	4	60
01-00668-07501	R0.75	3	–	A	1.5	–	12°	4	60
01-00668-07511		1.1	7.5	B	1.5	1.45	12°	4	60
01-00668-07513			15	B	1.5	1.45	12°	4	60
01-00668-10001	R1	4	–	A	2	–	12°	4	60
01-00668-10011		1.5	10	B	2	1.94	12°	4	60
01-00668-10013			20	B	2	1.94	12°	4	60
01-00668-15001	R1.5	6	–	A	3	–	12°	6	60
01-00668-15011		2.5	15	B	3	2.85	12°	6	60
01-00668-15013			30	B	3	2.85	12°	6	70
01-00668-20001	R2	8	–	A	4	–	12°	6	70
01-00668-20011		3	20	B	4	3.8	12°	6	80
01-00668-20013			40	B	4	3.8	12°	6	90
01-00668-25001	R2.5	10	–	A	5	–	12°	6	80
01-00668-25011		3.5	25	B	5	4.8	12°	6	80
01-00668-25013			50	B	5	4.8	12°	6	100
01-00668-30001	R3	12	–	A	6	–	–	6	90
01-00668-30011		6	30	B	6	5.8	–	6	90
01-00668-30013			60	B	6	5.8	–	6	120
01-00668-40001	R4	16	–	A	8	–	–	8	90
01-00668-50001	R5	20	–	A	10	–	–	10	100
01-00668-60001	R6	24	–	A	12	–	–	12	110

How to Order When you order, indicate ALB225-DLC (R)×(ℓ) [×(ℓ1)]. ※(γ) is reference value.

ALB225-DLC

Recommended Milling Conditions

Work Material			Aluminium Alloy A2017・A5052・A7075							
			Normal Speed				High Speed			
Tool Overhung			L / D≧10				L / D＜10			
Radius	Length of Cut	Under neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
			min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
0.3	0.45	3	20,000	1,000	0.1	0.2	40,000	2,000	0.1	0.2
0.4	0.6	4	20,000	1,000	0.1	0.2	40,000	2,000	0.1	0.2
0.5	2	–	20,000	2,000	0.3	0.3	40,000	4,000	0.3	0.3
	0.75	5	20,000	1,500	0.3	0.3	30,000	3,000	0.3	0.3
	0.75	10	10,000	1,000	0.2	0.2	20,000	2,000	0.2	0.2
0.75	3	–	20,000	2,000	0.3	0.5	40,000	4,000	0.3	0.5
	1.1	7.5	16,000	1,600	0.3	0.5	30,000	3,000	0.3	0.5
	1.1	15	10,000	1,000	0.2	0.3	20,000	2,000	0.2	0.3
1	4	–	20,000	2,000	0.5	0.5	30,000	4,000	0.5	0.5
	1.5	10	15,000	1,500	0.3	0.5	20,000	3,000	0.3	0.5
	1.5	20	12,000	1,200	0.2	0.5	15,000	2,000	0.2	0.5
1.5	6	–	18,000	2,000	0.6	1	25,000	4,000	0.6	1
	2.5	15	15,000	1,600	0.6	1	20,000	3,000	0.6	1
	2.5	30	12,000	1,200	0.3	1	15,000	2,000	0.3	1
2	8	–	14,000	2,000	0.5	1.5	20,000	4,000	0.5	1.5
	3	20	12,000	1,500	0.5	1.5	16,000	3,000	0.5	1.5
	3	40	8,000	1,000	0.3	1.5	12,000	2,000	0.3	1.5
2.5	10	–	12,000	3,000	0.8	1.8	20,000	5,000	0.8	1.8
	3.5	25	8,000	2,000	0.8	1.8	15,000	3,000	0.8	1.8
	3.5	50	5,000	1,500	0.5	1.8	10,000	2,000	0.5	1.8
3	12	–	12,000	3,000	1	2	20,000	5,000	1	2
	6	30	8,000	2,000	1	2	15,000	4,000	1	2
	6	60	5,000	1,200	0.6	2	10,000	2,000	0.6	2
4	16	–	10,000	2,000	1	2	15,000	3,000	1	2
5	20	–	8,000	2,000	2	3	12,000	3,000	2	3
6	24	–	6,000	2,000	3	4	10,000	3,000	3	4

Notes

※1 Depth of Cut: ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※2 Adjust both spindle speed and feed at the same rate.
(When using spindle speed 20,000 or more, the same adjustment is required.)
※3 Use a rigid and precise machine and chuck holder.
※4 Adjust milling conditions when vibration and abnormal sounds occur according to the rigidity of the machine and the chuck holder, or work clamping condition.
※5 Water-soluble fluid is recommended.

N Aluminium Alloy ◎
N Copper ○
O Resin ○

Ball Coating
Long Neck Ball Coating

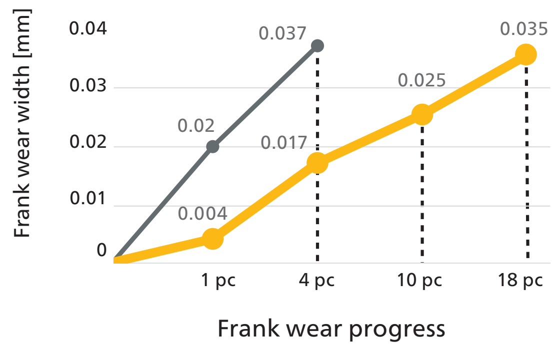
Realized overwhelming long tool life and high quality burrless cutting performance

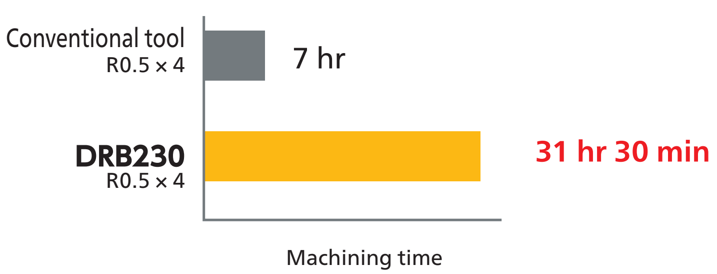
Long tool life

DLC Coating optimized for copper and copper alloy machining increases tool life compare to conventional tool

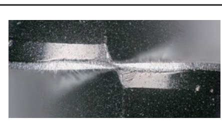
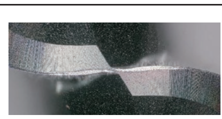
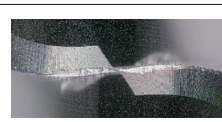
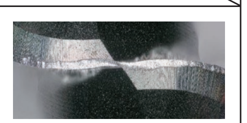
Tool life comparison with conventional tool

Work Material : Tough pitch copper
Coolant : Water-soluble fluid

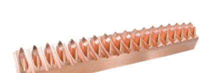




4.5 times longer tool life than conventional tool

	After machining 4pcs 7hr	After machining 10pcs 17hr 30min	After machining 18pcs 31hr 30min
Conventional tool R0.5×4			
DRB230 R0.5×4			

Ended at the fourth working piece by excess wear width



DRB230 machined 18pieces (31 hr 30 min)

Burr suppression

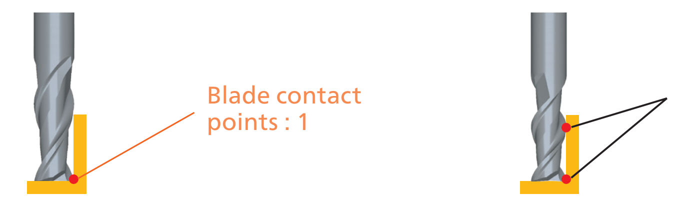
Shape of cutting edge

Adoption of sharper cutting edge to realize high precision machining by suppressing burr and deflection.

Helix angle of peripheral flutes

High helix angle improves shearing ability. Specialized 37.5°helix angle with high shearing ability and less contact point to reduce waveness.

ap:2D

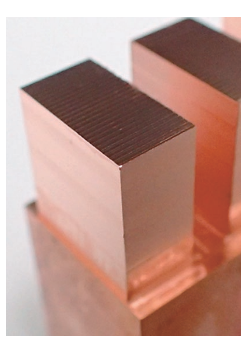


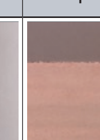
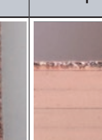
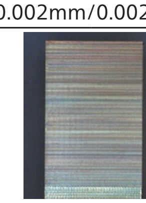
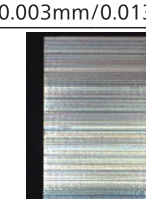
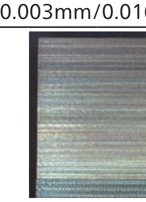
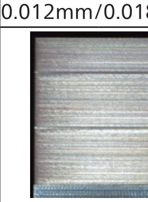
Specialized for copper electrode machining
37.5°helix angle
DHR237 / DHR237R

General high helix angle type
45°helix angle

Comparison with conventional tool

Work Material :
Tough pitch copper
Machined size:
8 × 15 mm
Machining depth 12 mm
Coolant :
Water-insoluble fluid



	DHR237 ϕ3×15				Conventional tool ϕ3×14			
	Beginning		After 10hr		Beginning		After 10hr	
	Top	Side	Top	Side	Top	Side	Top	Side
Burr height								
	0.002mm/0.002mm		0.003mm/0.013mm		0.003mm/0.016mm		0.012mm/0.018mm	
Roughness	 Ra:0.075μm		 Ra:0.076μm		 Ra:0.120μm		 Ra:0.350μm	

Model	Size	Maximum Cutting Depth	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	P Carbon Steel	P Alloy Steel	P Prehardened steel	H Hardened Steel ~55 HRC	H Hardened Steel ~65 HRC	H Hardened Steel ~70 HRC	M Stainless Steel	S Heat Resistant Alloy	N Aluminium Alloy	N Copper	N Copper Tungsten	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Long Neck Square																									
DHR237	φ0.1 ~ φ6	12D	DLC	2	37.5°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	74	K-006
Long neck square end mill specialized for machining copper alloy. Sharpe cutting edge makes less burr and high quality surface																									
Long Neck Ball																									
DRB230	R0.05 ~ R3	16D	DLC	2	30°	-	-	-	3D	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	94	K-010
Long neck ball end mill specialized for machining copper alloy. Sharpe cutting edge makes less burr and high quality surface																									
Long Neck Corner Radius																									
DHR237R	φ0.2 × R0.02 ~ φ6 × R1	13D	DLC	2	37.5°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	○	◎	◎	○	-	-	153	K-016
Long neck corner radius end mill specialized for machining copper alloy. Sharpe cutting edge makes less burr and high quality surface																									

DHR237

Size ϕ 0.1～ϕ 6

DLC

DHR237

Long Neck Square End Mill for Copper Electrode

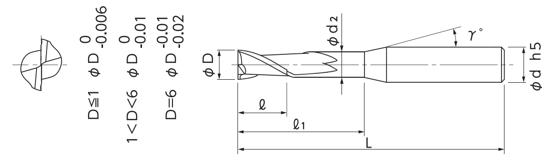
Total 74 sizes

Long Neck Square End Mill for Copper Electrode

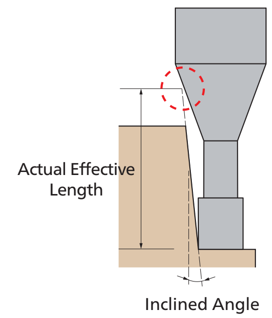
Long neck square end mill specialized for machining copper alloy
Sharpe cutting edge makes less burr and high quality surface

MG | 2 | 37.5° | ϕd h5

Side | Slot | Face



- Long neck square end mill specialized for machining copper electrode.
- Helix angle 37.5 degrees to achieve both sharpness and finished surface quality that prevents scratches on cutting surface.
- High quality and stable milling performance with long tool life by optimized design and DLC COATING.
- Machining copper tungsten electrodes is also effective.



Aluminium Alloy N ○
Copper Copper Tungsten N ◎
Resin O ○
Long Neck Square Coating

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
07-00100-01003	0.1	0.3	0.2	0.085	12°	4	45	0.34	0.36	0.38	0.40	0.44
07-00100-01005		0.5	0.2	0.085	12°	4	45	0.55	0.58	0.61	0.64	0.71
07-00100-01007		0.75	0.2	0.085	12°	4	45	0.81	0.85	0.89	0.93	1.04
07-00100-01010		1	0.2	0.085	12°	4	45	1.07	1.12	1.18	1.23	1.37
07-00100-02005	0.2	0.5	0.4	0.18	12°	4	45	0.57	0.59	0.62	0.65	0.72
07-00100-02010		1	0.4	0.18	12°	4	45	1.09	1.14	1.19	1.25	1.38
07-00100-02015		1.5	0.4	0.18	12°	4	45	1.61	1.68	1.76	1.85	2.05
07-00100-02020		2	0.4	0.18	12°	4	45	2.13	2.23	2.33	2.44	2.71
07-00100-03010	0.3	1	0.6	0.28	12°	4	45	1.09	1.14	1.19	1.25	1.38
07-00100-03015		1.5	0.6	0.28	12°	4	45	1.61	1.68	1.76	1.85	2.05
07-00100-03020		2	0.6	0.28	12°	4	45	2.13	2.23	2.33	2.44	2.71
07-00100-03030		3	0.6	0.28	12°	4	45	3.17	3.31	3.47	3.64	4.04
07-00100-04010	0.4	1	0.8	0.37	12°	4	45	1.11	1.16	1.22	1.28	1.42
07-00100-04020		2	0.8	0.37	12°	4	45	2.15	2.25	2.36	2.47	2.74
07-00100-04030		3	0.8	0.37	12°	4	45	3.20	3.34	3.50	3.67	4.07
07-00100-04040		4	0.8	0.37	12°	4	45	4.24	4.43	4.64	4.87	5.40
07-00100-05015	0.5	1.5	1	0.46	12°	4	45	1.66	1.73	1.81	1.90	2.11
07-00100-05020		2	1	0.46	12°	4	45	2.18	2.28	2.38	2.50	2.77
07-00100-05030		3	1	0.46	12°	4	45	3.22	3.37	3.52	3.70	4.10
07-00100-05040		4	1	0.46	12°	4	45	4.26	4.46	4.66	4.89	5.43
07-00100-05060		6	1	0.46	12°	4	45	6.35	6.63	6.95	7.29	8.08
07-00100-06020	0.6	2	1.2	0.56	12°	4	45	2.18	2.28	2.38	2.50	2.77
07-00100-06030		3	1.2	0.56	12°	4	45	3.22	3.37	3.52	3.70	4.10
07-00100-06040		4	1.2	0.56	12°	4	45	4.26	4.46	4.66	4.89	5.43
07-00100-06060		6	1.2	0.56	12°	4	45	6.35	6.63	6.95	7.29	8.08

How to Order　When you order, indicate DHR237 (D)×(ℓ1).　※(γ) is reference value.

Machining case　S-030

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
07-00100-08030	0.8	3	1.6	0.76	12°	4	45	3.22	3.37	3.52	3.70	4.10
07-00100-08040		4	1.6	0.76	12°	4	45	4.26	4.46	4.66	4.89	5.43
07-00100-08060		6	1.6	0.76	12°	4	45	6.35	6.63	6.95	7.29	8.08
07-00100-08080		8	1.6	0.76	12°	4	50	8.44	8.81	9.23	9.68	10.74
07-00100-10030	1	3	2	0.95	12°	4	45	3.25	3.39	3.55	3.73	4.13
07-00100-10040		4	2	0.95	12°	4	45	4.29	4.48	4.69	4.92	5.46
07-00100-10050		5	2	0.95	12°	4	45	5.33	5.57	5.83	6.12	6.79
07-00100-10060		6	2	0.95	12°	4	45	6.37	6.66	6.97	7.32	8.11
07-00100-10080		8	2	0.95	12°	4	50	8.46	8.84	9.25	9.71	10.77
07-00100-10100		10	2	0.95	12°	4	50	10.55	11.02	11.53	12.10	13.42
07-00100-10120		12	2	0.95	12°	4	50	12.63	13.20	13.82	14.49	16.08
07-00100-15040	1.5	4	3	1.45	12°	4	45	4.29	4.48	4.69	4.92	5.46
07-00100-15060		6	3	1.45	12°	4	50	6.37	6.66	6.97	7.32	8.11
07-00100-15080		8	3	1.45	12°	4	50	8.46	8.84	9.25	9.71	10.77
07-00100-15100		10	3	1.45	12°	4	50	10.55	11.02	11.53	12.10	13.42
07-00100-15120		12	3	1.45	12°	4	50	12.63	13.20	13.82	14.49	16.08
07-00100-15160		16	3	1.45	12°	4	60	16.80	17.55	18.38	19.28	21.39
07-00100-20060	2	6	4	1.94	12°	4	50	6.40	6.69	7.00	7.34	8.15
07-00100-20080		8	4	1.94	12°	4	50	8.48	8.86	9.28	9.74	10.80
07-00100-20100		10	4	1.94	12°	4	50	10.57	11.04	11.56	12.13	13.45
07-00100-20120		12	4	1.94	12°	4	50	12.66	13.22	13.84	14.52	16.11
07-00100-20140		14	4	1.94	12°	4	50	14.74	15.40	16.12	16.92	18.76
07-00100-20160		16	4	1.94	12°	4	60	16.83	17.58	18.40	19.31	Free
07-00100-20200		20	4	1.94	12°	4	60	21.00	21.94	22.97	24.10	Free
07-00100-25060	2.5	6	5	2.4	12°	4	45	6.50	6.79	7.11	7.46	8.27
07-00100-25080		8	5	2.4	12°	4	50	8.58	8.97	9.39	9.85	10.93
07-00100-25100		10	5	2.4	12°	4	50	10.67	11.15	11.67	12.24	13.58
07-00100-25120		12	5	2.4	12°	4	50	12.75	13.32	13.95	14.64	Free
07-00100-25140		14	5	2.4	12°	4	50	14.84	15.50	16.23	17.03	Free
07-00100-25160		16	5	2.4	12°	4	50	16.93	17.68	18.51	19.42	Free
07-00100-25200		20	5	2.4	12°	4	60	21.10	22.04	23.07	Free	Free
07-00100-30080	3	8	6	2.85	12°	6	50	8.71	9.10	9.52	9.99	11.08
07-00100-30100		10	6	2.85	12°	6	50	10.79	11.27	11.80	12.38	13.74
07-00100-30150		15	6	2.85	12°	6	60	16.01	16.72	17.50	18.37	20.37
07-00100-30200		20	6	2.85	12°	6	60	21.22	22.17	23.21	24.35	27.01
07-00100-30250		25	6	2.85	12°	6	70	26.43	27.62	28.91	30.33	Free
07-00100-40100	4	10	8	3.8	12°	6	50	10.91	11.40	11.94	12.52	13.89
07-00100-40150		15	8	3.8	12°	6	60	16.13	16.85	17.64	18.51	Free
07-00100-40200		20	8	3.8	12°	6	60	21.34	22.30	23.34	24.49	Free
07-00100-40250		25	8	3.8	12°	6	70	26.56	27.74	29.04	Free	Free
07-00100-40300		30	8	3.8	12°	6	70	31.77	33.19	34.75	Free	Free
07-00100-50150	5	15	10	4.8	12°	6	50	16.13	16.85	17.64	Free	Free
07-00100-50200		20	10	4.8	12°	6	60	21.34	22.30	Free	Free	Free
07-00100-50250		25	10	4.8	12°	6	60	26.56	27.74	Free	Free	Free
07-00100-50300		30	10	4.8	12°	6	70	31.77	Free	Free	Free	Free
07-00100-60150	6	15	12	5.8	–	6	50	Free	Free	Free	Free	Free
07-00100-60200		20	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00100-60300		30	12	5.8	–	6	70	Free	Free	Free	Free	Free
07-00100-60500		50	12	5.8	–	6	90	Free	Free	Free	Free	Free

Work Material			Copper							Copper Tungsten (W70%-Cu30%)						
Dia.	Under Neck Length	L/D	Side Milling				Slotting			Side Milling				Slotting		
			Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm
0.1	0.3	3	40,000	180	0.1	0.006	40,000	170	0.01	30,000	120	0.05	0.004	30,000	110	0.006
	0.5	5	40,000	140	0.1	0.004	40,000	130	0.007	30,000	80	0.05	0.003	30,000	70	0.004
	0.75	7.5	40,000	100	0.1	0.003	40,000	90	0.005	30,000	50	0.05	0.003	30,000	45	0.003
	1	10	40,000	80	0.1	0.003	40,000	70	0.003	30,000	40	0.05	0.003	30,000	35	0.002
0.2	0.5	2.5	40,000	400	0.2	0.008	40,000	380	0.02	30,000	260	0.1	0.006	30,000	250	0.01
	1	5	40,000	350	0.2	0.006	40,000	320	0.015	30,000	220	0.1	0.004	30,000	200	0.008
	1.5	7.5	40,000	300	0.2	0.004	40,000	250	0.01	30,000	200	0.1	0.003	30,000	130	0.005
	2	10	40,000	250	0.2	0.003	40,000	180	0.005	30,000	150	0.1	0.003	30,000	90	0.003
0.3	1	3.3	40,000	500	0.3	0.01	40,000	450	0.035	30,000	350	0.15	0.008	30,000	280	0.014
	1.5	5	40,000	450	0.3	0.008	40,000	400	0.025	30,000	300	0.15	0.006	30,000	250	0.012
	2	6.7	40,000	380	0.3	0.006	40,000	350	0.017	30,000	250	0.15	0.004	30,000	220	0.008
	3	10	35,000	300	0.3	0.004	35,000	250	0.01	30,000	200	0.15	0.003	30,000	150	0.005
0.4	1	2.5	40,000	700	0.4	0.02	40,000	650	0.045	30,000	500	0.2	0.014	30,000	450	0.025
	2	5	40,000	600	0.4	0.015	40,000	550	0.03	30,000	450	0.2	0.01	30,000	400	0.02
	3	7.5	35,000	500	0.4	0.01	35,000	450	0.02	26,000	350	0.2	0.007	26,000	300	0.015
	4	10	28,000	350	0.4	0.006	28,000	300	0.015	24,000	220	0.2	0.004	22,000	200	0.01
0.5	1.5	3	40,000	900	0.5	0.025	40,000	800	0.07	30,000	650	0.3	0.02	30,000	550	0.05
	2	4	38,000	800	0.5	0.02	35,000	700	0.055	28,000	550	0.3	0.016	26,000	450	0.04
	3	6	35,000	700	0.5	0.015	32,000	600	0.04	26,000	500	0.3	0.012	25,000	400	0.03
	4	8	28,000	550	0.5	0.008	26,000	500	0.03	24,000	400	0.3	0.005	22,000	300	0.02
	6	12	18,000	350	0.5	0.005	18,000	300	0.015	15,000	220	0.3	0.003	15,000	180	0.01
0.6	2	3.3	38,000	1,000	0.6	0.025	35,000	850	0.1	28,000	700	0.4	0.018	26,000	500	0.08
	3	5	32,000	800	0.6	0.02	30,000	700	0.08	24,000	550	0.4	0.014	22,000	500	0.06
	4	6.7	28,000	700	0.6	0.015	26,000	600	0.06	22,000	500	0.4	0.012	20,000	400	0.04
	6	10	20,000	450	0.6	0.01	20,000	400	0.03	18,000	350	0.4	0.008	16,000	300	0.02
0.8	3	3.8	30,000	1,300	0.8	0.04	28,000	1,200	0.15	24,000	1,000	0.6	0.03	22,000	900	0.1
	4	5	26,000	1,100	0.8	0.03	24,000	1,000	0.12	22,000	850	0.6	0.02	18,000	650	0.08
	6	7.5	22,000	900	0.8	0.02	18,000	650	0.08	16,000	600	0.6	0.014	14,000	500	0.06
	8	10	16,000	600	0.8	0.01	16,000	500	0.05	14,000	450	0.6	0.01	13,000	350	0.03
1	3	3	24,000	2,200	1	0.06	24,000	2,000	0.22	20,000	1,600	0.8	0.04	20,000	1,400	0.16
	4	4	24,000	2,000	1	0.05	22,000	1,800	0.2	20,000	1,400	0.8	0.035	18,000	1,100	0.14
	5	5	22,000	1,700	1	0.04	20,000	1,500	0.16	18,000	1,200	0.8	0.028	16,000	950	0.12
	6	6	20,000	1,500	1	0.03	18,000	1,200	0.14	16,000	1,000	0.8	0.02	14,000	800	0.1
	8	8	16,000	1,200	1	0.025	15,000	1,000	0.1	14,000	800	0.8	0.018	12,000	650	0.08
	10	10	14,000	1,000	1	0.02	12,000	800	0.07	12,000	650	0.8	0.014	11,000	550	0.05
	12	12	10,000	700	1	0.01	10,000	650	0.05	9,000	450	0.8	0.007	8,000	400	0.035
1.5	4	2.7	20,000	2,500	1.5	0.08	18,000	2,000	0.35	17,000	1,850	1	0.06	15,000	1,300	0.22
	6	4	18,000	2,200	1.5	0.08	16,000	1,800	0.3	15,000	1,600	1	0.05	14,000	1,200	0.2
	8	5.3	16,000	1,700	1.5	0.06	14,000	1,400	0.25	13,000	1,200	1	0.04	12,000	950	0.18
	10	6.7	14,000	1,450	1.5	0.05	12,000	1,150	0.2	11,000	950	1	0.035	10,000	750	0.15
	12	8	12,000	1,200	1.5	0.04	11,000	1,000	0.15	10,000	800	1	0.03	9,000	650	0.1
	16	10.7	10,000	900	1.5	0.02	10,000	800	0.08	8,000	600	1	0.015	7,000	500	0.06

Aluminium Alloy N

Copper / Copper Tungsten N

Resin O

Long Neck Square Coating

DHR237

Copper Electrode Milling

Recommended Milling Conditions

Work Material			Copper							Copper Tungsten (W70%-Cu30%)						
Dia.	Under Neck Length	L/D	Side Milling				Slotting			Side Milling				Slotting		
			Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut
			min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm
2	6	3	18,000	2,500	2	0.1	16,000	2,200	0.45	14,000	1,800	1.5	0.08	12,000	1,500	0.3
	8	4	16,000	2,200	2	0.09	14,000	1,900	0.4	12,000	1,500	1.5	0.07	12,000	1,400	0.28
	10	5	14,000	1,900	2	0.08	12,000	1,600	0.35	10,000	1,200	1.5	0.06	10,000	1,000	0.24
	12	6	12,000	1,600	2	0.07	11,000	1,400	0.28	10,000	1,100	1.5	0.05	9,000	900	0.2
	14	7	11,000	1,400	2	0.06	10,000	1,200	0.24	9,000	950	1.5	0.04	8,000	800	0.16
	16	8	10,000	1,200	2	0.045	9,000	1,000	0.18	8,000	800	1.5	0.03	7,000	650	0.12
	20	10	9,000	1,000	2	0.03	8,000	850	0.12	7,000	700	1.5	0.02	6,000	550	0.08
2.5	6	2.4	17,000	2,450	2.5	0.13	15,000	2,100	0.55	13,000	1,800	2	0.1	12,000	1,600	0.4
	8	3.2	16,000	2,300	2.5	0.12	14,000	1,950	0.5	12,000	1,650	2	0.09	11,000	1,450	0.35
	10	4	15,000	2,100	2.5	0.1	13,000	1,700	0.4	11,000	1,500	2	0.07	10,000	1,300	0.3
	12	4.8	14,000	1,900	2.5	0.08	12,000	1,550	0.35	10,000	1,300	2	0.065	9,000	1,100	0.25
	14	5.6	13,000	1,700	2.5	0.07	11,000	1,350	0.3	10,000	1250	2	0.06	9,000	1050	0.2
	16	6.4	11,000	1,400	2.5	0.06	10,000	1,200	0.25	9,000	1100	2	0.05	8,000	850	0.15
	20	8	10,000	1,250	2.5	0.05	9,000	1000	0.2	8,000	950	2	0.04	7,000	700	0.12
3	8	2.7	16,000	2,400	3	0.15	14,000	2,000	0.75	12,000	1,800	2.4	0.11	11,000	1500	0.55
	10	3.3	16,000	2,400	3	0.12	14,000	2,000	0.7	12,000	1,800	2.4	0.08	11,000	1,500	0.5
	15	5	14,000	2,100	3	0.1	12,000	1,600	0.6	11,000	1,600	2.4	0.07	9,000	1,100	0.4
	20	6.7	11,000	1,500	3	0.07	10,000	1,200	0.4	9,000	1,100	2.4	0.05	8,000	900	0.3
	25	8.3	10,000	1,300	3	0.05	9,000	1,000	0.2	8,000	900	2.4	0.03	7,000	700	0.15
4	10	2.5	12,000	2,400	4	0.2	10,000	2,000	1	9,000	1,600	3	0.15	8,000	1,400	0.8
	15	3.8	12,000	2,400	4	0.2	10,000	2,000	0.9	9,000	1,600	3	0.15	8,000	1,400	0.7
	20	5	10,000	2,000	4	0.15	8,000	1,600	0.7	8,000	1,400	3	0.1	6,000	1,000	0.5
	25	6.3	9,000	1,700	4	0.1	8,000	1,500	0.5	7,000	1,200	3	0.07	6,000	1,000	0.3
	30	7.5	8,000	1,500	4	0.07	7,000	1,300	0.3	6,000	1,000	3	0.05	5,000	800	0.2
5	15	3	9,500	2,600	5	0.25	8,500	2,200	1.1	7,000	1,800	3.5	0.18	6,000	1,400	0.8
	20	4	8,000	2,150	5	0.2	7,000	1,750	1	6,500	1,650	3.5	0.15	5,500	1,150	0.6
	25	5	7,000	1,800	5	0.15	6,000	1,400	0.9	5,800	1,300	3.5	0.12	4,800	1,000	0.5
	30	6	6,000	1,500	5	0.1	5,000	1,100	0.7	5,000	1,000	3.5	0.1	4,000	830	0.4
6	15	2.5	8,000	2,750	6	0.3	7,000	2,350	1.2	6,000	1,950	4	0.2	5,000	1400	0.9
	20	3.3	7,000	2,400	6	0.3	6,000	2,000	1.2	5,000	1,600	4	0.2	4,500	1,200	0.8
	30	5	5,000	1,600	6	0.2	4,000	1,200	1	4,000	1,100	4	0.15	3,500	900	0.6
	50	8.3	3,500	800	6	0.1	3,000	650	0.4	3,000	600	4	0.07	3,000	500	0.25

Notes

※1 Recommend to use the milling condition as just reference. Adjust milling conditions according to machining shape and machine status.
※2 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Water-insoluble fluid is recommended.

Aluminium Alloy N

Copper / Copper Tungsten N

Resin O

Long Neck Square Coating

DRB230

Size R0.05 ~ R3

DLC

DRB230

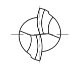
Copper Electrode Milling

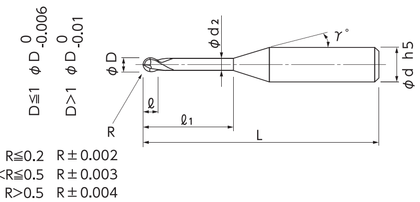
Long Neck Ball End Mill for Copper Electrode

Total 94 sizes

Long Neck Ball End Mill for Copper Electrode

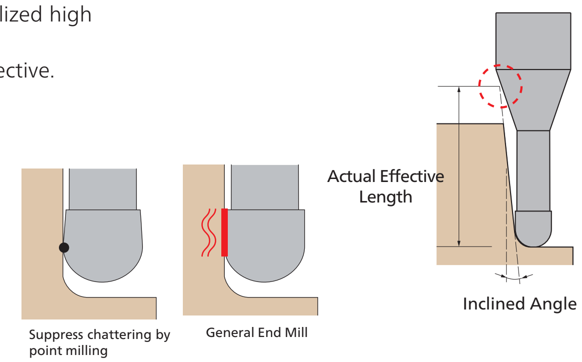
Long neck ball end mill specialized for machining copper alloy
Sharpe cutting edge makes less burr and high quality surface





- Long neck ball end mill specialized for machining copper electrode.
- Sharp edge shearing ability and DLC coating realized high quality and stable a long life machining.
- Machining copper tungsten electrodes is also effective.

※R accuracy of DRB230 is based on a half value.



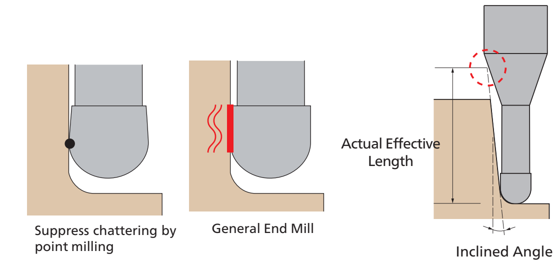
○ Aluminium Alloy N
◎ Copper ◎ Copper Tungsten N
○ Resin O
Long Neck Ball Coating

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
07-00530-00503	R0.05	0.3	0.07	0.1	0.085	12°	4	45	0.34	0.36	0.37	0.39	0.42
07-00530-00505		0.5	0.07	0.1	0.085	12°	4	45	0.55	0.57	0.60	0.63	0.69
07-00530-00703	R0.075	0.3	0.1	0.15	0.13	12°	4	45	0.35	0.37	0.38	0.40	0.43
07-00530-00705		0.5	0.1	0.15	0.13	12°	4	45	0.56	0.58	0.61	0.64	0.70
07-00530-00710		1	0.1	0.15	0.13	12°	4	45	1.08	1.13	1.18	1.23	1.36
07-00530-01005	R0.1	0.5	0.15	0.2	0.18	12°	4	45	0.56	0.58	0.61	0.63	0.69
07-00530-01007		0.75	0.15	0.2	0.18	12°	4	45	0.82	0.85	0.89	0.93	1.02
07-00530-01010		1	0.15	0.2	0.18	12°	4	45	1.08	1.13	1.18	1.23	1.35
07-00530-01015		1.5	0.15	0.2	0.18	12°	4	45	1.60	1.67	1.75	1.83	2.02
07-00530-01020		2	0.15	0.2	0.18	12°	4	45	2.13	2.22	2.32	2.43	2.68
07-00530-01505	R0.15	0.5	0.2	0.3	0.28	12°	4	45	0.56	0.58	0.60	0.62	0.67
07-00530-01510		1	0.2	0.3	0.28	12°	4	45	1.08	1.12	1.17	1.22	1.34
07-00530-01515		1.5	0.2	0.3	0.28	12°	4	45	1.60	1.67	1.74	1.82	2.00
07-00530-01520		2	0.2	0.3	0.28	12°	4	45	2.12	2.21	2.31	2.42	2.66
07-00530-02005	R0.2	0.5	0.3	0.4	0.37	12°	4	45	0.58	0.60	0.62	0.64	0.69
07-00530-02010		1	0.3	0.4	0.37	12°	4	45	1.10	1.14	1.19	1.24	1.35
07-00530-02015		1.5	0.3	0.4	0.37	12°	4	45	1.62	1.69	1.76	1.84	2.02
07-00530-02020		2	0.3	0.4	0.37	12°	4	45	2.15	2.23	2.33	2.43	2.68
07-00530-02030		3	0.3	0.4	0.37	12°	4	45	3.19	3.32	3.47	3.63	4.01
07-00530-02040		4	0.3	0.4	0.37	12°	4	45	4.23	4.41	4.61	4.83	5.33
07-00530-02050		5	0.3	0.4	0.37	12°	4	45	5.27	5.50	5.75	6.02	6.66
07-00530-02060		6	0.3	0.4	0.37	12°	4	45	6.32	6.59	6.89	7.22	7.99

How to Order — When you order, indicate DRB230 (R)×(ℓ1). ※(γ) is reference value.

Machining case — S-029



Unit : mm

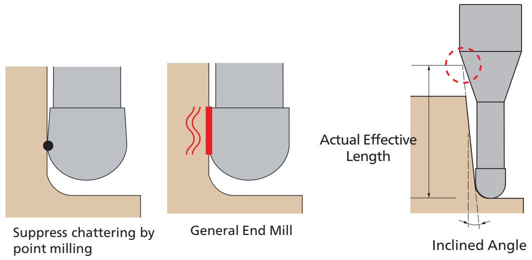
Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
07-00530-02510	R0.25	1	0.35	0.5	0.46	12°	4	45	1.13	1.16	1.21	1.26	1.37
07-00530-02515		1.5	0.35	0.5	0.46	12°	4	45	1.65	1.71	1.78	1.85	2.03
07-00530-02520		2	0.35	0.5	0.46	12°	4	45	2.17	2.25	2.35	2.45	2.69
07-00530-02530		3	0.35	0.5	0.46	12°	4	45	3.21	3.34	3.49	3.65	4.02
07-00530-02540		4	0.35	0.5	0.46	12°	4	45	4.25	4.43	4.63	4.85	5.35
07-00530-02550		5	0.35	0.5	0.46	12°	4	45	5.30	5.52	5.77	6.04	6.68
07-00530-02560		6	0.35	0.5	0.46	12°	4	45	6.34	6.61	6.91	7.24	8.00
07-00530-03010	R0.3	1	0.45	0.6	0.56	12°	4	45	1.12	1.16	1.20	1.25	1.35
07-00530-03015		1.5	0.45	0.6	0.56	12°	4	45	1.64	1.71	1.77	1.84	2.02
07-00530-03020		2	0.45	0.6	0.56	12°	4	45	2.17	2.25	2.34	2.44	2.68
07-00530-03030		3	0.45	0.6	0.56	12°	4	45	3.21	3.34	3.48	3.64	4.01
07-00530-03040		4	0.45	0.6	0.56	12°	4	45	4.25	4.43	4.62	4.84	5.33
07-00530-03050		5	0.45	0.6	0.56	12°	4	45	5.29	5.52	5.76	6.03	6.66
07-00530-03060		6	0.45	0.6	0.56	12°	4	45	6.34	6.61	6.90	7.23	7.99
07-00530-03080		8	0.45	0.6	0.56	12°	4	45	8.42	8.79	9.18	9.62	10.64
07-00530-03100		10	0.45	0.6	0.56	12°	4	50	10.51	10.97	11.47	12.02	13.30
07-00530-04015	R0.4	1.5	0.6	0.8	0.76	12°	4	45	1.64	1.70	1.76	1.83	1.98
07-00530-04020		2	0.6	0.8	0.76	12°	4	45	2.16	2.24	2.33	2.42	2.65
07-00530-04030		3	0.6	0.8	0.76	12°	4	45	3.20	3.33	3.47	3.62	3.97
07-00530-04040		4	0.6	0.8	0.76	12°	4	45	4.25	4.42	4.61	4.82	5.30
07-00530-04050		5	0.6	0.8	0.76	12°	4	45	5.29	5.51	5.75	6.01	6.63
07-00530-04060		6	0.6	0.8	0.76	12°	4	45	6.33	6.60	6.89	7.21	7.96
07-00530-04080		8	0.6	0.8	0.76	12°	4	45	8.42	8.78	9.17	9.60	10.61
07-00530-04100		10	0.6	0.8	0.76	12°	4	50	10.50	10.96	11.45	12.00	13.26
07-00530-05020	R0.5	2	0.75	1	0.95	12°	4	45	2.18	2.26	2.34	2.43	2.65
07-00530-05030		3	0.75	1	0.95	12°	4	45	3.22	3.35	3.48	3.63	3.97
07-00530-05040		4	0.75	1	0.95	12°	4	45	4.27	4.44	4.62	4.83	5.30
07-00530-05050		5	0.75	1	0.95	12°	4	45	5.31	5.53	5.76	6.02	6.63
07-00530-05060		6	0.75	1	0.95	12°	4	45	6.35	6.62	6.90	7.22	7.96
07-00530-05080		8	0.75	1	0.95	12°	4	45	8.44	8.79	9.18	9.61	10.61
07-00530-05100		10	0.75	1	0.95	12°	4	45	10.52	10.97	11.46	12.01	13.26
07-00530-05120		12	0.75	1	0.95	12°	4	45	12.61	13.15	13.75	14.40	15.92
07-00530-05140		14	0.75	1	0.95	12°	4	50	14.70	15.33	16.03	16.79	18.57
07-00530-05160		16	0.75	1	0.95	12°	4	50	16.78	17.51	18.31	19.18	21.23
07-00530-07504	R0.75	4	1.1	1.5	1.45	12°	4	50	4.26	4.41	4.59	4.78	5.22
07-00530-07506		6	1.1	1.5	1.45	12°	4	50	6.34	6.59	6.87	7.17	7.88
07-00530-07508		8	1.1	1.5	1.45	12°	4	50	8.43	8.77	9.15	9.56	10.53
07-00530-07510		10	1.1	1.5	1.45	12°	4	50	10.51	10.95	11.43	11.96	13.18
07-00530-07512		12	1.1	1.5	1.45	12°	4	50	12.60	13.13	13.71	14.35	15.84
07-00530-07514		14	1.1	1.5	1.45	12°	4	50	14.69	15.31	15.99	16.74	18.49
07-00530-07516		16	1.1	1.5	1.45	12°	4	50	16.77	17.49	18.27	19.14	21.15
07-00530-07518		18	1.1	1.5	1.45	12°	4	50	18.86	19.67	20.55	21.53	23.80

N Aluminium Alloy ○
N Copper ◎ Copper Tungsten ◎
O Resin ○
Long Neck Ball Coating

DRB230

Long Neck Ball End Mill for Copper Electrode

Copper Electrode Milling



Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30′	1°	1°30′	2°	3°
07-00530-10030	R1	3	1.5	2	1.94	12°	4	50	3.23	3.33	3.44	3.56	3.85
07-00530-10040	R1	4	1.5	2	1.94	12°	4	50	4.27	4.42	4.58	4.76	5.17
07-00530-10060	R1	6	1.5	2	1.94	12°	4	50	6.36	6.60	6.86	7.15	7.83
07-00530-10080	R1	8	1.5	2	1.94	12°	4	50	8.44	8.78	9.14	9.54	10.48
07-00530-10100	R1	10	1.5	2	1.94	12°	4	50	10.53	10.95	11.42	11.94	13.14
07-00530-10120	R1	12	1.5	2	1.94	12°	4	50	12.61	13.13	13.70	14.33	15.79
07-00530-10140	R1	14	1.5	2	1.94	12°	4	50	14.70	15.31	15.98	16.72	18.45
07-00530-10160	R1	16	1.5	2	1.94	12°	4	50	16.78	17.49	18.27	19.12	Free
07-00530-10200	R1	20	1.5	2	1.94	12°	4	60	20.96	21.85	22.83	23.90	Free
07-00530-10250	R1	25	1.5	2	1.94	12°	4	60	26.17	27.30	28.53	Free	Free
07-00530-15060	R1.5	6	2.5	3	2.85	12°	6	60	6.56	6.78	7.03	7.31	7.95
07-00530-15080	R1.5	8	2.5	3	2.85	12°	6	60	8.64	8.96	9.31	9.70	10.60
07-00530-15100	R1.5	10	2.5	3	2.85	12°	6	60	10.73	11.14	11.59	12.09	13.26
07-00530-15120	R1.5	12	2.5	3	2.85	12°	6	60	12.81	13.32	13.88	14.49	15.91
07-00530-15150	R1.5	15	2.5	3	2.85	12°	6	70	15.94	16.59	17.30	18.08	19.89
07-00530-15200	R1.5	20	2.5	3	2.85	12°	6	70	21.16	22.04	23.00	24.06	26.53
07-00530-15250	R1.5	25	2.5	3	2.85	12°	6	70	26.37	27.48	28.70	30.04	Free
07-00530-15300	R1.5	30	2.5	3	2.85	12°	6	70	31.58	32.93	34.40	36.03	Free
07-00530-20100	R2	10	3	4	3.8	12°	6	60	10.83	11.22	11.66	12.14	13.25
07-00530-20120	R2	12	3	4	3.8	12°	6	60	12.91	13.40	13.94	14.53	15.91
07-00530-20150	R2	15	3	4	3.8	12°	6	60	16.04	16.67	17.36	18.12	19.89
07-00530-20200	R2	20	3	4	3.8	12°	6	60	21.26	22.12	23.06	24.10	Free
07-00530-20250	R2	25	3	4	3.8	12°	6	70	26.47	27.57	28.77	30.09	Free
07-00530-20300	R2	30	3	4	3.8	12°	6	70	31.68	33.01	34.47	Free	Free
07-00530-20400	R2	40	3	4	3.8	12°	6	80	42.11	43.91	Free	Free	Free
07-00530-30200	R3	20	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
07-00530-30250	R3	25	6	6	5.7	–	6	70	Free	Free	Free	Free	Free
07-00530-30300	R3	30	6	6	5.7	–	6	80	Free	Free	Free	Free	Free
07-00530-30400	R3	40	6	6	5.7	–	6	80	Free	Free	Free	Free	Free
07-00530-30500	R3	50	6	6	5.7	–	6	100	Free	Free	Free	Free	Free

How to Order When you order, indicate DRB230 (R)×(ℓ1). ※(γ) is reference value.

Machining case S-029

Work Material			Copper				Copper Tungsten (W70% - Cu30%)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.05	0.3	3	0.01	0.01	200	40,000	0.008	0.008	150	30,000
	0.5	5	0.007	0.007	150	40,000	0.005	0.005	100	30,000
0.075	0.3	2	0.015	0.02	250	40,000	0.01	0.015	180	30,000
	0.5	3.3	0.015	0.02	200	40,000	0.008	0.015	150	30,000
	1	6.7	0.007	0.01	150	40,000	0.005	0.008	100	30,000
0.1	0.5	2.5	0.025	0.05	500	40,000	0.02	0.04	350	30,000
	0.75	3.75	0.025	0.05	450	40,000	0.02	0.04	300	30,000
	1	5	0.02	0.04	400	40,000	0.015	0.03	250	30,000
	1.5	7.5	0.015	0.03	300	40,000	0.008	0.02	150	30,000
	2	10	0.008	0.015	200	40,000	0.005	0.01	100	30,000
0.15	0.5	1.7	0.03	0.07	700	40,000	0.03	0.07	500	30,000
	1	3.3	0.03	0.07	700	40,000	0.03	0.07	500	30,000
	1.5	5	0.025	0.05	500	40,000	0.02	0.05	300	30,000
	2	6.7	0.015	0.03	400	40,000	0.01	0.02	200	30,000
0.2	0.5	1.3	0.05	0.1	1,000	40,000	0.04	0.08	700	30,000
	1	2.5	0.05	0.1	1,000	40,000	0.04	0.08	700	30,000
	1.5	3.8	0.04	0.08	1,000	40,000	0.03	0.06	700	30,000
	2	5	0.035	0.06	600	40,000	0.02	0.05	350	30,000
	3	7.5	0.02	0.04	400	30,000	0.01	0.03	200	25,000
	4	10	0.008	0.015	250	25,000	0.005	0.01	100	18,000
	5	12.5	0.005	0.015	200	25,000	0.005	0.01	80	16,000
	6	15	0.005	0.015	150	22,000	0.005	0.01	70	14,000
0.25	1	2	0.08	0.15	800	40,000	0.08	0.15	500	30,000
	1.5	3	0.08	0.15	800	40,000	0.08	0.15	500	30,000
	2	4	0.08	0.15	800	40,000	0.08	0.15	500	30,000
	3	6	0.06	0.1	600	35,000	0.06	0.08	400	27,000
	4	8	0.04	0.08	400	30,000	0.025	0.05	200	22,000
	5	10	0.02	0.04	300	25,000	0.01	0.02	150	18,000
	6	12	0.015	0.03	250	22,000	0.005	0.01	120	16,000
0.3	1	1.7	0.12	0.2	1,600	40,000	0.12	0.2	1,200	30,000
	1.5	2.5	0.12	0.2	1,600	40,000	0.12	0.2	1,200	30,000
	2	3.3	0.12	0.2	1,600	40,000	0.12	0.2	1,200	30,000
	3	5	0.1	0.14	1,000	40,000	0.08	0.1	700	30,000
	4	6.7	0.07	0.1	700	30,000	0.04	0.06	400	25,000
	5	8.3	0.05	0.08	600	27,000	0.02	0.04	300	22,000
	6	10	0.04	0.06	500	25,000	0.01	0.03	200	20,000
	8	13.3	0.015	0.05	400	22,000	0.005	0.02	150	18,000
	10	16.7	0.015	0.03	350	20,000	0.005	0.01	120	16,000
0.4	1.5	1.9	0.15	0.3	2,000	40,000	0.15	0.3	1,400	30,000
	2	2.5	0.15	0.3	2,000	40,000	0.15	0.3	1,400	30,000
	3	3.8	0.15	0.3	2,000	40,000	0.15	0.3	1,400	30,000
	4	5	0.12	0.2	1,600	35,000	0.1	0.16	1,000	27,000
	5	6.3	0.1	0.18	1,200	32,000	0.08	0.12	750	24,000
	6	7.5	0.08	0.15	1,000	30,000	0.05	0.1	500	20,000
	8	10	0.05	0.06	700	22,000	0.02	0.025	300	16,000
	10	12.5	0.02	0.05	600	20,000	0.01	0.02	200	14,000
0.5	2	2	0.25	0.4	2,800	40,000	0.25	0.4	2,000	30,000
	3	3	0.25	0.4	2,800	40,000	0.25	0.4	2,000	30,000
	4	4	0.2	0.4	2,400	40,000	0.2	0.4	1,600	30,000
	5	5	0.16	0.3	2,000	35,000	0.12	0.25	1,400	27,000
	6	6	0.14	0.3	1,600	30,000	0.1	0.25	1,000	25,000

Aluminium Alloy N

Copper
Copper Tungsten N

Resin O

Long Neck Ball
Coating

Work Material			Copper				Copper Tungsten (W70% - Cu30%)			
Radius	Under Neck Length	L/D	Depth of Cut		Feed	Spindle Speed	Depth of Cut		Feed	Spindle Speed
			ap mm	ae mm	mm/min	min^{-1}	ap mm	ae mm	mm/min	min^{-1}
0.5	8	8	0.12	0.2	1,000	25,000	0.06	0.1	500	18,000
	10	10	0.08	0.15	800	20,000	0.03	0.05	300	16,000
	12	12	0.06	0.1	600	16,000	0.015	0.04	200	12,000
	14	14	0.04	0.08	500	14,000	0.01	0.04	160	10,000
	16	16	0.02	0.06	400	12,000	0.005	0.03	120	8,000
0.75	4	2.7	0.3	0.6	2,800	35,000	0.3	0.6	2,200	30,000
	6	4	0.3	0.6	2,400	30,000	0.3	0.6	1,800	25,000
	8	5.3	0.25	0.5	1,800	25,000	0.2	0.4	1,200	20,000
	10	6.7	0.2	0.4	1,400	20,000	0.15	0.3	800	16,000
	12	8	0.15	0.3	1,000	16,000	0.1	0.2	500	12,000
	14	9.3	0.12	0.2	800	14,000	0.08	0.1	350	10,000
	16	10.7	0.1	0.15	650	12,000	0.05	0.08	280	9,000
	18	12	0.08	0.12	500	10,000	0.02	0.06	200	8,000
1	3	1.5	0.45	0.8	4,000	30,000	0.45	0.8	2,400	25,000
	4	2	0.45	0.8	4,000	30,000	0.45	0.8	2,400	22,000
	6	3	0.45	0.8	3,000	27,000	0.45	0.8	1,800	20,000
	8	4	0.4	0.8	2,400	25,000	0.4	0.8	1,600	18,000
	10	5	0.3	0.6	2,000	22,000	0.25	0.5	1,400	16,000
	12	6	0.3	0.6	1,400	16,000	0.25	0.5	900	12,000
	14	7	0.25	0.6	1,200	14,000	0.2	0.5	700	10,000
	16	8	0.25	0.5	1,000	12,000	0.12	0.25	500	9,000
	20	10	0.15	0.3	800	10,000	0.06	0.1	350	8,000
	25	12.5	0.08	0.15	600	8,000	0.03	0.05	200	6,000
1.5	6	2	0.7	1.5	3,400	20,000	0.6	1.2	2,400	16,000
	8	2.7	0.7	1.5	3,400	20,000	0.6	1.2	2,400	16,000
	10	3.3	0.7	1.5	3,400	20,000	0.6	1.2	2,400	16,000
	12	4	0.6	1.2	3,400	20,000	0.6	1	2,400	16,000
	15	5	0.6	1	3,000	18,000	0.5	0.8	2,000	14,000
	20	6.7	0.5	0.8	2,400	16,000	0.4	0.6	1,400	12,000
	25	8.3	0.4	0.6	1,800	12,000	0.2	0.3	900	10,000
	30	10	0.2	0.4	1,200	8,000	0.08	0.15	500	6,000
2	10	2.5	1	1.6	4,000	16,000	0.8	1.6	2,800	12,000
	12	3	1	1.6	3,600	16,000	0.8	1.6	2,800	12,000
	15	3.8	0.8	1.6	3,400	16,000	0.8	1.6	2,400	12,000
	20	5	0.8	1.6	3,000	14,000	0.8	1.6	2,000	10,000
	25	6.3	0.6	1.2	3,000	14,000	0.5	1	2,000	10,000
	30	7.5	0.5	1	2,400	12,000	0.3	0.5	1,200	7,000
	40	10	0.4	0.8	1,200	8,000	0.15	0.3	500	5,000
3	20	3.3	1	2	3,600	12,000	1	2	2,400	9,000
	25	4.2	1	1.8	3,300	11,000	0.8	1.2	2,100	8,000
	30	5	0.8	1.6	3,000	10,000	0.4	0.8	1,800	7,000
	40	6.7	0.6	1.2	2,400	8,000	0.3	0.6	1,250	5,500
	50	8.3	0.5	1	1,800	6,000	0.25	0.5	800	4,000

Notes

※1 These recommended cutting conditions indicate just reference. It should be adjusted according to milling shape and machine type.
※2 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※3 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※4 Water-insoluble fluid is recommended.

N Aluminium Alloy

N Copper
Copper Tungsten

O Resin

Long Neck Ball
Coating

DHR237R

Size ϕ0.2 × R0.02 ~ ϕ6 × R1 DLC

DHR237R

Long Neck Radius End Mill for Copper Electrode

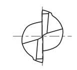
Total 153 sizes

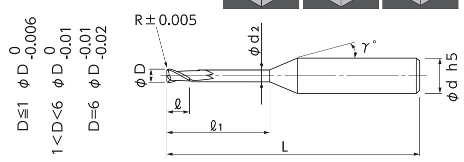
Long Neck Radius End Mill for Copper Electrode

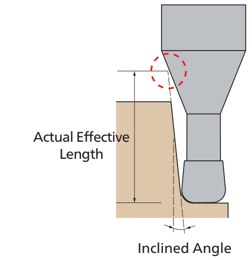
Copper Electrode Milling

Long neck corner radius end mill specialized for machining copper alloy
Sharpe cutting edge makes less burr and high quality surface

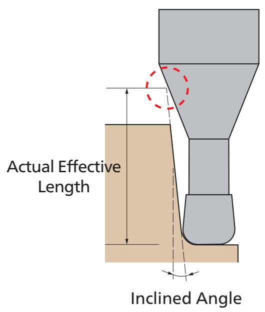
MG | 2 | 37.5° | Corner R ±0.005 | ϕd h5
Side | Slot | Face







- Long neck radius end mill specialized for machining copper electrode.
- 37.5°helix angle provides both sharpness shearing ability and finishing surface quality, combining the most suitable cutting edge design realizes the higher quality of finishing surface.
- High quality and stable milling performance with long tool life by optimized design and DLC COATING.
- Machining copper tungsten electrodes is also effective.



N	Aluminium Alloy	○
N	Copper Copper Tungsten	◎
O	Resin	○

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
07-00110-02021	0.2	R0.02	0.5	0.4	0.18	12°	4	45	0.56	0.59	0.62	0.65	0.71
07-00110-02023			1	0.4	0.18	12°	4	45	1.09	1.13	1.19	1.24	1.38
07-00110-02025			1.5	0.4	0.18	12°	4	45	1.61	1.68	1.76	1.84	2.04
07-00110-02051		R0.05	0.5	0.4	0.18	12°	4	45	0.56	0.59	0.61	0.64	0.71
07-00110-02053			1	0.4	0.18	12°	4	45	1.08	1.13	1.18	1.24	1.37
07-00110-02055			1.5	0.4	0.18	12°	4	45	1.61	1.68	1.75	1.84	2.03
07-00110-03021	0.3	R0.02	1	0.6	0.28	12°	4	45	1.09	1.13	1.19	1.24	1.38
07-00110-03022			1.5	0.6	0.28	12°	4	45	1.61	1.68	1.76	1.84	2.04
07-00110-03023			2	0.6	0.28	12°	4	45	2.13	2.22	2.33	2.44	2.71
07-00110-03051		R0.05	1	0.6	0.28	12°	4	45	1.08	1.13	1.18	1.24	1.37
07-00110-03052			1.5	0.6	0.28	12°	4	45	1.61	1.68	1.75	1.84	2.03
07-00110-03053			2	0.6	0.28	12°	4	45	2.13	2.22	2.32	2.43	2.70
07-00110-04021	0.4	R0.02	1	0.8	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.41
07-00110-04023			2	0.8	0.37	12°	4	45	2.15	2.25	2.35	2.47	2.74
07-00110-04025			3	0.8	0.37	12°	4	45	3.20	3.34	3.49	3.67	4.06
07-00110-04027			4	0.8	0.37	12°	4	45	4.24	4.43	4.63	4.86	5.39
07-00110-04051		R0.05	1	0.8	0.37	12°	4	45	1.11	1.16	1.21	1.27	1.40
07-00110-04053			2	0.8	0.37	12°	4	45	2.15	2.25	2.35	2.46	2.73
07-00110-04055			3	0.8	0.37	12°	4	45	3.19	3.34	3.49	3.66	4.05
07-00110-04057			4	0.8	0.37	12°	4	45	4.24	4.43	4.63	4.86	5.38
07-00110-04101		R0.1	1	0.8	0.37	12°	4	45	1.11	1.15	1.20	1.26	1.38
07-00110-04103			2	0.8	0.37	12°	4	45	2.15	2.24	2.34	2.45	2.71
07-00110-04105			3	0.8	0.37	12°	4	45	3.19	3.33	3.48	3.65	4.04
07-00110-04107			4	0.8	0.37	12°	4	45	4.24	4.42	4.62	4.85	5.37

How to Order When you order, indicate DHR237R (D)×(R)×(ℓ1). ※(γ) is reference value.

Machining case S-032

Long Neck Corner Radius Coating

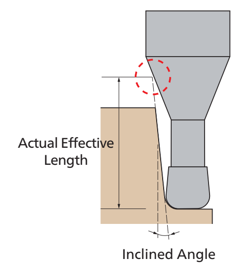
Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece 30´	1°	1°30´	2°	3°
07-00110-05022	0.5	R0.02	2	1	0.46	12°	4	45	2.18	2.27	2.38	2.50	2.77
07-00110-05023			3	1	0.46	12°	4	45	3.22	3.36	3.52	3.69	4.10
07-00110-05024			4	1	0.46	12°	4	45	4.26	4.45	4.66	4.89	5.42
07-00110-05025			5	1	0.46	12°	4	45	5.31	5.54	5.80	6.09	6.75
07-00110-05052		R0.05	2	1	0.46	12°	4	45	2.18	2.27	2.38	2.49	2.76
07-00110-05053			3	1	0.46	12°	4	45	3.22	3.36	3.52	3.69	4.09
07-00110-05054			4	1	0.46	12°	4	45	4.26	4.45	4.66	4.88	5.41
07-00110-05055			5	1	0.46	12°	4	45	5.31	5.54	5.80	6.08	6.74
07-00110-05102		R0.1	2	1	0.46	12°	4	45	2.17	2.27	2.37	2.48	2.74
07-00110-05103			3	1	0.46	12°	4	45	3.22	3.36	3.51	3.68	4.07
07-00110-05104			4	1	0.46	12°	4	45	4.26	4.45	4.65	4.87	5.40
07-00110-05105			5	1	0.46	12°	4	45	5.30	5.54	5.79	6.07	6.72
07-00110-06022	0.6	R0.02	2	1.2	0.56	12°	4	45	2.18	2.27	2.38	2.50	2.77
07-00110-06024			4	1.2	0.56	12°	4	45	4.26	4.45	4.66	4.89	5.42
07-00110-06026			6	1.2	0.56	12°	4	45	6.35	6.63	6.94	7.28	8.08
07-00110-06052		R0.05	2	1.2	0.56	12°	4	45	2.18	2.27	2.38	2.49	2.76
07-00110-06054			4	1.2	0.56	12°	4	45	4.26	4.45	4.66	4.88	5.41
07-00110-06056			6	1.2	0.56	12°	4	45	6.35	6.63	6.94	7.28	8.07
07-00110-06102		R0.1	2	1.2	0.56	12°	4	45	2.17	2.27	2.37	2.48	2.74
07-00110-06104			4	1.2	0.56	12°	4	45	4.26	4.45	4.65	4.87	5.40
07-00110-06106			6	1.2	0.56	12°	4	45	6.35	6.63	6.93	7.27	8.05
07-00110-08024	0.8	R0.02	4	1.6	0.76	12°	4	45	4.26	4.45	4.66	4.89	5.42
07-00110-08026			6	1.6	0.76	12°	4	45	6.35	6.63	6.94	7.28	8.08
07-00110-08028			8	1.6	0.76	12°	4	50	8.43	8.81	9.22	9.68	10.73
07-00110-08054		R0.05	4	1.6	0.76	12°	4	45	4.26	4.45	4.66	4.88	5.41
07-00110-08056			6	1.6	0.76	12°	4	45	6.35	6.63	6.94	7.28	8.07
07-00110-08058			8	1.6	0.76	12°	4	50	8.43	8.81	9.22	9.67	10.72
07-00110-08104		R0.1	4	1.6	0.76	12°	4	45	4.26	4.45	4.65	4.87	5.40
07-00110-08106			6	1.6	0.76	12°	4	45	6.35	6.63	6.93	7.27	8.05
07-00110-08108			8	1.6	0.76	12°	4	50	8.43	8.80	9.21	9.66	10.71
07-00110-10053	1	R0.05	3	2	0.95	12°	4	45	3.24	3.39	3.54	3.72	4.12
07-00110-10054			4	2	0.95	12°	4	45	4.29	4.48	4.68	4.91	5.44
07-00110-10055			5	2	0.95	12°	4	45	5.33	5.57	5.82	6.11	6.77
07-00110-10056			6	2	0.95	12°	4	45	6.37	6.66	6.97	7.31	8.10
07-00110-10058			8	2	0.95	12°	4	50	8.46	8.83	9.25	9.70	10.75
07-00110-10060			10	2	0.95	12°	4	50	10.54	11.01	11.53	12.09	13.41
07-00110-10103		R0.1	3	2	0.95	12°	4	45	3.24	3.38	3.54	3.71	4.10
07-00110-10104			4	2	0.95	12°	4	45	4.28	4.47	4.68	4.90	5.43
07-00110-10105			5	2	0.95	12°	4	45	5.33	5.56	5.82	6.10	6.76
07-00110-10106			6	2	0.95	12°	4	45	6.37	6.65	6.96	7.30	8.08
07-00110-10108			8	2	0.95	12°	4	50	8.46	8.83	9.24	9.69	10.74
07-00110-10110			10	2	0.95	12°	4	50	10.54	11.01	11.52	12.08	13.39
07-00110-10203		R0.2	3	2	0.95	12°	4	45	3.24	3.37	3.52	3.69	4.07
07-00110-10204			4	2	0.95	12°	4	45	4.28	4.46	4.66	4.88	5.40
07-00110-10205			5	2	0.95	12°	4	45	5.32	5.55	5.80	6.08	6.72
07-00110-10206			6	2	0.95	12°	4	45	6.37	6.64	6.94	7.28	8.05
07-00110-10208			8	2	0.95	12°	4	50	8.45	8.82	9.23	9.67	10.71
07-00110-10210			10	2	0.95	12°	4	50	10.54	11.00	11.51	12.06	13.36

N	Aluminium Alloy	○
N	Copper Copper Tungsten	◎
O	Resin	○

Long Neck Corner Radius Coating

Long Neck Radius End Mill for Copper Electrode



Aluminium Alloy N ○
Copper Copper Tungsten N ◎ ◎
Resin O ○

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
07-00110-15105	1.5	R0.1	5	3	1.45	12°	4	45	5.33	5.56	5.82	6.10	6.76
07-00110-15110			10	3	1.45	12°	4	50	10.54	11.01	11.52	12.08	13.39
07-00110-15115			15	3	1.45	12°	4	50	15.76	16.46	17.22	18.07	20.03
07-00110-15205		R0.2	5	3	1.45	12°	4	45	5.32	5.55	5.80	6.08	6.72
07-00110-15210			10	3	1.45	12°	4	50	10.54	11.00	11.51	12.06	13.36
07-00110-15215			15	3	1.45	12°	4	50	15.75	16.45	17.21	18.05	20.00
07-00110-15305		R0.3	5	3	1.45	12°	4	45	5.32	5.54	5.79	6.06	6.69
07-00110-15310			10	3	1.45	12°	4	50	10.53	10.99	11.49	12.04	13.33
07-00110-15315			15	3	1.45	12°	4	50	15.75	16.44	17.20	18.03	19.96
07-00110-15505		R0.5	5	3	1.45	12°	4	45	5.31	5.53	5.76	6.02	6.63
07-00110-15510			10	3	1.45	12°	4	50	10.52	10.97	11.46	12.01	13.26
07-00110-15515			15	3	1.45	12°	4	50	15.74	16.42	17.17	17.99	19.90
07-00110-15520			20	3	1.45	12°	4	60	20.95	21.87	22.87	23.97	Free
07-00110-20105	2	R0.1	5	4	1.94	12°	4	45	5.35	5.59	5.84	6.13	6.79
07-00110-20108			8	4	1.94	12°	4	50	8.48	8.86	9.27	9.72	10.77
07-00110-20110			10	4	1.94	12°	4	50	10.57	11.03	11.55	12.11	13.42
07-00110-20115			15	4	1.94	12°	4	50	15.78	16.48	17.25	18.09	Free
07-00110-20120			20	4	1.94	12°	4	60	20.99	21.93	22.95	24.08	Free
07-00110-20205		R0.2	5	4	1.94	12°	4	45	5.35	5.58	5.83	6.11	6.75
07-00110-20208			8	4	1.94	12°	4	50	8.48	8.85	9.25	9.70	10.74
07-00110-20210			10	4	1.94	12°	4	50	10.56	11.03	11.53	12.09	13.39
07-00110-20215			15	4	1.94	12°	4	50	15.78	16.47	17.24	18.07	Free
07-00110-20220			20	4	1.94	12°	4	60	20.99	21.92	22.94	24.06	Free
07-00110-20305		R0.3	5	4	1.94	12°	4	45	5.34	5.57	5.82	6.09	6.72
07-00110-20308			8	4	1.94	12°	4	50	8.47	8.84	9.24	9.68	10.70
07-00110-20310			10	4	1.94	12°	4	50	10.56	11.02	11.52	12.07	13.36
07-00110-20315			15	4	1.94	12°	4	50	15.77	16.46	17.22	18.05	Free
07-00110-20320			20	4	1.94	12°	4	60	20.99	21.91	22.92	24.04	Free
07-00110-20505		R0.5	5	4	1.94	12°	4	45	5.33	5.55	5.79	6.05	6.66
07-00110-20508			8	4	1.94	12°	4	50	8.46	8.82	9.21	9.64	10.64
07-00110-20510			10	4	1.94	12°	4	50	10.55	11.00	11.49	12.03	13.30
07-00110-20515			15	4	1.94	12°	4	50	15.76	16.45	17.19	18.02	Free
07-00110-20520			20	4	1.94	12°	4	60	20.98	21.89	22.90	24.00	Free
07-00110-25208	2.5	R0.2	8	5	2.4	12°	4	50	8.57	8.95	9.36	9.81	10.86
07-00110-25214			14	5	2.4	12°	4	50	14.83	15.49	16.20	16.99	Free
07-00110-25220			20	5	2.4	12°	4	60	21.09	22.02	23.05	Free	Free
07-00110-25508		R0.5	8	5	2.4	12°	4	50	8.56	8.92	9.32	9.75	10.77
07-00110-25514			14	5	2.4	12°	4	50	14.82	15.46	16.16	16.93	Free
07-00110-25520			20	5	2.4	12°	4	60	21.08	22.00	23.00	Free	Free

How to Order When you order, indicate DHR237R (D)×(R)×(ℓ1). ※(γ) is reference value.

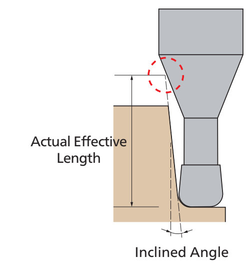
Machining case S-032

Long Neck Corner Radius Coating

DHR237R

Copper Electrode Milling

Long Neck Radius End Mill for Copper Electrode



N Aluminium Alloy ○
N Copper Copper Tungsten ◎ ◎
O Resin ○

Unit : mm

Code No.	Dia. (D)	Corner Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Actual effective length depending on inclined angle of workpiece				
									30´	1°	1°30´	2°	3°
07-00110-30112	3	R0.1	12	6	2.85	12°	6	50	12.87	13.44	14.07	14.76	16.36
07-00110-30118			18	6	2.85	12°	6	60	19.13	19.98	20.91	21.94	24.32
07-00110-30124			24	6	2.85	12°	6	70	25.39	26.52	27.76	29.12	Free
07-00110-30212		R0.2	12	6	2.85	12°	6	50	12.87	13.44	14.06	14.74	16.33
07-00110-30218			18	6	2.85	12°	6	60	19.13	19.97	20.90	21.92	24.29
07-00110-30224			24	6	2.85	12°	6	70	25.38	26.51	27.74	29.10	Free
07-00110-30312		R0.3	12	6	2.85	12°	6	50	12.86	13.43	14.04	14.72	16.29
07-00110-30318			18	6	2.85	12°	6	60	19.12	19.96	20.88	21.90	24.26
07-00110-30324			24	6	2.85	12°	6	70	25.38	26.50	27.73	29.08	Free
07-00110-30512		R0.5	12	6	2.85	12°	6	50	12.86	13.41	14.01	14.68	16.23
07-00110-30515			15	6	2.85	12°	6	60	15.98	16.68	17.44	18.27	20.21
07-00110-30518			18	6	2.85	12°	6	60	19.11	19.95	20.86	21.86	24.19
07-00110-30524			24	6	2.85	12°	6	70	25.37	26.48	27.70	29.04	Free
07-00110-30530			30	6	2.85	12°	6	70	31.63	33.02	34.54	36.22	Free
07-00110-40116	4	R0.1	16	8	3.8	12°	6	60	17.17	17.93	18.77	19.68	Free
07-00110-40124			24	8	3.8	12°	6	60	25.51	26.65	27.89	Free	Free
07-00110-40132			32	8	3.8	12°	6	70	33.85	35.36	37.01	Free	Free
07-00110-40216		R0.2	16	8	3.8	12°	6	60	17.16	17.92	18.75	19.66	Free
07-00110-40224			24	8	3.8	12°	6	60	25.50	26.64	27.88	Free	Free
07-00110-40232			32	8	3.8	12°	6	70	33.85	35.35	37.00	Free	Free
07-00110-40316		R0.3	16	8	3.8	12°	6	60	17.16	17.91	18.74	19.65	Free
07-00110-40324			24	8	3.8	12°	6	60	25.50	26.63	27.86	Free	Free
07-00110-40332			32	8	3.8	12°	6	70	33.84	35.34	36.99	Free	Free
07-00110-40516		R0.5	16	8	3.8	12°	6	60	17.15	17.89	18.71	19.61	Free
07-00110-40524			24	8	3.8	12°	6	60	25.49	26.61	27.83	Free	Free
07-00110-40532			32	8	3.8	12°	6	70	33.83	35.33	36.96	Free	Free
07-00110-41016		R1	16	8	3.8	12°	6	60	17.13	17.85	18.64	19.51	Free
07-00110-41024			24	8	3.8	12°	6	60	25.47	26.57	27.77	29.08	Free
07-00110-41032			32	8	3.8	12°	6	70	33.81	35.28	36.89	Free	Free
07-00110-50120	5	R0.1	20	10	4.8	12°	6	60	21.34	22.29	Free	Free	Free
07-00110-50140			40	10	4.8	12°	6	80	42.19	Free	Free	Free	Free
07-00110-60124	6	R0.1	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60148			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-60224		R0.2	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60248			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-60324		R0.3	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60348			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-60524		R0.5	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-60530			30	12	5.8	–	6	70	Free	Free	Free	Free	Free
07-00110-60548			48	12	5.8	–	6	90	Free	Free	Free	Free	Free
07-00110-61024		R1	24	12	5.8	–	6	60	Free	Free	Free	Free	Free
07-00110-61048			48	12	5.8	–	6	90	Free	Free	Free	Free	Free

Long Neck Corner Radius Coating

Work Material				Copper				Copper Tungsten (W70%-Cu30%)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
0.2	0.02	0.5	2.5	40,000	400	0.01	0.1	36,000	360	0.009	0.09
		1	5	40,000	320	0.008	0.1	36,000	280	0.007	0.09
		1.5	7.5	30,000	180	0.005	0.1	27,000	160	0.005	0.09
	0.05	0.5	2.5	40,000	400	0.03	0.1	36,000	360	0.027	0.09
		1	5	40,000	320	0.02	0.1	36,000	280	0.018	0.09
		1.5	7.5	30,000	180	0.01	0.1	27,000	160	0.009	0.09
0.3	0.02	1	3.3	40,000	480	0.01	0.15	36,000	420	0.009	0.14
		1.5	5	40,000	360	0.008	0.15	36,000	320	0.007	0.14
		2	6.7	30,000	240	0.005	0.15	27,000	210	0.005	0.14
	0.05	1	3.3	40,000	480	0.03	0.15	36,000	420	0.027	0.14
		1.5	5	40,000	360	0.024	0.15	36,000	320	0.022	0.14
		2	6.7	30,000	240	0.018	0.15	27,000	210	0.016	0.14
0.4	0.02	1	2.5	40,000	640	0.01	0.2	36,000	580	0.009	0.18
		2	5	40,000	560	0.01	0.2	36,000	500	0.009	0.18
		3	7.5	30,000	420	0.008	0.2	27,000	380	0.007	0.18
		4	10	30,000	360	0.005	0.2	27,000	320	0.005	0.18
	0.05	1	2.5	40,000	640	0.03	0.2	36,000	580	0.027	0.18
		2	5	40,000	560	0.024	0.2	36,000	500	0.022	0.18
		3	7.5	30,000	420	0.018	0.2	27,000	380	0.016	0.18
		4	10	30,000	360	0.012	0.2	27,000	320	0.01	0.18
	0.1	1	2.5	40,000	640	0.06	0.2	36,000	580	0.054	0.18
		2	5	40,000	560	0.05	0.2	36,000	500	0.045	0.18
		3	7.5	30,000	420	0.036	0.2	27,000	380	0.032	0.18
		4	10	30,000	360	0.024	0.2	27,000	320	0.022	0.18
0.5	0.02	2	4	40,000	800	0.01	0.25	36,000	720	0.009	0.23
		3	6	35,000	640	0.01	0.25	32,000	580	0.009	0.23
		4	8	30,000	480	0.008	0.25	27,000	420	0.007	0.23
		5	10	25,000	400	0.005	0.25	23,000	360	0.005	0.23
	0.05	2	4	40,000	800	0.03	0.25	36,000	720	0.027	0.23
		3	6	35,000	640	0.024	0.25	32,000	580	0.022	0.23
		4	8	30,000	480	0.018	0.25	27,000	420	0.016	0.23
		5	10	25,000	400	0.012	0.25	23,000	360	0.01	0.23
	0.1	2	4	40,000	800	0.06	0.25	36,000	720	0.054	0.23
		3	6	35,000	640	0.05	0.25	32,000	580	0.045	0.23
		4	8	30,000	480	0.036	0.25	27,000	420	0.032	0.23
		5	10	25,000	400	0.024	0.25	23,000	360	0.022	0.23
0.6	0.02	2	3.3	30,000	1,000	0.01	0.3	27,000	900	0.009	0.27
		4	6.7	25,000	800	0.01	0.3	23,000	720	0.009	0.27
		6	10	20,000	600	0.008	0.3	18,000	540	0.007	0.27
	0.05	2	3.3	30,000	1,000	0.03	0.3	27,000	900	0.027	0.27
		4	6.7	25,000	800	0.02	0.3	23,000	720	0.018	0.27
		6	10	20,000	600	0.012	0.3	18,000	540	0.01	0.27
	0.1	2	3.3	30,000	1,000	0.06	0.3	27,000	900	0.054	0.27
		4	6.7	25,000	800	0.05	0.3	23,000	720	0.045	0.27
		6	10	20,000	600	0.036	0.3	18,000	540	0.032	0.27

Aluminium Alloy N
Copper Copper Tungsten N
Resin O

Long Neck Corner Radius Coating

Work Material				Copper				Copper Tungsten (W70%-Cu30%)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
0.8	0.02	4	5	25,000	1,600	0.01	0.4	23,000	1,400	0.009	0.36
		6	7.5	20,000	1,200	0.01	0.4	18,000	1,100	0.009	0.36
		8	10	16,000	800	0.01	0.4	14,000	720	0.009	0.36
	0.05	4	5	25,000	1,600	0.03	0.4	23,000	1,400	0.027	0.36
		6	7.5	20,000	1,200	0.024	0.4	18,000	1,100	0.022	0.36
		8	10	16,000	800	0.02	0.4	14,000	720	0.018	0.36
	0.1	4	5	25,000	1,600	0.06	0.4	23,000	1,400	0.054	0.36
		6	7.5	20,000	1,200	0.05	0.4	18,000	1,100	0.045	0.36
		8	10	16,000	800	0.04	0.4	14,000	720	0.036	0.36
1	0.05	3	3	25,000	2,400	0.03	0.6	23,000	2,200	0.027	0.55
		4	4	25,000	2,200	0.03	0.6	23,000	2,000	0.027	0.55
		5	5	22,000	2,000	0.024	0.6	20,000	1,800	0.022	0.55
		6	6	20,000	1,800	0.024	0.6	18,000	1,600	0.022	0.55
		8	8	16,000	1,400	0.02	0.6	14,000	1,200	0.018	0.55
		10	10	12,000	1,000	0.02	0.6	11,000	900	0.018	0.55
	0.1	3	3	25,000	2,400	0.06	0.6	23,000	2,200	0.054	0.55
		4	4	25,000	2,200	0.055	0.6	23,000	2,000	0.05	0.55
		5	5	22,000	2,000	0.05	0.6	20,000	1,800	0.045	0.55
		6	6	20,000	1,800	0.045	0.6	18,000	1,600	0.04	0.55
		8	8	16,000	1,400	0.04	0.6	14,000	1,200	0.036	0.55
		10	10	12,000	1,000	0.03	0.6	11,000	900	0.027	0.55
	0.2	3	3	25,000	2,400	0.12	0.6	23,000	2,200	0.11	0.55
		4	4	25,000	2,200	0.11	0.6	23,000	2,000	0.1	0.55
		5	5	22,000	2,000	0.1	0.6	20,000	1,800	0.09	0.55
		6	6	20,000	1,800	0.09	0.6	18,000	1,600	0.08	0.55
		8	8	16,000	1,400	0.08	0.6	14,000	1,200	0.07	0.55
		10	10	12,000	1,000	0.06	0.6	11,000	900	0.054	0.55
1.5	0.1	5	3.3	20,000	2,400	0.06	0.9	18,000	2,200	0.054	0.8
		10	6.6	16,000	1,600	0.05	0.9	14,000	1,400	0.045	0.8
		15	10	12,000	1,000	0.04	0.9	11,000	900	0.036	0.8
	0.2	5	3.3	20,000	2,400	0.12	0.9	18,000	2,200	0.11	0.8
		10	6.6	16,000	1,600	0.1	0.9	14,000	1,400	0.09	0.8
		15	10	12,000	1,000	0.08	0.9	11,000	900	0.07	0.8
	0.3	5	3.3	20,000	2,400	0.18	0.9	18,000	2,200	0.16	0.8
		10	6.6	16,000	1,600	0.15	0.9	14,000	1,400	0.14	0.8
		15	10	12,000	1,000	0.12	0.9	11,000	900	0.11	0.8
	0.5	5	3.3	20,000	2,400	0.25	0.5	18,000	2,200	0.23	0.8
		10	6.6	16,000	1,600	0.2	0.5	14,000	1,400	0.18	0.8
		15	10	12,000	1,000	0.12	0.5	11,000	900	0.11	0.8
		20	13.3	8,000	600	0.06	0.5	7,000	540	0.054	0.8

N Aluminium Alloy
N Copper Copper Tungsten
O Resin

Long Neck Corner Radius Coating

DHR237R

Recommended Milling Conditions

Copper Electrode Milling

Work Material				Copper				Copper Tungsten (W70%-Cu30%)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
2	0.1	5	2.5	16,000	3,000	0.06	1.2	14,000	2,700	0.054	1.1
		8	4	14,000	2,600	0.06	1.2	13,000	2,400	0.054	1.1
		10	5	12,000	2,000	0.06	1.2	11,000	1,800	0.054	1.1
		15	7.5	10,000	1,600	0.05	1.2	9,000	1,400	0.045	1.1
		20	10	8,000	1,200	0.04	1.2	7,000	1,100	0.036	1.1
	0.2	5	2.5	16,000	3,000	0.12	1.2	14,000	2,700	0.11	1.1
		8	4	14,000	2,600	0.12	1.2	13,000	2,400	0.11	1.1
		10	5	12,000	2,000	0.12	1.2	11,000	1,800	0.11	1.1
		15	7.5	10,000	1,600	0.1	1.2	9,000	1,400	0.09	1.1
		20	10	8,000	1,200	0.08	1.2	7,000	1,100	0.07	1.1
	0.3	5	2.5	16,000	3,000	0.18	1.2	14,000	2,700	0.16	1.1
		8	4	14,000	2,600	0.18	1.2	13,000	2,400	0.16	1.1
		10	5	12,000	2,000	0.18	1.2	11,000	1,800	0.16	1.1
		15	7.5	10,000	1,600	0.14	1.2	9,000	1,400	0.13	1.1
		20	10	8,000	1,200	0.1	1.2	7,000	1,100	0.09	1.1
	0.5	5	2.5	16,000	3,000	0.3	1.2	14,000	2,700	0.27	1.1
		8	4	14,000	2,600	0.3	1.2	13,000	2,400	0.27	1.1
		10	5	12,000	2,000	0.3	1.2	11,000	1,800	0.27	1.1
		15	7.5	10,000	1,600	0.2	1.2	9,000	1,400	0.18	1.1
		20	10	8,000	1,200	0.15	1.2	7,000	1,100	0.14	1.1
2.5	0.2	8	3.2	15,000	3,000	0.12	1.5	13,500	2,700	0.11	1.4
		14	5.6	12,000	2,200	0.1	1.5	11,000	2,000	0.09	1.4
		20	8	10,000	1,600	0.08	1.5	9,000	1,400	0.04	1.4
	0.5	8	3.2	15,000	3,000	0.3	1.5	13,500	2,700	0.027	1.4
		14	5.6	12,000	2,200	0.25	1.5	11,000	2,000	0.23	1.4
		20	8	10,000	1,600	0.2	1.5	9,000	1,400	0.18	1.4
3	0.1	12	4	14,000	3,000	0.06	1.8	13,000	2,700	0.054	1.6
		18	6	12,000	2,400	0.05	1.8	11,000	2,200	0.045	1.6
		24	8	10,000	1,800	0.04	1.8	9,000	1,600	0.036	1.6
	0.2	12	4	14,000	3,000	0.12	1.8	13,000	2,700	0.11	1.6
		18	6	12,000	2,400	0.1	1.8	11,000	2,200	0.09	1.6
		24	8	10,000	1,800	0.08	1.8	9,000	1,600	0.07	1.6
	0.3	12	4	14,000	3,000	0.18	1.8	13,000	2,700	0.16	1.6
		18	6	12,000	2,400	0.15	1.8	11,000	2,200	0.14	1.6
		24	8	10,000	1,800	0.12	1.8	9,000	1,600	0.11	1.6
	0.5	12	4	14,000	3,000	0.3	1.8	13,000	2,700	0.27	1.6
		15	5	13,000	2,600	0.3	1.8	12,000	2,400	0.27	1.6
		18	6	12,000	2,400	0.25	1.8	11,000	2,200	0.23	1.6
		24	8	10,000	1,800	0.2	1.8	9,000	1,600	0.18	1.6
		30	10	8,000	1,400	0.16	1.8	7,000	1,200	0.14	1.6

Work Material				Copper				Copper Tungsten (W70%-Cu30%)			
Dia.	Corner Radius	Under Neck Length	L/D	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
				min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	ae mm
4	0.1	16	4	10,000	2,800	0.06	2.8	9,000	2,500	0.054	2.5
		24	6	8,000	2,200	0.05	2.8	7,000	1,900	0.045	2.5
		32	8	6,000	1,600	0.04	2.8	5,500	1,400	0.036	2.5
	0.2	16	4	10,000	2,800	0.14	2.8	9,000	2,500	0.13	2.5
		24	6	8,000	2,200	0.12	2.8	7,000	1,900	0.11	2.5
		32	8	6,000	1,600	0.1	2.8	5,500	1,400	0.09	2.5
	0.3	16	4	10,000	2,800	0.18	2.8	9,000	2,500	0.16	2.5
		24	6	8,000	2,200	0.15	2.8	7,000	1,900	0.14	2.5
		32	8	6,000	1,600	0.12	2.8	5,500	1,400	0.11	2.5
	0.5	16	4	10,000	2,800	0.3	2.4	9,000	2,500	0.27	2.2
		24	6	8,000	2,200	0.24	2.4	7,000	1,900	0.22	2.2
		32	8	6,000	1,600	0.18	2.4	5,500	1,400	0.16	2.2
	1	16	4	10,000	2,800	0.6	2	9,000	2,500	0.54	1.8
		24	6	8,000	2,200	0.48	2	7,000	1,900	0.43	1.8
		32	8	6,000	1,600	0.36	2	5,500	1,400	0.32	1.8
5	0.1	20	4	8,000	2,700	0.06	3.5	7,000	2,400	0.054	3.2
		40	8	5,000	1,600	0.04	3.5	4,500	1,400	0.036	3.2
6	0.1	24	4	6,000	2,600	0.06	4.2	5,500	2,300	0.054	3.8
		48	8	4,000	1,600	0.03	4.2	3,500	1,400	0.027	3.8
	0.2	24	4	6,000	2,600	0.12	4.2	5,500	2,300	0.11	3.8
		48	8	4,000	1,600	0.06	4.2	3,500	1,400	0.054	3.8
	0.3	24	4	6,000	2,600	0.18	4.2	5,500	2,300	0.16	3.8
		48	8	4,000	1,600	0.09	4.2	3,500	1,400	0.08	3.8
	0.5	24	4	6,000	2,600	0.3	3.6	5,500	2,300	0.27	3.2
		30	5	5,000	2,200	0.24	3.6	4,500	1,900	0.22	3.2
		48	8	4,000	1,600	0.16	3.6	3,500	1,400	0.14	3.2
	1	24	4	6,000	2,600	0.6	3	5,500	2,300	0.54	2.7
		48	8	4,000	1,600	0.3	3	3,500	1,400	0.27	2.7

Notes

※1 Recommend to use the milling condition as just reference. Adjust milling conditions according to machining shape and machine status.
※2 Depth of Cut : ap=Axial Depth of Cut / ae=Radial Depth of Cut.
※3 Recommend to apply helical or ramping for approaching into axial direction.
※4 For slotting, recommend reciprocating milling by adjusting feed & ap in below 60% of recommended milling condition.
※5 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※6 Water-insoluble fluid is recommended.

Aluminium Alloy N ○
Copper ◎ Copper Tungsten ◎ N
Resin O ○

Long Neck Corner Radius Coating

Resin Milling

Sharp cutting edge shape with high cutting performance realizes good machined surface

Product lineup

3 models. Lineup of 353 sizes is available for a variety of madhining shapes

Model		Length of cut	Size	Number of flute	Features
Square End Mill / Long Neck Square End Mill					
RSES230		1.5D	ϕ0.1 ～ ϕ6	2	Short cutting length type with high rigidity
RSE230		3D ～ 10D	ϕ0.1 ～ ϕ6	2	Maximum depth of cut is 35D with long neck type
Ball End Mill / Long Neck Ball End Mill					
RSB230		3D ～ 10D	R0.1 ～ R3	2	Maximum depth of cut is 35D with long neck type

Machining Case

Ball End Mill for Resin

RSB230

Work Material : Acrylic
Work Size : 50 × 50 mm
(Machining depth 8 mm)
Coolant : Oil mist
Total machining time : 3hr 20 min

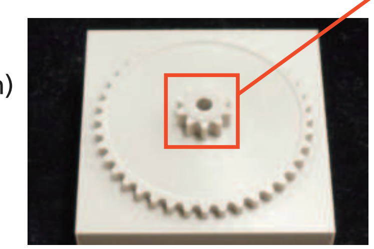
Process	Finishing
Tool	RSB230 R1 × 6
Spindle speed [min^{-1}]	20,000
Feed [mm/min]	1,600
Depth of cut ap × ae [mm]	0.02 × 0.03
Machining time	2 hr 20 min

Sharp cutting edge design with high cutting ability enables processing with high transparency

Short Flute End Mill for Resin

RSES230

Work Material : PEEK resin
Work Size : 45 × 45 mm
(Machining depth 6.5 mm)
Coolant : Water-soluble fluid
Total machining time : 1hr 40 min



Smooth cutting surface with no chattering

Process	Roughing	Semi-finishing	Finishing
Tool	RSES230 ϕ6 × 9	RSES230 ϕ1 × 1.5 × 4	RSES230 ϕ1 × 1.5 × 4
Spindle speed [min^{-1}]	3,000	20,000	
Feed [mm/min]	1,250	800	400
Depth of cut ap × ae [mm]	6.47 × 1	0.3 × 0.5	0.3 × 0.03 (Side) 0.03 × 0.3 (Flat)
Machining time	4 min 30 sec	7 min	1hr 28 min 30 sec

High machinability sharp cutting edge suppresses burrs and enables good finished surface

Model	Size	Length of Cut	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square・Long Neck Square																							
RSES230	ϕ0.1 ~ ϕ6	1.5D	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	○	○	◎	-	-	155	L-006
Square end mill for resin. High rigidity with short length of cut																							
RSE230	ϕ0.1 ~ ϕ6	3D~10D	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	○	○	◎	-	-	135	L-014
Square end mill for resin. Maximum L/D=10 for standard type, maximum L/D=35 for long neck type																							
Ball・Long Neck Ball																							
RSB230	R0.1 ~ R3	3D~10D	2	30°	-	-	-	3D	-	-	-	-	-	-	-	-	○	○	◎	-	-	63	L-022
Ball end mill for resin. Maximum L/D=10 for standard type, maximum L/D=35 for long neck type																							

RSES230

Size φ 0.1～φ 6

Short Flute End Mill for Resin

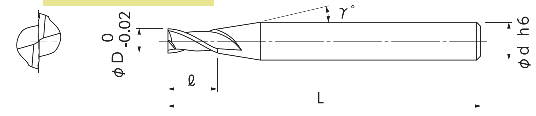
Total 155 sizes

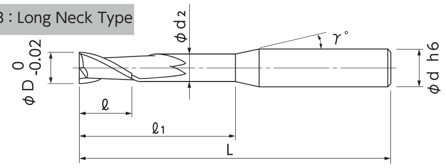
Short Flute End Mill for Resin

Square end mill for resin. High rigidity with short length of cut

2 | 30° | 90°

Side | Slot | Face





- Applicable to nonferrous material such as Aluminium and Copper.
- Eliminate the conventional problem of the long flute length.

○	Aluminium Alloy	N
○	Copper	N
◎	Resin	O

Square

Long Neck Square

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00640-01000	0.1	0.15	–	A	–	9°	4	50
01-00640-01003			0.3	B	0.085	12°	4	50
01-00640-01005			0.5		0.085	12°	4	50
01-00640-01008			0.8		0.085	12°	4	50
01-00640-01010			1		0.085	12°	4	50
01-00640-01500	0.15	0.23	–	A	–	9°	4	50
01-00640-01505			0.5	B	0.13	12°	4	50
01-00640-01508			0.8		0.13	12°	4	50
01-00640-01510			1		0.13	12°	4	50
01-00640-01515			1.5		0.13	12°	4	50
01-00640-02000	0.2	0.3	–	A	–	9°	4	50
01-00640-02006			0.6	B	0.18	12°	4	50
01-00640-02010			1		0.18	12°	4	50
01-00640-02015			1.5		0.18	12°	4	50
01-00640-02020			2		0.18	12°	4	50
▌01-00640-02025			2.5		0.18	12°	4	50
▌01-00640-02030			3		0.18	12°	4	50
▌01-00640-02035			3.5		0.18	12°	4	50
▌01-00640-02040			4		0.18	12°	4	50
01-00640-03000	0.3	0.45	–	A	–	9°	4	50
01-00640-03010			1	B	0.28	12°	4	50
01-00640-03015			1.5		0.28	12°	4	50

How to Order When you order, indicate RSES230 (D)×(ℓ) [×(ℓ1)]. Choose Shank Dia. (d) for TypeA of Dia. 4. ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00640-03020	0.3	0.45	2	B	0.28	12°	4	50
01-00640-03025			2.5		0.28	12°	4	50
01-00640-03030			3		0.28	12°	4	50
▌01-00640-03040			4		0.28	12°	4	50
▌01-00640-03050			5		0.28	12°	4	50
▌01-00640-03060			6		0.28	12°	4	50
▌01-00640-03090			9		0.28	12°	4	50
01-00640-04000	0.4	0.6	–	A	–	9°	4	60
01-00640-04015			1.5	B	0.37	12°	4	60
01-00640-04020			2		0.37	12°	4	60
01-00640-04025			2.5		0.37	12°	4	60
01-00640-04030			3		0.37	12°	4	60
01-00640-04035			3.5		0.37	12°	4	60
01-00640-04040			4		0.37	12°	4	60
▌01-00640-04060			6		0.37	12°	4	60
▌01-00640-04080			8		0.37	12°	4	60
▌01-00640-04100			10		0.37	12°	4	60
▌01-00640-04120			12		0.37	12°	4	60
01-00640-05000	0.5	0.75	–	A	–	9°	4	60
01-00640-05020			2	B	0.46	12°	4	60
01-00640-05030			3		0.46	12°	4	60
01-00640-05040			4		0.46	12°	4	60
01-00640-05060			6		0.46	12°	4	60
01-00640-05080			8		0.46	12°	4	60
01-00640-05100			10		0.46	12°	4	60
01-00640-05120			12		0.46	12°	4	60
▌01-00640-05150			15		0.46	12°	4	60
▌01-00640-05180			18		0.46	12°	4	60
▌01-00640-05200			20		0.46	12°	4	60
01-00640-06000	0.6	0.9	–	A	–	9°	4	60
01-00640-06030			3	B	0.56	12°	4	60
01-00640-06040			4		0.56	12°	4	60
01-00640-06060			6		0.56	12°	4	60
01-00640-06080			8		0.56	12°	4	60

N Aluminium Alloy ○
N Copper ○
O Resin ◎

Square

Long Neck Square

RSES230

RSES230

Short Flute End Mill for Resin

Short Flute End Mill for Resin

Resin Milling

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00640-06100	0.6	0.9	10	B	0.56	12°	4	60
▌01-00640-06120			12		0.56	12°	4	60
▌01-00640-06150			15		0.56	12°	4	60
▌01-00640-06180			18		0.56	12°	4	60
01-00640-07000	0.7	1.05	–	A	–	9°	4	60
01-00640-07040			4	B	0.66	12°	4	60
01-00640-07060			6		0.66	12°	4	60
▌01-00640-07080			8		0.66	12°	4	60
▌01-00640-07100			10		0.66	12°	4	60
▌01-00640-07120			12		0.66	12°	4	60
▌01-00640-07140			14		0.66	12°	4	60
01-00640-08000	0.8	1.2	–	A	–	9°	4	60
01-00640-08040			4	B	0.76	12°	4	60
01-00640-08060			6		0.76	12°	4	60
01-00640-08080			8		0.76	12°	4	60
01-00640-08100			10		0.76	12°	4	60
01-00640-08120			12		0.76	12°	4	60
01-00640-08140			14		0.76	12°	4	60
01-00640-08160			16		0.76	12°	4	60
▌01-00640-08180			18		0.76	12°	4	60
▌01-00640-08200			20		0.76	12°	4	60
▌01-00640-08240			24		0.76	12°	4	60
01-00640-09000	0.9	1.35	–	A	–	9°	4	60
01-00640-09060			6	B	0.86	12°	4	60
01-00640-09080			8		0.86	12°	4	60
▌01-00640-09100			10		0.86	12°	4	60
▌01-00640-09120			12		0.86	12°	4	60
▌01-00640-09160			16		0.86	12°	4	60
▌01-00640-09180			18		0.86	12°	4	60
01-00640-10000	1	1.5	–	A	–	9°	4	70
01-00640-10040			4	B	0.95	12°	4	70
01-00640-10060			6		0.95	12°	4	70
01-00640-10080			8		0.95	12°	4	70
01-00640-10100			10		0.95	12°	4	70

How to Order When you order, indicate RSES230 (D)×(ℓ) [×(ℓ1)] . Choose Shank Dia. (d) for TypeA of Dia. 4. ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00640-10120	1	1.5	12	B	0.95	12°	4	70
01-00640-10140			14		0.95	12°	4	70
01-00640-10150			15		0.95	12°	4	70
01-00640-10180			18		0.95	12°	4	70
01-00640-10200			20		0.95	12°	4	70
▌01-00640-10250			25		0.95	12°	4	70
▌01-00640-10300			30		0.95	12°	4	70
▌01-00640-10350			35		0.95	12°	4	70
01-00640-15000	1.5	2.25	–	A	–	9°	4	70
01-00640-15060			6	B	1.45	12°	4	70
01-00640-15080			8		1.45	12°	4	70
01-00640-15100			10		1.45	12°	4	70
01-00640-15120			12		1.45	12°	4	70
01-00640-15150			15		1.45	12°	4	70
01-00640-15180			18		1.45	12°	4	70
01-00640-15200			20		1.45	12°	4	70
01-00640-15230			23		1.45	12°	4	70
01-00640-15250			25		1.45	12°	4	70
01-00640-15300			30		1.45	12°	4	70
▌01-00640-15350			35		1.45	12°	4	70
▌01-00640-15400			40		1.45	12°	4	100
▌01-00640-15450			45		1.45	12°	4	100
▌01-00640-15530			53		1.45	12°	4	100
01-00640-20000	2	3	–	A	–	9°	4	60
01-00640-20060			6	B	1.94	12°	4	60
01-00640-20080			8		1.94	12°	4	60
01-00640-20100			10		1.94	12°	4	60
01-00640-20120			12		1.94	12°	4	60
01-00640-20150			15		1.94	12°	4	60
01-00640-20200			20		1.94	12°	4	80
01-00640-20240			24		1.94	12°	4	80
01-00640-20300			30		1.94	12°	4	80
01-00640-20400			40		1.94	12°	4	100
▌01-00640-20500			50		1.94	12°	4	100

N Aluminium Alloy ○
N Copper ○
O Resin ◎
Square
Long Neck Square

RSES230

Short Flute End Mill for Resin

RSES230

Resin Milling

Recommended Milling Conditions

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
▌01-00640-20600	2	3	60	B	1.94	12°	4	120
▌01-00640-20700			70		1.94	12°	4	150
01-00640-30000	3	4.5	–	A	–	–	3	80
01-00640-30100			10	B	2.85	12°	6	80
01-00640-30120			12		2.85	12°	6	80
01-00640-30150			15		2.85	12°	6	80
01-00640-30200			20		2.85	12°	6	80
01-00640-30240			24		2.85	12°	6	80
01-00640-30300			30		2.85	12°	6	80
01-00640-30360			36		2.85	12°	6	80
▌01-00640-30450			45		2.85	12°	6	100
▌01-00640-30600			60		2.85	12°	6	120
▌01-00640-30750			75		2.85	12°	6	150
01-00640-40000	4	6	–	A	–	–	4	80
01-00640-40001			–		–	9°	6	80
01-00640-40100			10	B	3.8	12°	6	80
01-00640-40150			15		3.8	12°	6	80
01-00640-40200			20		3.8	12°	6	80
01-00640-40300			30		3.8	12°	6	80
01-00640-40400			40		3.8	12°	6	100
▌01-00640-40550			55		3.8	12°	6	120
▌01-00640-40700			70		3.8	12°	6	150
01-00640-50000	5	7.5	–	A	–	9°	6	80
01-00640-50300			30	B	4.8	12°	6	80
01-00640-50400			40		4.8	12°	6	100
▌01-00640-50550			55		4.8	12°	6	120
▌01-00640-50700			70		4.8	12°	6	150
01-00640-60000	6	9	–	A	–	–	6	90
01-00640-60400			40	B	5.8	–	6	90
01-00640-60600			60		5.8	–	6	120
01-00640-60800			80		5.8	–	6	150

How to Order When you order, indicate RSES230 (D)×(ℓ) [×(ℓ1)]. Choose Shank Dia. (d) for TypeA of Dia. 4. ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

Work Material				ABS·MC nylon ·PTFE						Polycarbonate·POM·PEEK						Acrylic·Bakelite					
Dia.	Length of Cut	Under neck Length	L/D	Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut		
					Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting
				min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm
0.1	0.15	–	1.5	20,000	190	90	0.15	0.02	0.1	20,000	160	80	0.15	0.02	0.1	20,000	120	60	0.15	0.02	0.1
		0.3	3	20,000	190	90	0.15	0.02	0.1	20,000	160	80	0.15	0.02	0.1	20,000	120	60	0.15	0.02	0.1
		0.5	5	19,000	150	70	0.15	0.01	0.05	19,000	120	60	0.15	0.01	0.05	19,000	100	50	0.15	0.01	0.05
		0.8	8	17,000	120	60	0.15	0.005	0.025	17,000	100	50	0.15	0.005	0.025	17,000	80	40	0.15	0.005	0.025
		1	10	15,600	80	40	0.15	0.003	0.012	15,600	60	30	0.15	0.003	0.012	15,600	50	20	0.15	0.003	0.012
0.15	0.23	–	1.5	20,000	400	200	0.22	0.03	0.15	20,000	340	170	0.22	0.03	0.15	20,000	270	130	0.22	0.03	0.15
		0.5	3.3	19,800	390	190	0.22	0.028	0.13	19,800	320	160	0.22	0.028	0.13	19,800	260	130	0.22	0.028	0.13
		0.8	5.3	18,700	320	160	0.22	0.015	0.071	18,700	260	130	0.22	0.015	0.071	18,700	210	100	0.22	0.015	0.071
		1	6.7	17,800	280	140	0.22	0.011	0.055	17,800	240	120	0.22	0.011	0.055	17,800	190	90	0.22	0.011	0.055
		1.5	10	15,600	170	80	0.22	0.004	0.018	15,600	140	70	0.22	0.004	0.018	15,600	110	50	0.22	0.004	0.018
0.2	0.3	–	1.5	20,000	620	310	0.3	0.04	0.2	20,000	520	260	0.3	0.04	0.2	20,000	410	200	0.3	0.04	0.2
		0.6	3	20,000	620	310	0.3	0.04	0.2	20,000	520	260	0.3	0.04	0.2	20,000	410	200	0.3	0.04	0.2
		1	5	19,000	500	250	0.3	0.02	0.1	19,000	410	200	0.3	0.02	0.1	19,000	330	160	0.3	0.02	0.1
		1.5	7.5	17,300	410	200	0.3	0.012	0.059	17,300	340	170	0.3	0.012	0.059	17,300	270	130	0.3	0.012	0.059
		2	10	15,600	260	130	0.3	0.005	0.024	15,600	220	110	0.3	0.005	0.024	15,600	170	80	0.3	0.005	0.024
		2.5	12.5	15,000	230	110	0.3	0.004	0.02	15,000	190	90	0.3	0.004	0.02	15,000	150	70	0.3	0.004	0.02
		3	15	14,500	200	100	0.3	0.004	0.016	14,500	160	80	0.3	0.004	0.016	14,500	130	60	0.3	0.004	0.016
		3.5	17.5	14,000	170	80	0.3	0.003	0.012	14,000	140	70	0.3	0.003	0.012	14,000	110	50	0.3	0.003	0.012
		4	20	13,500	140	70	0.3	0.002	0.008	13,500	120	60	0.3	0.002	0.008	13,500	90	40	0.3	0.002	0.008
0.3	0.45	–	1.5	20,000	1,050	520	0.45	0.06	0.3	20,000	880	440	0.45	0.06	0.3	20,000	700	350	0.45	0.06	0.3
		1	3.3	19,800	1,020	510	0.45	0.055	0.27	19,800	850	420	0.45	0.055	0.27	19,800	680	340	0.45	0.055	0.27
		1.5	5	19,000	850	420	0.45	0.03	0.15	19,000	710	350	0.45	0.03	0.15	19,000	560	280	0.45	0.03	0.15
		2	6.7	17,800	750	370	0.45	0.022	0.1	17,800	620	310	0.45	0.022	0.1	17,800	500	250	0.45	0.022	0.1
		2.5	8.3	16,700	630	310	0.45	0.014	0.069	16,700	520	260	0.45	0.014	0.069	16,700	420	210	0.45	0.014	0.069
		3	10	15,600	450	220	0.45	0.008	0.036	15,600	370	180	0.45	0.008	0.036	15,600	300	150	0.45	0.008	0.036
		4	13.3	14,800	370	180	0.45	0.006	0.028	14,800	310	150	0.45	0.006	0.028	14,800	250	120	0.45	0.006	0.028
		5	16.7	14,100	310	150	0.45	0.004	0.02	14,100	250	120	0.45	0.004	0.02	14,100	200	100	0.45	0.004	0.02
		6	20	13,500	240	120	0.45	0.003	0.012	13,500	200	100	0.45	0.003	0.012	13,500	160	80	0.45	0.003	0.012
0.4	0.6	–	1.5	20,000	1,480	740	0.6	0.08	0.4	20,000	1,240	620	0.6	0.08	0.4	20,000	990	490	0.6	0.08	0.4
		1.5	3.8	19,600	1,370	680	0.6	0.065	0.32	19,600	1,140	570	0.6	0.065	0.32	19,600	910	450	0.6	0.065	0.32
		2	5	19,000	1,200	600	0.6	0.04	0.2	19,000	1,000	500	0.6	0.04	0.2	19,000	800	400	0.6	0.04	0.2
		2.5	6.3	18,100	1,090	540	0.6	0.032	0.15	18,100	910	450	0.6	0.032	0.15	18,100	720	360	0.6	0.032	0.15
		3	7.5	17,300	980	490	0.6	0.024	0.11	17,300	820	410	0.6	0.024	0.11	17,300	650	320	0.6	0.024	0.11
		3.5	8.8	16,400	820	410	0.6	0.017	0.081	16,400	680	340	0.6	0.017	0.081	16,400	550	270	0.6	0.017	0.081
		4	10	15,600	630	310	0.6	0.01	0.048	15,600	530	260	0.6	0.01	0.048	15,600	420	210	0.6	0.01	0.048
		6	15	14,500	480	240	0.6	0.007	0.032	14,500	400	200	0.6	0.007	0.032	14,500	320	160	0.6	0.007	0.032
		8	20	13,500	350	170	0.6	0.004	0.016	13,500	290	140	0.6	0.004	0.016	13,500	230	110	0.6	0.004	0.016
0.5	0.75	–	1.5	20,000	1,920	960	0.75	0.1	0.5	20,000	1,600	800	0.75	0.1	0.5	20,000	1,280	640	0.75	0.1	0.5
		2	4	19,500	1,730	860	0.75	0.075	0.37	19,500	1,440	720	0.75	0.075	0.37	19,500	1,150	570	0.75	0.075	0.37
		3	6	18,300	1,430	710	0.75	0.042	0.2	18,300	1,190	590	0.75	0.042	0.2	18,300	950	470	0.75	0.042	0.2
		4	8	17,000	1,220	610	0.75	0.025	0.12	17,000	1,020	510	0.75	0.025	0.12	17,000	810	400	0.75	0.025	0.12
		6	12	15,100	740	370	0.75	0.011	0.052	15,100	610	300	0.75	0.011	0.052	15,100	490	240	0.75	0.011	0.052
		8	16	14,300	590	290	0.75	0.008	0.036	14,300	490	240	0.75	0.008	0.036	14,300	390	190	0.75	0.008	0.036
		10	20	13,500	450	220	0.75	0.004	0.02	13,500	370	180	0.75	0.004	0.02	13,500	300	150	0.75	0.004	0.02
0.6	0.9	–	1.5	20,000	2,160	1,080	0.9	0.12	0.6	20,000	1,800	900	0.9	0.12	0.6	20,000	1,440	720	0.9	0.12	0.6
		3	5	19,000	1,740	870	0.9	0.06	0.3	19,000	1,450	720	0.9	0.06	0.3	19,000	1,160	580	0.9	0.06	0.3
		4	6.7	17,800	1,530	760	0.9	0.044	0.21	17,800	1,270	630	0.9	0.044	0.21	17,800	1,020	510	0.9	0.044	0.21
		6	10	15,000	890	440	0.9	0.015	0.072	15,000	740	370	0.9	0.015	0.072	15,000	590	290	0.9	0.015	0.072
		8	13.3	14,400	750	370	0.9	0.012	0.056	14,400	620	310	0.9	0.012	0.056	14,400	500	250	0.9	0.012	0.056
		10	16.7	13,700	610	300	0.9	0.008	0.04	13,700	510	250	0.9	0.008	0.04	13,700	410	200	0.9	0.008	0.04
		12	20	13,000	490	240	0.9	0.005	0.024	13,000	400	200	0.9	0.005	0.024	13,000	320	160	0.9	0.005	0.024

Dia.	Length of Cut	Under neck Length	L/D	ABS･MC nylon･PTFE Spindle Speed (min⁻¹)	Feed Side Milling (mm/min)	Feed Slotting (mm/min)	Depth of Cut Side Milling ap mm	Depth of Cut Side Milling ae mm	Depth of Cut Slotting ap mm	Polycarbonate･POM･PEEK Spindle Speed (min⁻¹)	Feed Side Milling (mm/min)	Feed Slotting (mm/min)	Depth of Cut Side Milling ap mm	Depth of Cut Side Milling ae mm	Depth of Cut Slotting ap mm	Acrylic･Bakelite Spindle Speed (min⁻¹)	Feed Side Milling (mm/min)	Feed Slotting (mm/min)	Depth of Cut Side Milling ap mm	Depth of Cut Side Milling ae mm	Depth of Cut Slotting ap mm
0.7	1.05	–	1.5	20,000	2,400	1,200	1.05	0.14	0.7	20,000	2,000	1,000	1.05	0.14	0.7	20,000	1,600	800	1.05	0.14	0.7
		4	5.7	18,500	1,830	910	1.05	0.062	0.3	18,500	1,530	760	1.05	0.062	0.3	18,500	1,220	610	1.05	0.062	0.3
		6	8.6	14,500	1,200	600	1.05	0.03	0.14	14,500	1,000	500	1.05	0.03	0.14	14,500	800	400	1.05	0.03	0.14
		8	11.4	14,000	870	430	1.05	0.016	0.076	14,000	730	360	1.05	0.016	0.076	14,000	580	290	1.05	0.016	0.076
		10	14.3	13,500	750	370	1.05	0.012	0.06	13,500	620	310	1.05	0.012	0.06	13,500	500	250	1.05	0.012	0.06
		12	17.1	13,000	630	310	1.05	0.009	0.044	13,000	520	260	1.05	0.009	0.044	13,000	420	210	1.05	0.009	0.044
		14	20	12,500	520	260	1.05	0.006	0.028	12,500	430	210	1.05	0.006	0.028	12,500	350	170	1.05	0.006	0.028
0.8	1.2	–	1.5	20,000	2,640	1,320	1.2	0.16	0.8	20,000	2,200	1,100	1.2	0.16	0.8	20,000	1,760	880	1.2	0.16	0.8
		4	5	19,000	2,130	1,060	1.2	0.08	0.4	19,000	1,770	880	1.2	0.08	0.4	19,000	1,420	710	1.2	0.08	0.4
		6	7.5	17,300	1,750	870	1.2	0.047	0.23	17,300	1,460	730	1.2	0.047	0.23	17,300	1,160	580	1.2	0.047	0.23
		8	10	14,000	1,010	500	1.2	0.02	0.096	14,000	840	420	1.2	0.02	0.096	14,000	670	330	1.2	0.02	0.096
		10	12.5	13,400	880	440	1.2	0.016	0.08	13,400	730	360	1.2	0.016	0.08	13,400	580	290	1.2	0.016	0.08
		12	15	12,700	750	370	1.2	0.013	0.064	12,700	620	310	1.2	0.013	0.064	12,700	500	250	1.2	0.013	0.064
		14	17.5	12,300	640	320	1.2	0.01	0.048	12,300	540	270	1.2	0.01	0.048	12,300	430	210	1.2	0.01	0.048
		16	20	12,000	550	270	1.2	0.007	0.032	12,000	460	230	1.2	0.007	0.032	12,000	360	180	1.2	0.007	0.032
0.9	1.35	–	1.5	18,500	2,660	1,330	1.35	0.18	0.9	18,500	2,220	1,110	1.35	0.18	0.9	18,500	1,770	880	1.35	0.18	0.9
		6	6.7	16,500	1,890	940	1.35	0.065	0.32	16,500	1,570	780	1.35	0.065	0.32	16,500	1,260	630	1.35	0.065	0.32
		8	8.9	13,500	1,280	640	1.35	0.035	0.17	13,500	1,070	530	1.35	0.035	0.17	13,500	850	420	1.35	0.035	0.17
		10	11.1	13,000	980	490	1.35	0.02	0.1	13,000	820	410	1.35	0.02	0.1	13,000	650	320	1.35	0.02	0.1
		12	13.3	12,500	870	430	1.35	0.017	0.084	12,500	720	360	1.35	0.017	0.084	12,500	580	290	1.35	0.017	0.084
		16	17.8	12,000	680	340	1.35	0.011	0.052	12,000	560	280	1.35	0.011	0.052	12,000	450	220	1.35	0.011	0.052
		18	20	11,500	570	280	1.35	0.008	0.036	11,500	480	240	1.35	0.008	0.036	11,500	380	190	1.35	0.008	0.036
1	1.5	–	1.5	17,000	2,650	1,320	1.5	0.2	1	17,000	2,210	1,100	1.5	0.2	1	17,000	1,760	880	1.5	0.2	1
		4	4	16,500	2,390	1,190	1.5	0.15	0.75	16,500	1,990	990	1.5	0.15	0.75	16,500	1,590	790	1.5	0.15	0.75
		6	6	15,500	1,980	990	1.5	0.084	0.41	15,500	1,650	820	1.5	0.084	0.41	15,500	1,320	660	1.5	0.084	0.41
		8	8	14,400	1,690	840	1.5	0.05	0.25	14,400	1,400	700	1.5	0.05	0.25	14,400	1,120	560	1.5	0.05	0.25
		10	10	13,000	1,110	550	1.5	0.024	0.12	13,000	920	460	1.5	0.024	0.12	13,000	740	370	1.5	0.024	0.12
		12	12	12,400	980	490	1.5	0.021	0.1	12,400	820	410	1.5	0.021	0.1	12,400	650	320	1.5	0.021	0.1
		14	14	12,000	870	430	1.5	0.018	0.088	12,000	730	360	1.5	0.018	0.088	12,000	580	290	1.5	0.018	0.088
		15	15	11,700	820	410	1.5	0.016	0.08	11,700	680	340	1.5	0.016	0.08	11,700	540	270	1.5	0.016	0.08
		18	18	11,300	680	340	1.5	0.012	0.056	11,300	570	280	1.5	0.012	0.056	11,300	450	220	1.5	0.012	0.056
		20	20	11,000	600	300	1.5	0.008	0.04	11,000	500	250	1.5	0.008	0.04	11,000	400	200	1.5	0.008	0.04
1.5	2.25	–	1.5	13,300	2,590	1,290	2.25	0.3	1.5	13,300	2,150	1,070	2.25	0.3	1.5	13,300	1,720	860	2.25	0.3	1.5
		6	4	12,800	2,350	1,170	2.25	0.22	1.1	12,800	1,950	970	2.25	0.22	1.1	12,800	1,560	780	2.25	0.22	1.1
		8	5.3	12,200	2,060	1,030	2.25	0.14	0.7	12,200	1,720	860	2.25	0.14	0.7	12,200	1,370	680	2.25	0.14	0.7
		10	6.7	11,400	1,850	920	2.25	0.1	0.54	11,400	1,540	770	2.25	0.1	0.54	11,400	1,230	610	2.25	0.1	0.54
		12	8	10,600	1,650	820	2.25	0.075	0.37	10,600	1,380	690	2.25	0.075	0.37	10,600	1,100	550	2.25	0.075	0.37
		15	10	9,400	1,150	570	2.25	0.036	0.18	9,400	960	480	2.25	0.036	0.18	9,400	770	380	2.25	0.036	0.18
		18	12	9,000	1,050	520	2.25	0.032	0.15	9,000	870	430	2.25	0.032	0.15	9,000	700	350	2.25	0.032	0.15
		20	13.3	8,700	980	490	2.25	0.028	0.14	8,700	810	400	2.25	0.028	0.14	8,700	650	320	2.25	0.028	0.14
		23	15.3	8,300	880	440	2.25	0.024	0.11	8,300	730	360	2.25	0.024	0.11	8,300	580	290	2.25	0.024	0.11
		25	16.7	8,100	820	410	2.25	0.02	0.1	8,100	680	340	2.25	0.02	0.1	8,100	550	270	2.25	0.02	0.1
		30	20	7,500	690	340	2.25	0.012	0.06	7,500	570	280	2.25	0.012	0.06	7,500	460	230	2.25	0.012	0.06
2	3	–	1.5	9,900	2,320	1,160	3	0.4	2	9,900	1,930	960	3	0.4	2	9,900	1,550	770	3	0.4	2
		6	3	9,900	2,320	1,160	3	0.4	2	9,900	1,930	960	3	0.4	2	9,900	1,550	770	3	0.4	2
		8	4	9,500	2,140	1,070	3	0.3	1.5	9,500	1,780	890	3	0.3	1.5	9,500	1,420	710	3	0.3	1.5
		10	5	9,100	1,960	980	3	0.2	1	9,100	1,640	820	3	0.2	1	9,100	1,310	650	3	0.2	1
		12	6	8,600	1,800	900	3	0.16	0.83	8,600	1,500	750	3	0.16	0.83	8,600	1,200	600	3	0.16	0.83
		15	7.5	7,700	1,560	780	3	0.11	0.58	7,700	1,300	650	3	0.11	0.58	7,700	1,040	520	3	0.11	0.58
		20	10	6,200	1,050	520	3	0.048	0.24	6,200	870	430	3	0.048	0.24	6,200	700	350	3	0.048	0.24
		24	12	5,900	950	470	3	0.042	0.2	5,900	790	390	3	0.042	0.2	5,900	630	310	3	0.042	0.2
		30	15	5,300	810	400	3	0.032	0.16	5,300	680	340	3	0.032	0.16	5,300	540	270	3	0.032	0.16
		40	20	4,500	620	310	3	0.016	0.08	4,500	510	250	3	0.016	0.08	4,500	410	200	3	0.016	0.08

RSES230

Resin Milling

Recommended Milling Conditions

Aluminium Alloy N
Copper N
Resin O
Square
Long Neck Square

Dia.	Length of Cut	Under neck Length	L/D	ABS･MC nylon･PTFE Spindle Speed (min⁻¹)	Feed Side Milling (mm/min)	Feed Slotting (mm/min)	Depth of Cut Side Milling ap mm	Depth of Cut Side Milling ae mm	Depth of Cut Slotting ap mm	Polycarbonate･POM･PEEK Spindle Speed (min⁻¹)	Feed Side Milling (mm/min)	Feed Slotting (mm/min)	Depth of Cut Side Milling ap mm	Depth of Cut Side Milling ae mm	Depth of Cut Slotting ap mm	Acrylic･Bakelite Spindle Speed (min⁻¹)	Feed Side Milling (mm/min)	Feed Slotting (mm/min)	Depth of Cut Side Milling ap mm	Depth of Cut Side Milling ae mm	Depth of Cut Slotting ap mm
3	4.5	–	1.5	6,600	2,060	1,030	4.5	0.6	3	6,600	1,710	850	4.5	0.6	3	6,600	1,370	680	4.5	0.6	3
		10	3.3	6,500	2,010	1,000	4.5	0.55	2.7	6,500	1,670	830	4.5	0.55	2.7	6,500	1,340	670	4.5	0.55	2.7
		12	4	6,300	1,910	950	4.5	0.45	2.2	6,300	1,590	790	4.5	0.45	2.2	6,300	1,270	630	4.5	0.45	2.2
		15	5	5,900	1,760	880	4.5	0.3	1.5	5,900	1,460	730	4.5	0.3	1.5	5,900	1,170	580	4.5	0.3	1.5
		20	6.7	5,200	1,500	750	4.5	0.21	1	5,200	1,250	620	4.5	0.21	1	5,200	1,000	500	4.5	0.21	1
		24	8	4,600	1,290	640	4.5	0.15	0.75	4,600	1,080	540	4.5	0.15	0.75	4,600	860	430	4.5	0.15	0.75
		30	10	3,700	920	460	4.5	0.072	0.36	3,700	770	380	4.5	0.072	0.36	3,700	610	300	4.5	0.072	0.36
		36	12	3,400	830	410	4.5	0.063	0.31	3,400	690	340	4.5	0.063	0.31	3,400	550	270	4.5	0.063	0.31
		45	15	2,900	690	340	4.5	0.048	0.24	2,900	580	290	4.5	0.048	0.24	2,900	460	230	4.5	0.048	0.24
		60	20	2,300	500	250	4.5	0.024	0.12	2,300	420	210	4.5	0.024	0.12	2,300	330	160	4.5	0.024	0.12
4	6(d4)	–	1.5	4,900	1,910	950	6	0.8	4	4,900	1,590	790	6	0.8	4	4,900	1,270	630	6	0.8	4
	6(d6)	–	1.5	4,900	1,910	950	6	0.8	4	4,900	1,590	790	6	0.8	4	4,900	1,270	630	6	0.8	4
	6	10	2.5	4,900	1,910	950	6	0.8	4	4,900	1,590	790	6	0.8	4	4,900	1,270	630	6	0.8	4
		15	3.8	4,800	1,810	900	6	0.65	3.2	4,800	1,510	750	6	0.65	3.2	4,800	1,200	600	6	0.65	3.2
		20	5	4,400	1,640	820	6	0.4	2	4,400	1,360	680	6	0.4	2	4,400	1,090	540	6	0.4	2
		30	7.5	3,600	1,270	630	6	0.23	1.1	3,600	1,060	530	6	0.23	1.1	3,600	850	420	6	0.23	1.1
		40	10	2,700	850	420	6	0.096	0.48	2,700	710	350	6	0.096	0.48	2,700	570	280	6	0.096	0.48
		55	13.8	2,300	690	340	6	0.072	0.36	2,300	580	290	6	0.072	0.36	2,300	460	230	6	0.072	0.36
		70	17.5	1,900	550	270	6	0.048	0.24	1,900	460	230	6	0.048	0.24	1,900	370	180	6	0.048	0.24
5	7.5	–	1.5	3,900	1,820	910	7.5	1	5	3,900	1,510	750	7.5	1	5	3,900	1,210	600	7.5	1	5
		30	6	3,300	1,410	700	7.5	0.41	2	3,300	1,180	590	7.5	0.41	2	3,300	940	470	7.5	0.41	2
		40	8	2,700	1,140	570	7.5	0.25	1.2	2,700	950	470	7.5	0.25	1.2	2,700	760	380	7.5	0.25	1.2
		55	11	2,100	770	380	7.5	0.11	0.56	2,100	640	320	7.5	0.11	0.56	2,100	510	250	7.5	0.11	0.56
		70	14	1,800	650	320	7.5	0.088	0.44	1,800	540	270	7.5	0.088	0.44	1,800	430	210	7.5	0.088	0.44
6	9	–	1.5	3,300	1,750	870	9	1.2	6	3,300	1,460	730	9	1.2	6	3,300	1,170	580	9	1.2	6
		40	6.7	2,600	1,270	630	9	0.43	2.1	2,600	1,060	530	9	0.43	2.1	2,600	850	420	9	0.43	2.1
		60	10	1,800	780	390	9	0.14	0.72	1,800	650	320	9	0.14	0.72	1,800	520	260	9	0.14	0.72
		80	13.3	1,600	650	320	9	0.11	0.56	1,600	540	270	9	0.11	0.56	1,600	430	210	9	0.11	0.56

Notes

※1 These recommended cutting conditions indicate just reference for roughing. It should be adjusted according to milling shape and machine type.
※2 For finishing process, please adjust to the optimized condition to meet the requirement of machining accuracy.
※3 Necessary to adjust the cutting condition at the parts overloading against the tools such as inner corner parts.
※4 When a tool with L/D 10 times and longer deflects on milling, please reduce Feed or Depth of Cut.
※5 For a tool with L/D longer than 20 times, reduce spindle speed, feed rate and depth of cut at sufficient values by referring the cutting conditions of L/D 20 times.
※6 Air blow is recommended.
※7 Care for chip removal to avoid being stuck or caught during process for better surface quality.
※8 Minimize chucking runout.
※9 Pay keen attention for tool length measurement with contact-type equipment for the tools under ϕ1 to avoid cutting edge damage.
※10 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.

RSE230

Size ϕ 0.1～ϕ 6

MG

RSE230

Resin Milling

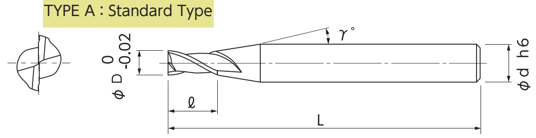
End Mill for Resin

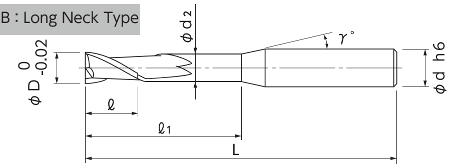
Total 135 sizes

End Mill for Resin

Square end mill for resin. Maximum L/D=10 for standard type
Maximum L/D=35 for long neck type

2 | 30° | 90°
Side | Slot | Face





- Available for the suitable L/D (3D, 5D and 10D) Length of cut with Extra Long Neck or without Under Neck Length!
- Applicable to nonferrous material such as Aluminium and Copper.

Aluminium Alloy N	Copper N	Resin O
○	○	◎

Square

Long Neck Square

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00644-00100	0.1	0.3	–	A	–	9°	4	45
01-00644-00108			0.8	B	0.085	12°	4	45
01-00644-00110			1		0.085	12°	4	45
01-00644-00150	0.15	0.45	–	A	–	9°	4	45
01-00644-00151			1	B	0.13	12°	4	45
01-00644-00152			1.5		0.13	12°	4	45
01-00644-00200	0.2	0.6	–	A	–	9°	4	45
01-00644-00201		1	–		–	10°	4	45
01-00644-00203		0.6	1	B	0.18	12°	4	45
01-00644-00204			1.5		0.18	12°	4	45
01-00644-00202			2		0.18	12°	4	45
01-00644-00300	0.3	0.9	–	A	–	9°	4	45
01-00644-00301		1.5	–		–	9°	4	45
01-00644-00302		2	–		–	9°	4	45
01-00644-00304		0.9	1.5	B	0.28	12°	4	45
01-00644-00305			2		0.28	12°	4	45
01-00644-00306			2.5		0.28	12°	4	45
01-00644-00303			3		0.28	12°	4	45
01-00644-00400	0.4	1.2	–	A	–	9°	4	45
01-00644-00401		2	–		–	10°	4	45
01-00644-00402		3	–		–	9°	4	45
01-00644-00403		1.2	2	B	0.37	12°	4	45
01-00644-00406	0.4	1.2	2.5	B	0.37	12°	4	45
01-00644-00407			3		0.37	12°	4	45
01-00644-00404			4		0.37	12°	4	45
01-00644-00405			5		0.37	12°	4	45
01-00644-00500	0.5	1.5	–	A	–	9°	4	45
01-00644-00501		2.5	–		–	9°	4	45
01-00644-00502		5	–		–	9°	4	45
01-00644-00503		1.5	3	B	0.46	12°	4	45
01-00644-00504			4		0.46	12°	4	45
01-00644-00506			6		0.46	12°	4	45
01-00644-00508			8		0.46	12°	4	50
01-00644-00510			10		0.46	12°	4	50
01-00644-00512			12		0.46	12°	4	50
01-00644-00515			15		0.46	12°	4	50
01-00644-00520			20		0.46	12°	4	50
01-00644-00600	0.6	1.8	–	A	–	9°	4	45
01-00644-00601		3	–		–	9°	4	45
01-00644-00602		4	–		–	9°	4	45
01-00644-00604		1.8	4	B	0.56	12°	4	45
01-00644-00606			6		0.56	12°	4	45
01-00644-00608			8		0.56	12°	4	50
01-00644-00610			10		0.56	12°	4	50
01-00644-00612			12		0.56	12°	4	50
01-00644-00800	0.8	2.4	–	A	–	9°	4	45
01-00644-00801		4	–		–	9°	4	45
01-00644-00802		6	–		–	9°	4	45
01-00644-00806		2.4	6	B	0.76	12°	4	45
01-00644-00808			8		0.76	12°	4	50
01-00644-00810			10		0.76	12°	4	50
01-00644-00812			12		0.76	12°	4	50
01-00644-00816			16		0.76	12°	4	60
01-00644-01000	1	3	–	A	–	9°	4	45
01-00644-01001		5	–		–	9°	4	50
01-00644-01003		7.5	–		–	9°	4	50

How to Order

When you order, indicate RSE230 (D)×(ℓ) [×(ℓ1)]. Choose Shank Dia. (d) for TypeA of Dia. 3×9ℓ・15ℓ and Dia. 4×12ℓ・20ℓ.
※(γ) is reference value.

RSE230

End Mill for Resin

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00644-01002	1	10	–	A	–	9°	4	50
01-00644-01006		3	6	B	0.95	12°	4	50
01-00644-01008			8		0.95	12°	4	50
01-00644-01010			10		0.95	12°	4	50
01-00644-01012			12		0.95	12°	4	50
01-00644-01015			15		0.95	12°	4	60
01-00644-01020			20		0.95	12°	4	60
01-00644-01025			25		0.95	12°	4	70
01-00644-01030			30		0.95	12°	4	70
01-00644-01035			35		0.95	12°	4	80
01-00644-01500	1.5	4.5	–	A	–	9°	4	45
01-00644-01501		7.5	–		–	9°	4	50
01-00644-01502		15	–		–	9°	4	60
01-00644-01510		4.5	10	B	1.45	12°	4	50
01-00644-01512			12		1.45	12°	4	50
01-00644-01515			15		1.45	12°	4	60
01-00644-01518			18		1.45	12°	4	60
01-00644-01523			23		1.45	12°	4	70
01-00644-01530			30		1.45	12°	4	70
01-00644-01538			38		1.45	12°	4	80
01-00644-01545			45		1.45	12°	4	90
01-00644-01553			53		1.45	12°	4	90
01-00644-02000	2	6	–	A	–	9°	4	50
01-00644-02001		10	–		–	9°	4	50
01-00644-02003		15	–		–	9°	4	60
01-00644-02002		20	–		–	9°	4	60
01-00644-02012		6	12	B	1.94	12°	4	60
01-00644-02015			15		1.94	12°	4	60
01-00644-02020			20		1.94	12°	4	60
01-00644-02024			24		1.94	12°	4	70
01-00644-02030			30		1.94	12°	4	80
01-00644-02040			40		1.94	12°	4	90
01-00644-02050			50		1.94	12°	4	110
01-00644-02060			60		1.94	12°	4	110
01-00644-02070			70		1.94	12°	4	110

How to Order

When you order, indicate RSE230 (D)×(ℓ) [×(ℓ1)]. Choose Shank Dia. (d) for TypeA of Dia. 3×9ℓ・15ℓ and Dia. 4×12ℓ・20ℓ.
※(γ) is reference value.

○ Aluminium Alloy N

○ Copper N

◎ Resin O

Square

Long Neck Square

Unit : mm

Code No.	Dia. (D)	Length of Cut (ℓ)	Under neck Length (ℓ1)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
01-00644-03000	3	9	–	A	–	–	3	100
01-00644-03001			–		–	9°	6	50
01-00644-03003		15	–		–	–	3	100
01-00644-03002			–		–	9°	6	60
01-00644-03004		20	–		–	9°	6	60
01-00644-03005		25	–		–	9°	6	70
01-00644-03006		30	–		–	9°	6	70
01-00644-03015		9	15	B	2.85	12°	6	60
01-00644-03020			20		2.85	12°	6	60
01-00644-03024			24		2.85	12°	6	70
01-00644-03030			30		2.85	12°	6	70
01-00644-03036			36		2.85	12°	6	80
01-00644-03045			45		2.85	12°	6	90
01-00644-03060			60		2.85	12°	6	110
01-00644-03075			75		2.85	12°	6	120
01-00644-04000	4	12	–	A	–	–	4	120
01-00644-04001			–		–	9°	6	50
01-00644-04003		20	–		–	–	4	120
01-00644-04002			–		–	9°	6	60
01-00644-04004		30	–		–	9°	6	70
01-00644-04005		40	–		–	9°	6	90
01-00644-04020		12	20	B	3.8	12°	6	60
01-00644-04030			30		3.8	12°	6	70
01-00644-04040			40		3.8	12°	6	90
01-00644-04055			55		3.8	12°	6	110
01-00644-04070			70		3.8	12°	6	120
01-00644-05002	5	10	–	A	–	9°	6	60
01-00644-05000		15	–		–	9°	6	70
01-00644-05001		25	–		–	9°	6	80
01-00644-05003		35	–		–	9°	6	90
01-00644-05004		40	–		–	9°	6	100
01-00644-05030		15	30	B	4.8	12°	6	90
01-00644-05040			40		4.8	12°	6	100
01-00644-05055			55		4.8	12°	6	120
01-00644-05070			70		4.8	12°	6	130
01-00644-06002	6	12	–	A	–	–	6	70
01-00644-06000		18	–		–	–	6	80
01-00644-06003		25	–		–	–	6	80
01-00644-06001		30	–		–	–	6	90
01-00644-06004		40	–		–	–	6	100
01-00644-06005		50	–		–	–	6	120
01-00644-06040		18	40	B	5.8	–	6	100
01-00644-06060			60		5.8	–	6	120
01-00644-06080			80		5.8	–	6	130

N Aluminium Alloy ○

N Copper ○

O Resin ◎

Square

Long Neck Square

Work Material				ABS·MC nylon ·PTFE						Polycarbonate·POM·PEEK						Acrylic·Bakelite					
Dia.	Length of Cut	Under neck Length	L/D	Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut		
					Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting
				min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm
0.1	0.3	–	3	20,000	190	90	0.2	0.02	0.1	20,000	160	80	0.2	0.02	0.1	20,000	120	60	0.2	0.02	0.1
		0.8	8	17,000	120	60	0.2	0.005	0.025	17,000	100	50	0.2	0.005	0.025	17,000	80	40	0.2	0.005	0.025
		1	10	15,600	80	40	0.2	0.003	0.012	15,600	60	30	0.2	0.003	0.012	15,600	50	20	0.2	0.003	0.012
0.15	0.45	–	3	20,000	400	200	0.3	0.03	0.15	20,000	340	170	0.3	0.03	0.15	20,000	270	130	0.3	0.03	0.15
		1	6.7	17,800	280	140	0.3	0.011	0.055	17,800	240	120	0.3	0.011	0.055	17,800	190	90	0.3	0.011	0.055
		1.5	10	15,600	170	80	0.3	0.004	0.018	15,600	140	70	0.3	0.004	0.018	15,600	110	50	0.3	0.004	0.018
0.2	0.6	–	3	20,000	620	310	0.4	0.04	0.2	20,000	520	260	0.4	0.04	0.2	20,000	410	200	0.4	0.04	0.2
	1	–	5	17,100	400	200	0.4	0.02	0.1	17,100	340	170	0.4	0.02	0.1	17,100	270	130	0.4	0.02	0.1
	0.6	1	5	19,000	500	250	0.4	0.02	0.1	19,000	410	200	0.4	0.02	0.1	19,000	330	160	0.4	0.02	0.1
		1.5	7.5	17,300	410	200	0.4	0.012	0.059	17,300	340	170	0.4	0.012	0.059	17,300	270	130	0.4	0.012	0.059
		2	10	15,600	260	130	0.4	0.005	0.024	15,600	220	110	0.4	0.005	0.024	15,600	170	80	0.4	0.005	0.024
0.3	0.9	–	3	20,000	1,050	520	0.6	0.06	0.3	20,000	880	440	0.6	0.06	0.3	20,000	700	350	0.6	0.06	0.3
	1.5	–	5	17,100	690	340	0.6	0.03	0.15	17,100	570	280	0.6	0.03	0.15	17,100	460	230	0.6	0.03	0.15
	2	–	6.7	16,100	600	300	0.6	0.022	0.1	16,100	500	250	0.6	0.022	0.1	16,100	400	200	0.6	0.022	0.1
	0.9	1.5	5	19,000	850	420	0.6	0.03	0.15	19,000	710	350	0.6	0.03	0.15	19,000	560	280	0.6	0.03	0.15
		2	6.7	17,800	750	370	0.6	0.022	0.1	17,800	620	310	0.6	0.022	0.1	17,800	500	250	0.6	0.022	0.1
		2.5	8.3	16,700	630	310	0.6	0.014	0.069	16,700	520	260	0.6	0.014	0.069	16,700	420	210	0.6	0.014	0.069
		3	10	15,600	450	220	0.6	0.008	0.036	15,600	370	180	0.6	0.008	0.036	15,600	300	150	0.6	0.008	0.036
0.4	1.2	–	3	20,000	1,480	740	0.8	0.08	0.4	20,000	1,240	620	0.8	0.08	0.4	20,000	990	490	0.8	0.08	0.4
	2	–	5	17,100	970	480	0.8	0.04	0.2	17,100	810	400	0.8	0.04	0.2	17,100	640	320	0.8	0.04	0.2
	3	–	7.5	15,600	800	400	0.8	0.024	0.11	15,600	660	330	0.8	0.024	0.11	15,600	530	260	0.8	0.024	0.11
	1.2	2	5	19,000	1,200	600	0.8	0.04	0.2	19,000	1,000	500	0.8	0.04	0.2	19,000	800	400	0.8	0.04	0.2
		2.5	6.3	18,100	1,090	540	0.8	0.032	0.15	18,100	910	450	0.8	0.032	0.15	18,100	720	360	0.8	0.032	0.15
		3	7.5	17,300	980	490	0.8	0.024	0.11	17,300	820	410	0.8	0.024	0.11	17,300	650	320	0.8	0.024	0.11
		4	10	15,600	630	310	0.8	0.01	0.048	15,600	530	260	0.8	0.01	0.048	15,600	420	210	0.8	0.01	0.048
		5	12.5	15,000	550	270	0.8	0.008	0.04	15,000	460	230	0.8	0.008	0.04	15,000	370	180	0.8	0.008	0.04
0.5	1.5	–	3	20,000	1,920	960	1	0.1	0.5	20,000	1,600	800	1	0.1	0.5	20,000	1,280	640	1	0.1	0.5
	2.5	–	5	17,100	1,250	620	1	0.05	0.25	17,100	1,040	520	1	0.05	0.25	17,100	830	410	1	0.05	0.25
	5	–	10	13,000	610	300	1	0.012	0.06	13,000	510	250	1	0.012	0.06	13,000	410	200	1	0.012	0.06
	1.5	3	6	18,300	1,430	710	1	0.042	0.2	18,300	1,190	590	1	0.042	0.2	18,300	950	470	1	0.042	0.2
		4	8	16,000	1,150	570	1	0.025	0.12	16,000	960	480	1	0.025	0.12	16,000	760	380	1	0.025	0.12
		6	12	15,200	740	370	1	0.011	0.052	15,200	620	310	1	0.011	0.052	15,200	490	240	1	0.011	0.052
		8	16	14,300	590	290	1	0.008	0.036	14,300	490	240	1	0.008	0.036	14,300	390	190	1	0.008	0.036
		10	20	13,500	450	220	1	0.004	0.02	13,500	370	180	1	0.004	0.02	13,500	300	150	1	0.004	0.02
0.6	1.8	–	3	20,000	2,160	1,080	1.2	0.12	0.6	20,000	1,800	900	1.2	0.12	0.6	20,000	1,440	720	1.2	0.12	0.6
	3	–	5	17,100	1,410	700	1.2	0.06	0.3	17,100	1,170	580	1.2	0.06	0.3	17,100	940	470	1.2	0.06	0.3
	4	–	6.7	16,100	1,240	620	1.2	0.044	0.21	16,100	1,030	510	1.2	0.044	0.21	16,100	820	410	1.2	0.044	0.21
	1.8	4	6.7	17,800	1,530	760	1.2	0.044	0.21	17,800	1,270	630	1.2	0.044	0.21	17,800	1,020	510	1.2	0.044	0.21
		6	10	15,000	890	440	1.2	0.015	0.072	15,000	740	370	1.2	0.015	0.072	15,000	590	290	1.2	0.015	0.072
		8	13.3	14,400	750	370	1.2	0.012	0.056	14,400	620	310	1.2	0.012	0.056	14,400	500	250	1.2	0.012	0.056
		10	16.7	13,700	610	300	1.2	0.008	0.04	13,700	510	250	1.2	0.008	0.04	13,700	410	200	1.2	0.008	0.04
		12	20	13,000	490	240	1.2	0.005	0.024	13,000	400	200	1.2	0.005	0.024	13,000	320	160	1.2	0.005	0.024
0.8	2.4	–	3	20,000	2,640	1,320	1.6	0.16	0.8	20,000	2,200	1,100	1.6	0.16	0.8	20,000	1,760	880	1.6	0.16	0.8
	4	–	5	17,100	1,720	860	1.6	0.08	0.4	17,100	1,430	710	1.6	0.08	0.4	17,100	1,150	570	1.6	0.08	0.4
	6	–	7.5	15,600	1,420	710	1.6	0.047	0.23	15,600	1,180	590	1.6	0.047	0.23	15,600	940	470	1.6	0.047	0.23
	2.4	6	7.5	17,300	1,750	870	1.6	0.047	0.23	17,300	1,460	730	1.6	0.047	0.23	17,300	1,160	580	1.6	0.047	0.23
		8	10	14,000	1,010	500	1.6	0.02	0.096	14,000	840	420	1.6	0.02	0.096	14,000	670	330	1.6	0.02	0.096
		10	12.5	13,400	880	440	1.6	0.016	0.08	13,400	730	360	1.6	0.016	0.08	13,400	580	290	1.6	0.016	0.08
		12	15	12,700	750	370	1.6	0.013	0.064	12,700	620	310	1.6	0.013	0.064	12,700	500	250	1.6	0.013	0.064
		16	20	12,000	550	270	1.6	0.007	0.032	12,000	460	230	1.6	0.007	0.032	12,000	360	180	1.6	0.007	0.032

Aluminium Alloy N

Copper N

Resin O

Square

Long Neck Square

Work Material				ABS·MC nylon ·PTFE						Polycarbonate·POM·PEEK						Acrylic·Bakelite					
Dia.	Length of Cut	Under neck Length	L/D	Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut		
					Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting
				min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm
1	3	–	3	17,000	2,650	1,320	2	0.2	1	17,000	2,210	1,100	2	0.2	1	17,000	1,760	880	2	0.2	1
	5	–	5	14,500	1,730	860	2	0.1	0.5	14,500	1,440	720	2	0.1	0.5	14,500	1,150	570	2	0.1	0.5
	7.5	–	7.5	13,200	1,420	710	2	0.059	0.29	13,200	1,180	590	2	0.059	0.29	13,200	940	470	2	0.059	0.29
	10	–	10	12,000	920	460	2	0.024	0.12	12,000	770	380	2	0.024	0.12	12,000	610	300	2	0.024	0.12
	3	6	6	15,500	1,980	990	2	0.084	0.41	15,500	1,650	820	2	0.084	0.41	15,500	1,320	660	2	0.084	0.41
		8	8	14,400	1,690	840	2	0.05	0.25	14,400	1,400	700	2	0.05	0.25	14,400	1,120	560	2	0.05	0.25
		10	10	13,000	1,110	550	2	0.024	0.12	13,000	920	460	2	0.024	0.12	13,000	740	370	2	0.024	0.12
		12	12	12,400	980	490	2	0.021	0.1	12,400	820	410	2	0.021	0.1	12,400	650	320	2	0.021	0.1
		15	15	11,700	820	410	2	0.016	0.08	11,700	680	340	2	0.016	0.08	11,700	540	270	2	0.016	0.08
		20	20	11,000	600	300	2	0.008	0.04	11,000	500	250	2	0.008	0.04	11,000	400	200	2	0.008	0.04
1.5	4.5	–	3	13,300	2,590	1,290	3	0.3	1.5	13,300	2,150	1,070	3	0.3	1.5	13,300	1,720	860	3	0.3	1.5
	7.5	–	5	11,100	1,710	850	3	0.15	0.75	11,100	1,430	710	3	0.15	0.75	11,100	1,140	570	3	0.15	0.75
	15	–	10	8,500	930	460	3	0.036	0.18	8,500	780	390	3	0.036	0.18	8,500	620	310	3	0.036	0.18
	4.5	10	6.7	11,400	1,850	920	3	0.1	0.54	11,400	1,540	770	3	0.1	0.54	11,400	1,230	610	3	0.1	0.54
		12	8	10,600	1,650	820	3	0.075	0.37	10,600	1,380	690	3	0.075	0.37	10,600	1,100	550	3	0.075	0.37
		15	10	9,400	1,150	570	3	0.036	0.18	9,400	960	480	3	0.036	0.18	9,400	770	380	3	0.036	0.18
		18	12	9,000	1,050	520	3	0.032	0.15	9,000	870	430	3	0.032	0.15	9,000	700	350	3	0.032	0.15
		23	15.3	8,300	880	440	3	0.024	0.11	8,300	730	360	3	0.024	0.11	8,300	580	290	3	0.024	0.11
		30	20	7,500	690	340	3	0.012	0.06	7,500	570	280	3	0.012	0.06	7,500	460	230	3	0.012	0.06
2	6	–	3	9,900	2,320	1,160	4	0.4	2	9,900	1,930	960	4	0.4	2	9,900	1,550	770	4	0.4	2
	10	–	5	8,200	1,590	790	4	0.2	1	8,200	1,320	660	4	0.2	1	8,200	1,060	530	4	0.2	1
	15	–	7.5	7,000	1,260	630	4	0.11	0.58	7,000	1,050	520	4	0.11	0.58	7,000	840	420	4	0.11	0.58
	20	–	10	5,600	850	420	4	0.048	0.24	5,600	710	350	4	0.048	0.24	5,600	560	280	4	0.048	0.24
	6	12	6	8,600	1,800	900	4	0.16	0.83	8,600	1,500	750	4	0.16	0.83	8,600	1,200	600	4	0.16	0.83
		15	7.5	7,700	1,560	780	4	0.11	0.58	7,700	1,300	650	4	0.11	0.58	7,700	1,040	520	4	0.11	0.58
		20	10	6,200	1,050	520	4	0.048	0.24	6,200	870	430	4	0.048	0.24	6,200	700	350	4	0.048	0.24
		24	12	5,900	950	470	4	0.042	0.2	5,900	790	390	4	0.042	0.2	5,900	630	310	4	0.042	0.2
		30	15	5,300	810	400	4	0.032	0.16	5,300	680	340	4	0.032	0.16	5,300	540	270	4	0.032	0.16
		40	20	4,500	620	310	4	0.016	0.08	4,500	510	250	4	0.016	0.08	4,500	410	200	4	0.016	0.08
3	9(d3)	–	3	6,600	2,060	1,030	6	0.6	3	6,600	1,710	850	6	0.6	3	6,600	1,370	680	6	0.6	3
	9(d6)	–	3	6,600	2,060	1,030	6	0.6	3	6,600	1,710	850	6	0.6	3	6,600	1,370	680	6	0.6	3
	15(d3)	–	5	5,300	1,420	710	6	0.3	1.5	5,300	1,190	590	6	0.3	1.5	5,300	950	470	6	0.3	1.5
	15(d6)	–	5	5,300	1,420	710	6	0.3	1.5	5,300	1,190	590	6	0.3	1.5	5,300	950	470	6	0.3	1.5
	20	–	6.7	4,700	1,210	600	6	0.21	1	4,700	1,010	500	6	0.21	1	4,700	810	400	6	0.21	1
	25	–	8.3	4,000	990	490	6	0.13	0.68	4,000	830	410	6	0.13	0.68	4,000	660	330	6	0.13	0.68
	30	–	10	3,300	740	370	6	0.072	0.36	3,300	620	310	6	0.072	0.36	3,300	490	240	6	0.072	0.36
	9	15	5	5,900	1,760	880	6	0.3	1.5	5,900	1,460	730	6	0.3	1.5	5,900	1,170	580	6	0.3	1.5
		20	6.7	5,200	1,500	750	6	0.21	1	5,200	1,250	620	6	0.21	1	5,200	1,000	500	6	0.21	1
		24	8	4,600	1,290	640	6	0.15	0.75	4,600	1,080	540	6	0.15	0.75	4,600	860	430	6	0.15	0.75
		30	10	3,700	920	460	6	0.072	0.36	3,700	770	380	6	0.072	0.36	3,700	610	300	6	0.072	0.36
		36	12	3,400	830	410	6	0.063	0.31	3,400	690	340	6	0.063	0.31	3,400	550	270	6	0.063	0.31
		45	15	2,900	690	340	6	0.048	0.24	2,900	580	290	6	0.048	0.24	2,900	460	230	6	0.048	0.24
		60	20	2,300	500	250	6	0.024	0.12	2,300	420	210	6	0.024	0.12	2,300	330	160	6	0.024	0.12
4	12(d4)	–	3	4,900	1,910	950	8	0.8	4	4,900	1,590	790	8	0.8	4	4,900	1,270	630	8	0.8	4
	12(d6)	–	3	4,900	1,910	950	8	0.8	4	4,900	1,590	790	8	0.8	4	4,900	1,270	630	8	0.8	4
	20(d4)	–	5	4,000	1,320	660	8	0.4	2	4,000	1,100	550	8	0.4	2	4,000	880	440	8	0.4	2
	20(d6)	–	5	4,000	1,320	660	8	0.4	2	4,000	1,100	550	8	0.4	2	4,000	880	440	8	0.4	2
	30	–	7.5	3,200	1,030	510	8	0.23	1.1	3,200	860	430	8	0.23	1.1	3,200	690	340	8	0.23	1.1
	40	–	10	2,500	690	340	8	0.096	0.48	2,500	580	290	8	0.096	0.48	2,500	460	230	8	0.096	0.48
	12	20	5	4,400	1,640	820	8	0.4	2	4,400	1,360	680	8	0.4	2	4,400	1,090	540	8	0.4	2
		30	7.5	3,600	1,270	630	8	0.23	1.1	3,600	1,060	530	8	0.23	1.1	3,600	850	420	8	0.23	1.1
		40	10	2,700	850	420	8	0.096	0.48	2,700	710	350	8	0.096	0.48	2,700	570	280	8	0.096	0.48
		55	13.8	2,300	690	340	8	0.072	0.36	2,300	580	290	8	0.072	0.36	2,300	460	230	8	0.072	0.36
		70	17.5	1,900	550	270	8	0.048	0.24	1,900	460	230	8	0.048	0.24	1,900	370	180	8	0.048	0.24

N Aluminium Alloy

N Copper

O Resin

Square

Long Neck Square

Recommended Milling Conditions

Work Material				ABS・MC nylon ・PTFE						Polycarbonate・POM・PEEK						Acrylic・Bakelite					
Dia.	Length of Cut	Under neck Length	L/D	Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut			Spindle Speed	Feed		Depth of Cut		
					Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting		Side Milling	Slotting	Side Milling		Slotting
				min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm	min^{-1}	mm/min		ap mm	ae mm	ap mm
5	10	–	2	3,900	1,820	910	10	1	5	3,900	1,510	750	10	1	5	3,900	1,210	600	10	1	5
	15	–	3	3,900	1,820	910	10	1	5	3,900	1,510	750	10	1	5	3,900	1,210	600	10	1	5
	25	–	5	3,200	1,260	630	10	0.5	2.5	3,200	1,050	520	10	0.5	2.5	3,200	840	420	10	0.5	2.5
	35	–	7	2,700	1,030	510	10	0.33	1.6	2,700	860	430	10	0.33	1.6	2,700	690	340	10	0.33	1.6
	40	–	8	2,500	930	460	10	0.25	1.2	2,500	770	380	10	0.25	1.2	2,500	620	310	10	0.25	1.2
	15	30	6	3,300	1,410	700	10	0.41	2	3,300	1,180	590	10	0.41	2	3,300	940	470	10	0.41	2
		40	8	2,700	1,140	570	10	0.25	1.2	2,700	950	470	10	0.25	1.2	2,700	760	380	10	0.25	1.2
		55	11	2,100	770	380	10	0.11	0.56	2,100	640	320	10	0.11	0.56	2,100	510	250	10	0.11	0.56
		70	14	1,800	650	320	10	0.088	0.44	1,800	540	270	10	0.088	0.44	1,800	430	210	10	0.088	0.44
6	12	–	2	3,300	1,750	870	12	1.2	6	3,300	1,460	730	12	1.2	6	3,300	1,170	580	12	1.2	6
	18	–	3	3,300	1,750	870	12	1.2	6	3,300	1,460	730	12	1.2	6	3,300	1,170	580	12	1.2	6
	25	–	4.2	2,800	1,300	650	12	0.85	4.2	2,800	1,080	540	12	0.85	4.2	2,800	860	430	12	0.85	4.2
	30	–	5	2,600	1,210	600	12	0.6	3	2,600	1,010	500	12	0.6	3	2,600	810	400	12	0.6	3
	40	–	6.7	2,300	1,030	510	12	0.43	2.1	2,300	860	430	12	0.43	2.1	2,300	690	340	12	0.43	2.1
	50	–	8.3	2,000	850	420	12	0.27	1.3	2,000	700	350	12	0.27	1.3	2,000	560	280	12	0.27	1.3
	18	40	6.7	2,600	1,270	630	12	0.43	2.1	2,600	1,060	530	12	0.43	2.1	2,600	850	420	12	0.43	2.1
		60	10	1,800	780	390	12	0.14	0.72	1,800	650	320	12	0.14	0.72	1,800	520	260	12	0.14	0.72
		80	13.3	1,600	650	320	12	0.11	0.56	1,600	540	270	12	0.11	0.56	1,600	430	210	12	0.11	0.56

Notes

※1 These recommended cutting conditions indicate just reference for roughing. It should be adjusted according to milling shape and machine type.
※2 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※3 For finishing process, please adjust to the optimized condition to meet the requirement of machining accuracy.
※4 Necessary to adjust the cutting condition at the parts overloading against the tools such as inner corner parts.
※5 Adjust both spindle speed and feed at the same rate when chattering or abnormal sounds occurred.
※6 When a tool with L/D 10 times and longer deflects on milling, please reduce Feed or Depth of Cut.
※7 For a tool with L/D longer than 20 times, reduce spindle speed, feed rate and depth of cut at sufficient values by referring the cutting conditions of L/D 20 times.
※8 Air blow is recommended.
※9 Care for chip removal to avoid being stuck or caught during process for better surface quality.
※10 Minimize chucking runout.
※11 Pay keen attention for tool length measurement with contact-type equipment for the tools under ϕ1 to avoid cutting edge damage.

RSB230

Size R0.1 ~ R3

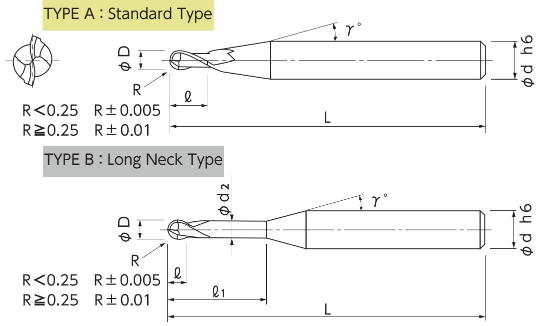
RSB230

Ball End Mill for Resin

Total 63 sizes

Ball End Mill for Resin

Ball end mill for resin.
Maximum L/D=10 for standard type, maximum L/D=35 for long neck type



- Select the right one for your job, 3D or 5D or 10D Length of cut, with Extra Long-neck or without Under neck length.
- Applicable to nonferrous material such as Aluminium and copper.

○	Aluminium Alloy N
○	Copper N
◎	Resin O

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Underneck Length (ℓ1)	Type	Dia. (D)	Neck Taper Angle (γ)	Neck Dia. (d2)	Shank Dia. (d)	Overall Length (L)
01-00654-01000	R0.1	0.6	–	A	0.2	9°	–	4	50
01-00654-01001		1	–	A	0.2	9°	–	4	50
01-00654-01002		0.6	2	B	0.2	12°	0.18	4	50
01-00654-01500	R0.15	0.9	–	A	0.3	9°	–	4	50
01-00654-01501		1.5	–	A	0.3	9°	–	4	50
01-00654-01503		0.9	3	B	0.3	12°	0.28	4	50
01-00654-02000	R0.2	1.2	–	A	0.4	9°	–	4	50
01-00654-02001		2	–	A	0.4	9°	–	4	50
01-00654-02004		1.2	4	B	0.4	12°	0.37	4	50
01-00654-02005			5	B	0.4	12°	0.37	4	50
01-00654-02500	R0.25	1.5	–	A	0.5	9°	–	4	50
01-00654-02501		2.5	–	A	0.5	9°	–	4	50
01-00654-02502		5	–	A	0.5	9°	–	4	50
01-00654-02510		1.5	10	B	0.5	12°	0.46	4	50
01-00654-02515			15	B	0.5	12°	0.46	4	50
01-00654-02520			20	B	0.5	12°	0.46	4	60
01-00654-03000	R0.3	1.8	–	A	0.6	9°	–	4	50
01-00654-03001		3	–	A	0.6	9°	–	4	50
01-00654-03006		1.8	6	B	0.6	12°	0.56	4	50
01-00654-03010			10	B	0.6	12°	0.56	4	50
01-00654-04000	R0.4	2.4	–	A	0.8	9°	–	4	50
01-00654-04001		4	–	A	0.8	9°	–	4	50
01-00654-04008		2.4	8	B	0.8	12°	0.76	4	50
01-00654-04012			12	B	0.8	12°	0.76	4	50
01-00654-05000	R0.5	3	–	A	1	9°	–	4	50
01-00654-05001		5	–	A	1	9°	–	4	50
01-00654-05002		10	–	A	1	9°	–	4	50
01-00654-05010		3	10	B	1	12°	0.95	4	50

How to Order When you order, indicate RSB230 (R)×(ℓ) [×(ℓ1)]. Choose Shank Dia. (d) for typeA of R1.5×9ℓ and R2×12ℓ.
※(γ) is reference value.

Unit : mm

Code No.	Radius (R)	Length of Cut (ℓ)	Underneck Length (ℓ1)	Type	Dia. (D)	Neck Taper Angle (γ)	Neck Dia. (d2)	Shank Dia. (d)	Overall Length (L)
01-00654-05015	R0.5	3	15	B	1	12°	0.95	4	60
01-00654-05020			20	B	1	12°	0.95	4	60
01-00654-05030			30	B	1	12°	0.95	4	70
01-00654-07500	R0.75	4.5	–	A	1.5	9°	–	4	50
01-00654-07501		7.5	–	A	1.5	9°	–	4	50
01-00654-07502		15	–	A	1.5	9°	–	4	60
01-00654-07515		4.5	15	B	1.5	12°	1.45	4	60
01-00654-07530			30	B	1.5	12°	1.45	4	70
01-00654-07545			45	B	1.5	12°	1.45	4	90
01-00654-10000	R1	6	–	A	2	9°	–	4	50
01-00654-10001		10	–	A	2	9°	–	4	50
01-00654-10002		20	–	A	2	9°	–	4	60
01-00654-10020		6	20	B	2	12°	1.94	4	60
01-00654-10030			30	B	2	12°	1.94	4	80
01-00654-10050			50	B	2	12°	1.94	4	110
01-00654-10070			70	B	2	12°	1.94	4	110
01-00654-15000	R1.5	9	–	A	3	–	–	3	100
01-00654-15001			–	A	3	9°	–	6	50
01-00654-15002		15	–	A	3	9°	–	6	60
01-00654-15030		9	30	B	3	12°	2.85	6	70
01-00654-15045			45	B	3	12°	2.85	6	90
01-00654-15060			60	B	3	12°	2.85	6	110
01-00654-20000	R2	12	–	A	4	–	–	4	120
01-00654-20001			–	A	4	9°	–	6	50
01-00654-20002		20	–	A	4	9°	–	6	60
01-00654-20030		12	30	B	4	12°	3.8	6	70
01-00654-20040			40	B	4	12°	3.8	6	90
01-00654-20070			70	B	4	12°	3.8	6	120
01-00654-25000	R2.5	15	–	A	5	9°	–	6	70
01-00654-25001		25	–	A	5	9°	–	6	80
01-00654-30000	R3	18	–	A	6	–	–	6	80
01-00654-30001		30	–	A	6	–	–	6	90
01-00654-30040		18	40	B	6	–	5.8	6	100
01-00654-30060			60	B	6	–	5.8	6	120
01-00654-30080			80	B	6	–	5.8	6	130

Work Material				ABS･MC nylon ･PTFE			Polycarbonate･POM･PEEK			Acrylic･Bakelite		
Radius	Length of Cut	Under neck Length	L/D	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm
R0.1	0.6	–	3	20,000	620	0.1	20,000	520	0.1	20,000	410	0.1
	1	–	5	17,100	400	0.05	17,100	340	0.05	17,100	270	0.05
	0.6	2	10	15,600	260	0.012	15,600	220	0.012	15,600	170	0.012
R0.15	0.9	–	3	20,000	1,050	0.15	20,000	880	0.15	20,000	700	0.15
	1.5	–	5	17,100	690	0.075	17,100	570	0.075	17,100	460	0.075
	0.9	3	10	15,600	450	0.018	15,600	370	0.018	15,600	300	0.018
R0.2	1.2	–	3	20,000	1,480	0.2	20,000	1,240	0.2	20,000	990	0.2
	2	–	5	17,100	970	0.1	17,100	810	0.1	17,100	640	0.1
	1.2	4	10	15,600	630	0.024	15,600	530	0.024	15,600	420	0.024
		5	12.5	15,000	550	0.02	15,000	460	0.02	15,000	370	0.02
R0.25	1.5	–	3	20,000	1,920	0.25	20,000	1,600	0.25	20,000	1,280	0.25
	2.5	–	5	17,100	1,250	0.12	17,100	1,040	0.12	17,100	830	0.12
	5	–	10	14,000	660	0.03	14,000	550	0.03	14,000	440	0.03
	1.5	10	20	13,500	450	0.01	13,500	370	0.01	13,500	300	0.01
R0.3	1.8	–	3	20,000	2,160	0.3	20,000	1,800	0.3	20,000	1,440	0.3
	3	–	5	17,100	1,410	0.15	17,100	1,170	0.15	17,100	940	0.15
	1.8	6	10	15,000	890	0.036	15,000	740	0.036	15,000	590	0.036
		10	16.7	13,700	610	0.02	13,700	510	0.02	13,700	410	0.02
R0.4	2.4	–	3	20,000	2,640	0.4	20,000	2,200	0.4	20,000	1,760	0.4
	4	–	5	17,100	1,720	0.2	17,100	1,430	0.2	17,100	1,150	0.2
	2.4	8	10	14,000	1,010	0.048	14,000	840	0.048	14,000	670	0.048
		12	15	12,700	750	0.032	12,700	620	0.032	12,700	500	0.032
R0.5	3	–	3	17,000	2,650	0.5	17,000	2,210	0.5	17,000	1,760	0.5
	5	–	5	14,500	1,730	0.25	14,500	1,440	0.25	14,500	1,150	0.25
	10	–	10	12,000	920	0.06	12,000	770	0.06	12,000	610	0.06
	3	10	10	13,000	1,110	0.06	13,000	920	0.06	13,000	740	0.06
		15	15	11,700	820	0.04	11,700	680	0.04	11,700	540	0.04
		20	20	11,000	600	0.02	11,000	500	0.02	11,000	400	0.02
R0.75	4.5	–	3	13,300	2,590	0.75	13,300	2,150	0.75	13,300	1,720	0.75
	7.5	–	5	11,100	1,710	0.37	11,100	1,430	0.37	11,100	1,140	0.37
	15	–	10	8,500	930	0.09	8,500	780	0.09	8,500	620	0.09
	4.5	15	10	9,400	1,150	0.09	9,400	960	0.09	9,400	770	0.09
		30	20	7,500	690	0.03	7,500	570	0.03	7,500	460	0.03
R1	6	–	3	9,900	2,320	1	9,900	1,930	1	9,900	1,550	1
	10	–	5	8,200	1,590	0.5	8,200	1,320	0.5	8,200	1,060	0.5
	20	–	10	5,600	850	0.12	5,600	710	0.12	5,600	560	0.12
	6	20	10	6,200	1,050	0.12	6,200	870	0.12	6,200	700	0.12
		30	15	5,300	810	0.08	5,300	680	0.08	5,300	540	0.08
R1.5	9(d3)	–	3	6,600	2,060	1.5	6,600	1,710	1.5	6,600	1,370	1.5
	9(d6)	–	3	6,600	2,060	1.5	6,600	1,710	1.5	6,600	1,370	1.5
	15	–	5	5,300	1,420	0.75	5,300	1,190	0.75	5,300	950	0.75
	9	30	10	3,700	920	0.18	3,700	770	0.18	3,700	610	0.18
		45	15	2,900	690	0.12	2,900	580	0.12	2,900	460	0.12
		60	20	2,300	500	0.06	2,300	420	0.06	2,300	330	0.06

Work Material				ABS･MC nylon ･PTFE			Polycarbonate･POM･PEEK			Acrylic･Bakelite		
Radius	Length of Cut	Under neck Length	L/D	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm	Spindle Speed min⁻¹	Feed mm/min	Depth of Cut ap mm
R2	12(d4)	–	3	4,900	1,910	2	4,900	1,590	2	4,900	1,270	2
	12(d6)	–	3	4,900	1,910	2	4,900	1,590	2	4,900	1,270	2
	20	–	5	4,000	1,320	1	4,000	1,100	1	4,000	880	1
	12	30	7.5	3,600	1,270	0.58	3,600	1,060	0.58	3,600	850	0.58
		40	10	2,700	850	0.24	2,700	710	0.24	2,700	570	0.24
		70	17.5	1,900	550	0.12	1,900	460	0.12	1,900	370	0.12
R2.5	15	–	3	3,900	1,820	2.5	3,900	1,510	2.5	3,900	1,210	2.5
	25	–	5	3,200	1,260	1.2	3,200	1,050	1.2	3,200	840	1.2
R3	18	–	3	3,300	1,750	3	3,300	1,460	3	3,300	1,170	3
	30	–	5	2,600	1,210	1.5	2,600	1,010	1.5	2,600	810	1.5
	18	40	6.7	2,600	1,270	1	2,600	1,060	1	2,600	850	1
		60	10	1,800	780	0.36	1,800	650	0.36	1,800	520	0.36
		80	13.3	1,600	650	0.28	1,600	540	0.28	1,600	430	0.28

Notes

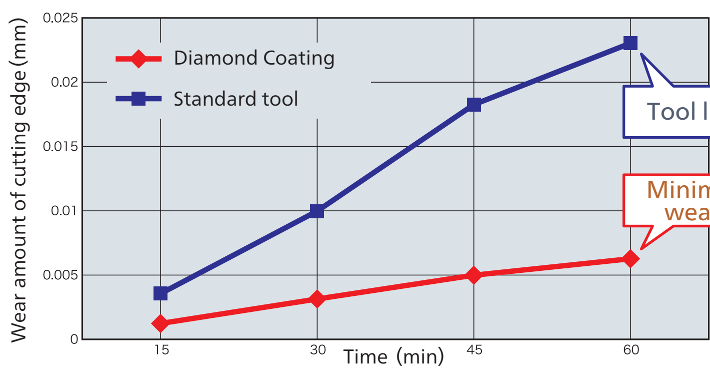
※1 These recommended cutting conditions indicate just reference for roughing. It should be adjusted according to milling shape and machine type.
※2 Reduce both spindle speed and feed at same rate for chattering and also for insufficient spindle speed of a machine.
※3 For finishing process, please adjust to the optimized condition to meet the requirement of machining accuracy.
※4 Necessary to adjust the cutting condition at the parts overloading against the tools such as inner corner parts.
※5 Adjust both spindle speed and feed at the same rate when chattering or abnormal sounds occurred.
※6 When a tool with L/D 10 times and longer deflects on milling, please reduce Feed or Depth of Cut.
※7 For a tool with L/D longer than 20 times, reduce spindle speed, feed rate and depth of cut at sufficient values by referring the cutting conditions of L/D 20 times.
※8 Air blow is recommended.
※9 Care for chip removal to avoid being stuck or caught during process for better surface quality.
※10 Minimize chucking runout.

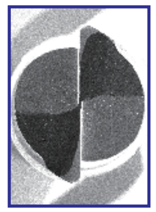
Long time machining and high durability are achieved on graphite machining

NS TOOL's proprietary diamond coating

The uniquely developed diamond coating is extremely hard with hardness of 10,000 HV.
Excellent durability and high adhesion technology with high-purity diamonds containing no bonding agents or impurities ensure long tool life in the machining of graphite and high silicon aluminium.

Comparison of coating by machining Resin inclusive of carbon





Standard tool (TiAlN Coating)

Diamond Coating

(n : 10,000min , Vf : 1,000mm/min, Depth of cut : 2mm (ap) ×0.1mm (ae), Cutting length : 40m, Machining time : 60 mins, Dry)

Product lineup

Shape	Model		Size	Features
Square	DCSE235		ϕ 0.5 ~ ϕ 6 Total 8 sizes	2-flute 35° helix angle Square end mill
Square	DCHR230		ϕ 0.5 ~ ϕ 6 Total 19 sizes	2-flute 30° helix angle Long neck square end mill
Ball	DCRB230		R0.2 ~ R3 Total 25 sizes	2-flute 30° helix angle Long neck ball end mill

Machhining case

DIAMOND COATING
2-Flute End Mill
DCSE235

DIAMOND COATING
2-Flute Long Neck End Mill
DCHR230

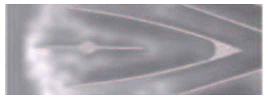
Work Material : Resin inclusive of glass fiber
Work size : 30 × 30 mm
(Machining depth 10 mm)
Coolant : Air blow
Total machining time : 53min

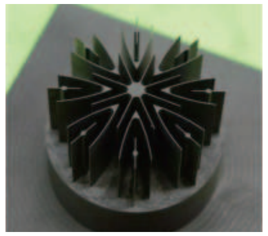
Process	Outer profile	Slot
Tool	DCSE235 ϕ6	DCHR230 ϕ1 × 6
Spindle speed [min^{-1}]	10,000	
Feed [mm/min]	2,000	1,000
Depth of cut ap × ae [mm]	10 × 0.5	ap 0.1
Machining time	3min	50min

DIAMOND COATING
2-flute Long Neck End Mill
DCHR230

Work Material : Graphite TTK-5
Work size : ϕ 14
(Machining depth 6 mm)
Coolant : Air blow
Total machining time : 5hr 13min

Thickness : 0.05 mm

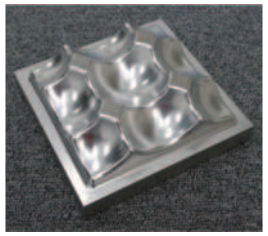




Process	Roughing・Finishing
Tool	DCHR230 ϕ0.5 × 6
Spindle speed [min^{-1}]	20,000
Feed [mm/min]	1,000
Depth of cut ap × ae [mm]	0.03 × 0.24
Machining time	5hr 13min

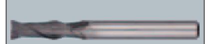
DIAMOND COATING
2-flute Long Neck Ball End Mill
DCRB230

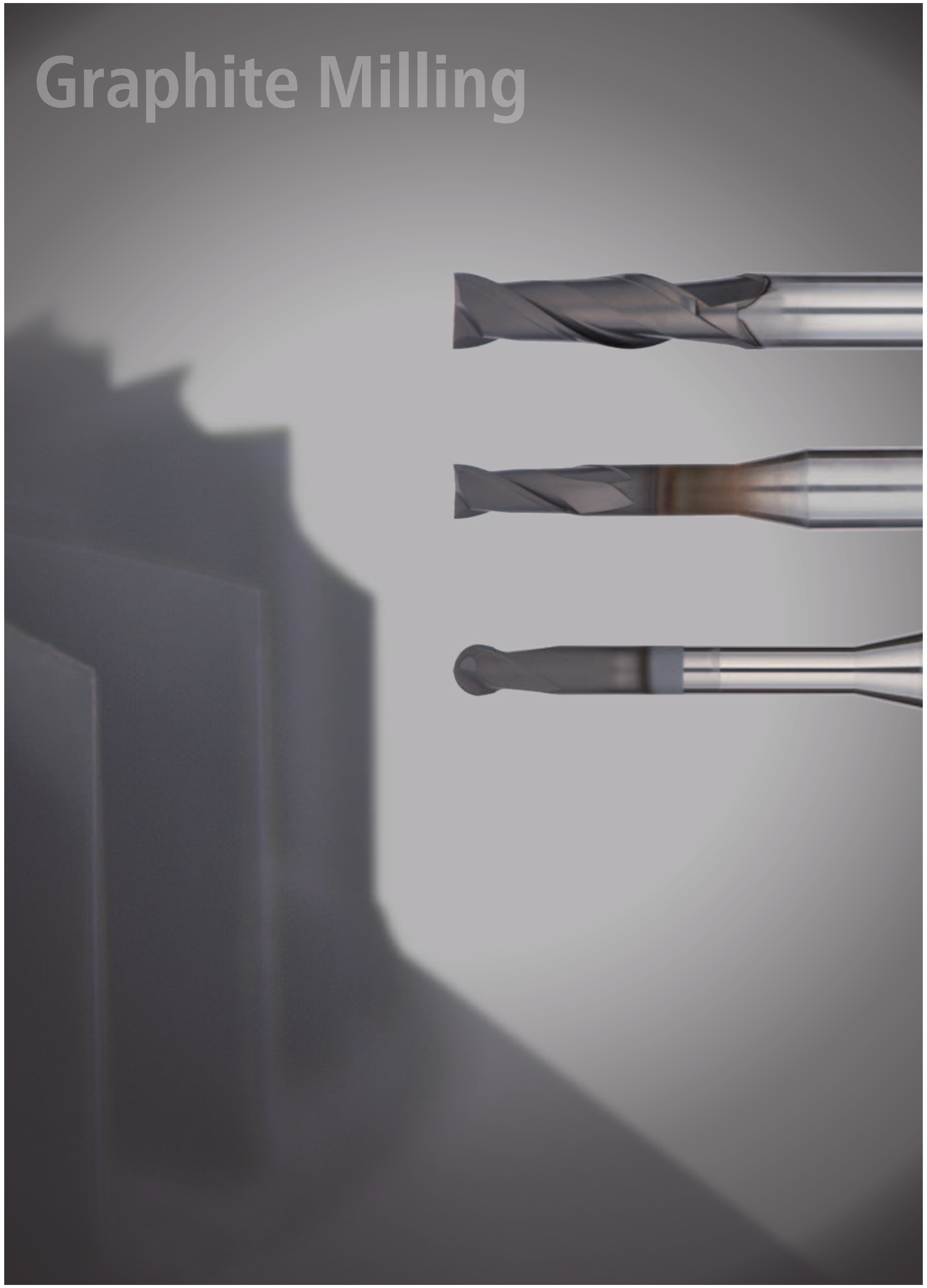
Work Material : MMC
Work size : 140 × 135 mm
(Machining depth 30 mm)
Coolant : Oil mist
Total machining time : 2hr 53min



Process	Roughing	Finishing
Tool	DCRB230 R3 × 30	
Spindle speed [min^{-1}]	10,000	
Feed [mm/min]	3,000	2,000
Depth of cut ap × ae [mm]	1 × 2	0.2 × 0.2
Machining time	1hr 28min	1hr 25min

Long time machining and high durability are achieved on graphite machining

Model	Size	Maximum Cutting Depth	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	Work Material P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ～55HRC	H Hardened Steel ～65HRC	H Hardened Steel ～70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Square																									
DCSE235 	ϕ0.5～ϕ6	3D	3D	DIA	2	35°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	8	M-006
2-flute with helix angle 35°end mill applied diamond coating suitable for graphite, composite material																									
Long Neck Square																									
DCHR230 	ϕ0.5～ϕ6	13D	2D	DIA	2	30°	Side	Slot	Face	-	-	-	-	-	-	-	-	-	-	-	-	◎	-	19	M-008
Long neck square end mill with diamond coating suitable for graphite, composite material																									
Long Neck Ball																									
DCRB230 	R0.2～R3	20D	≒1D	DIA	2	30°	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	◎	-	25	M-010
Long neck ball end mill with diamond coating suitable for graphite, composite material																									



DCSE235

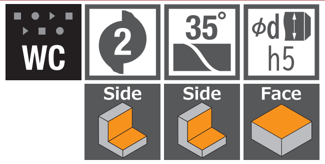
Size ϕ 0.5～ϕ 6

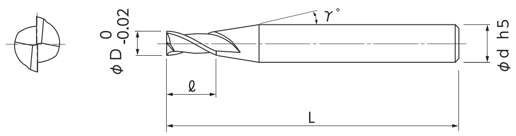
DIA ≦92.5 HRA

DIAMOND COATING 2-Flute End Mill

Total 8 sizes

2-flute with helix angle 35° end mill applied diamond coating suitable for graphite, composite material





- Original DIAMOND COATING realized a long tool life for the machining of graphite, silicon-aluminum alloy and brittle materials.
- Square design of L/D=3 is suited for the machining of narrow and deep area.

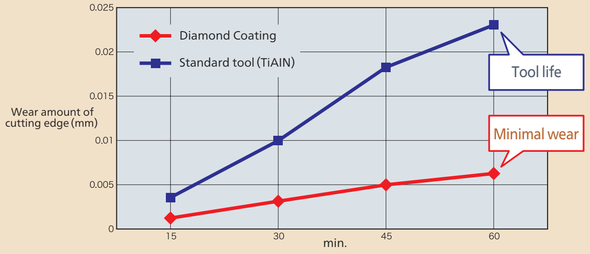
Unit : mm

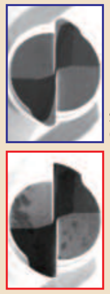
Code No.	Dia. (D)	Length of Cut (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
05-00035-00050	0.5	1.5	12°	4	45
05-00035-00100	1	3	12°	4	45
05-00035-00150	1.5	4.5	12°	4	45
05-00035-00200	2	6	12°	4	45
05-00035-00300	3	9	12°	6	45
05-00035-00400	4	12	12°	6	50
05-00035-00500	5	15	12°	6	55
05-00035-00600	6	18	–	6	60

How to Order When you order, indicate DCSE235 (D). ※(γ) is reference value.

Comparison of life

Comparison of coating by machining Resin inclusive of carbon





Standard tool (TiAlN Coating)

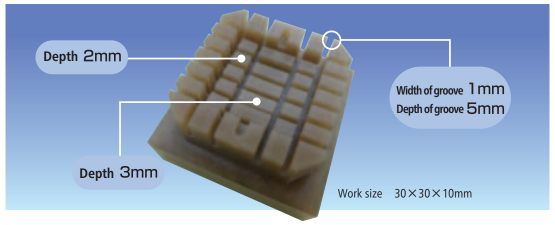
Diamond Coating

(n : 10,000min-1, Vf : 1,000mm/min, Depth of cut : 2mm (ap) ×0.1mm (ae), Cutting length : 40m, Machining time : 60 min, Dry)

Machining Case 1

Work Material : Resin inclusive of glass fiber

Process	Outer profile	Slot
Tool	DCSE235 ϕ6	DCHR230 ϕ1×6
Spindle speed	10,000 min^{-1}	10,000 min^{-1}
Feed	2,000 mm/min	1,000 mm/min
Depth of cut	10mm×0.5mm(ap×ae)	0.1mm(ap)
Cutting length	2.3m	28m
Machining time	3min	50min



Recommended Milling Conditions

Work Material	Graphite							Aluminium Alloy Die Casting						
	Side Milling				Slotting			Side Milling				Slotting		
Dia.	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut
	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm
0.5	30,000	1,000	1.5	0.03	30,000	800	0.05	20,000	600	1.5	0.01	20,000	500	0.03
1	30,000	1,200	3	0.05	30,000	1,000	0.1	20,000	1,000	3	0.02	20,000	800	0.1
1.5	25,000	1,500	4.5	0.07	25,000	1,200	0.2	20,000	1,000	4.5	0.05	20,000	800	0.2
2	25,000	2,000	6	0.1	25,000	1,500	0.3	20,000	1,500	6	0.07	20,000	1,200	0.3
3	20,000	2,500	9	0.1	20,000	1,500	0.4	20,000	1,500	9	0.07	20,000	1,200	0.4
4	18,000	2,500	12	0.2	18,000	2,000	0.5	18,000	2,000	12	0.15	18,000	1,500	0.5
5	14,000	3,000	15	0.2	14,000	2,000	0.7	14,000	2,500	15	0.15	14,000	2,000	0.7
6	12,000	3,000	18	0.3	12,000	2,000	1	12,000	2,500	18	0.2	12,000	2,000	1

Notes

※1 Graphite should be machined by the machining center designed for graphite machining.
When handling with graphite material, dust collector and respirator are recommended to protect against graphite dust.
※2 Air blow cooling is recommended for the machining of graphite.
※3 Slow down the feed for high accurate machining to avoid breakage of work piece.
※4 Adjust both spindle speed and feed at the same rate when chattering.

DCHR230

Size ϕ 0.5～ϕ 6

DIA ≦92.5 HRA

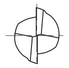
DIAMOND COATING 2-Flute Long Neck End Mill

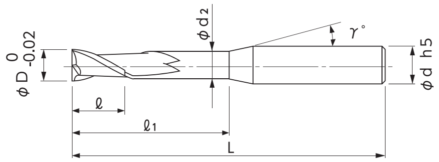
Total 19 sizes

WC 2 30° ϕd h5

Side Side Face

Long neck square end mill with diamond coating suitable for graphite and composite material





- Original DIAMOND COATING realized a long tool life for the machining of graphite, silicon-aluminium alloy and brittle materials.
- Long neck design is suited for the machining of narrow and deep area.

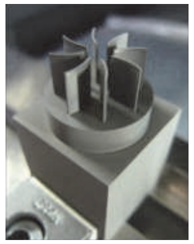
Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
05-00200-00502	0.5	2	1	0.46	12°	4	45
05-00200-00504		4	1	0.46	12°	4	45
05-00200-00506		6	1	0.46	12°	4	45
05-00200-01004	1	4	2	0.95	12°	4	50
05-00200-01006		6	2	0.95	12°	4	50
05-00200-01008		8	2	0.95	12°	4	50
05-00200-01010		10	2	0.95	12°	4	50
05-00200-01506	1.5	6	3	1.45	12°	4	50
05-00200-01512		12	3	1.45	12°	4	50
05-00200-01520		20	3	1.45	12°	4	60
05-00200-02006	2	6	4	1.94	12°	4	50
05-00200-02010		10	4	1.94	12°	4	50
05-00200-02016		16	4	1.94	12°	4	60
05-00200-02020		20	4	1.94	12°	4	60
05-00200-03016	3	16	6	2.85	12°	6	60
05-00200-03030		30	6	2.85	12°	6	70
05-00200-04020	4	20	8	3.8	12°	6	60
05-00200-04040		40	8	3.8	12°	6	90
05-00200-06030	6	30	12	5.8	–	6	90

How to Order — When you order, indicate DCHR230 (D)×(ℓ1). ※(γ) is reference value.

Machining case — S-034

Machining Case 1



propeller

- Work Material : Graphite (TTK-5)
- Total machining time : 1hr 20min
- Coolant : Air blow
- Work Size : ϕ 14mm (Height of blade : 6mm)

Process	Roughing (Cylinder)	Roughing	Semi-finishing	Finishing
Tool	DCSE235 ϕ6	DCHR230 ϕ1x10		
Spindle speed [min⁻¹]	8,000	20,000		
Feed[mm/min]	600	2,000	1,000	800
Depth of cut ap×ae [mm]	8x0.5	0.2x0.6	0.05x0.2	
Machining length [m]	7	67		18
Machining time	5min	1hr 5min		10min

Recommended Milling Conditions

Work Material		Graphite							Aluminium Alloy Die Casting						
		Contour Line Roughing				Slotting			Contour Line Roughing				Slotting		
Dia.	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut
		min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm	min⁻¹	mm/min	ap mm	ae mm	min⁻¹	mm/min	ap mm
0.5	2	30,000	1,200	0.1	0.3	30,000	800	0.1	20,000	1,000	0.03	0.3	20,000	500	0.03
	4	30,000	1,000	0.05	0.3	30,000	600	0.05	20,000	800	0.01	0.3	20,000	400	0.01
	6	25,000	800	0.03	0.3	25,000	500	0.03	20,000	600	0.01	0.3	20,000	300	0.01
1	4	30,000	2,500	0.2	0.6	30,000	1,500	0.2	20,000	2,000	0.15	0.6	20,000	1,200	0.15
	6	25,000	2,000	0.2	0.6	25,000	1,200	0.2	20,000	1,500	0.1	0.6	20,000	1,000	0.1
	8	20,000	1,500	0.1	0.6	20,000	1,000	0.1	20,000	1,000	0.07	0.6	20,000	700	0.07
	10	20,000	1,000	0.1	0.6	20,000	600	0.1	20,000	800	0.05	0.6	20,000	500	0.05
1.5	6	25,000	2,500	0.3	1	25,000	1,600	0.3	20,000	2,000	0.2	1	20,000	1,500	0.2
	12	16,000	1,800	0.2	1	16,000	1,000	0.2	16,000	1,500	0.05	1	16,000	1,000	0.05
	20	12,000	1,000	0.1	1	12,000	600	0.1	12,000	800	0.02	1	12,000	500	0.02
2	6	20,000	3,000	0.5	1.2	20,000	2,000	0.5	20,000	2,000	0.5	1.2	20,000	1,500	0.5
	10	20,000	2,500	0.5	1.2	20,000	1,600	0.5	20,000	1,500	0.3	1.2	20,000	1,000	0.3
	16	18,000	1,800	0.3	1.2	18,000	1,200	0.3	15,000	1,200	0.07	1.2	15,000	800	0.07
	20	15,000	1,200	0.2	1.2	15,000	800	0.2	10,000	1,000	0.03	1.2	10,000	600	0.03
3	16	20,000	3,000	0.5	2	20,000	2,000	0.5	18,000	2,000	0.5	2	18,000	1,500	0.5
	30	15,000	1,500	0.3	2	15,000	1,000	0.3	10,000	1,000	0.2	2	10,000	600	0.2
4	20	18,000	3,000	0.8	2.5	18,000	2,000	0.8	16,000	2,000	0.8	2.5	16,000	1,500	0.8
	40	9,000	1,500	0.4	2.5	9,000	1,000	0.4	8,000	1,000	0.4	2.5	8,000	600	0.4
6	30	16,000	3,000	1	4	16,000	2,000	1	12,000	2,000	1	4	12,000	1,500	1

Notes

※1 Graphite should be machined by the machining center designed for graphite machining. When handling with graphite material, dust collector and respirator are recommended to protect against graphite dust.
※2 Air blow cooling is recommended for the machining of graphite.
※3 Slow down the feed for high accurate machining to avoid breakage of work piece.
※4 Adjust both spindle speed and feed at the same rate when chattering.

DCRB230

Size R0.2 ~ R3

DIA ≦92.5 HRA

DCRB230

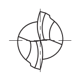
Graphite Milling

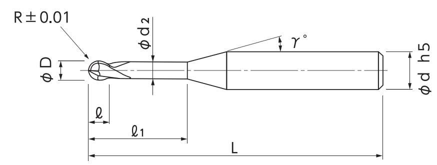
DIAMOND COATING 2-Flute Long Neck Ball End Mill

Total 25 sizes

WC 2 30° φd h5 3D

Long neck ball end mill with diamond coating suitable for graphite and composite material





- Original DIAMOND COATING realized a long tool life for the machining of graphite, silicon-aluminium alloy and brittle materials.
- Long neck design is suited for the machining of narrow and deep area.

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Dia. (D)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
05-00520-00201	R0.2	1	0.3	0.4	0.37	12°	4	45
05-00520-00202		2	0.3	0.4	0.37	12°	4	45
05-00520-00204		4	0.3	0.4	0.37	12°	4	45
05-00520-00206		6	0.3	0.4	0.37	12°	4	45
05-00520-00303	R0.3	3	0.45	0.6	0.56	12°	4	45
05-00520-00306		6	0.45	0.6	0.56	12°	4	45
05-00520-00309		9	0.45	0.6	0.56	12°	4	45
05-00520-00312		12	0.45	0.6	0.56	12°	4	45
05-00520-00504	R0.5	4	0.75	1	0.95	12°	4	45
05-00520-00506		6	0.75	1	0.95	12°	4	45
05-00520-00510		10	0.75	1	0.95	12°	4	50
05-00520-00516		16	0.75	1	0.95	12°	4	50
05-00520-00520		20	0.75	1	0.95	12°	4	55
05-00520-01006	R1	6	1.5	2	1.94	12°	4	45
05-00520-01010		10	1.5	2	1.94	12°	4	45
05-00520-01016		16	1.5	2	1.94	12°	4	50
05-00520-01020		20	1.5	2	1.94	12°	4	70
05-00520-01030		30	1.5	2	1.94	12°	4	70
05-00520-01520	R1.5	20	2.5	3	2.85	12°	6	65
05-00520-01540		40	2.5	3	2.85	12°	6	90
05-00520-02015	R2	15	3	4	3.8	12°	6	65
05-00520-02030		30	3	4	3.8	12°	6	70
05-00520-02040		40	3	4	3.8	12°	6	90
05-00520-03030	R3	30	6	6	5.8	–	6	80
05-00520-03060		60	6	6	5.8	–	6	120

How to Order　When you order, indicate DCRB230 (R)×(ℓ1).　※(γ) is reference value.

Recommended Milling Conditions

Work Material		Graphite				Aluminium Alloy Die Casting			
Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut		Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm	min^{-1}	mm/min	ap mm	ae mm
0.2	1	40,000	1,500	0.08	0.1	20,000	800	0.05	0.08
	2	40,000	1,200	0.05	0.1	20,000	600	0.02	0.05
	4	30,000	1,000	0.05	0.1	20,000	200	0.01	0.02
	6	30,000	800	0.03	0.1	20,000	120	0.01	0.01
0.3	3	30,000	1,500	0.1	0.2	20,000	1,000	0.05	0.1
	6	30,000	1,200	0.08	0.2	20,000	600	0.03	0.05
	9	25,000	1,000	0.07	0.15	18,000	400	0.01	0.02
	12	20,000	800	0.05	0.1	15,000	200	0.01	0.01
0.5	4	30,000	2,500	0.2	0.3	20,000	2,000	0.2	0.3
	6	25,000	2,000	0.15	0.3	20,000	1,500	0.1	0.3
	10	20,000	1,800	0.1	0.3	15,000	800	0.05	0.1
	16	18,000	1,200	0.08	0.2	12,000	500	0.03	0.08
	20	15,000	1,000	0.07	0.2	8,000	300	0.02	0.05
1	6	20,000	3,000	0.5	0.6	20,000	2,000	0.3	0.6
	10	20,000	2,500	0.3	0.6	20,000	1,500	0.3	0.6
	16	18,000	2,000	0.2	0.6	15,000	1,200	0.2	0.5
	20	15,000	1,500	0.2	0.5	10,000	1,000	0.1	0.2
	30	12,000	1,000	0.2	0.5	8,000	500	0.05	0.1
1.5	20	20,000	2,500	0.5	1	15,000	1,500	0.5	1
	40	12,000	1,400	0.3	0.7	7,000	600	0.1	0.3
2	15	20,000	3,000	0.5	1.5	16,000	2,000	0.5	1.5
	30	15,000	2,500	0.5	1.5	12,000	1,500	0.5	1.2
	40	12,000	2,000	0.3	1	8,000	1,000	0.2	0.7
3	30	16,000	3,000	0.6	2	12,000	2,000	0.6	2
	60	8,000	2,000	0.4	2	7,000	1,000	0.3	1

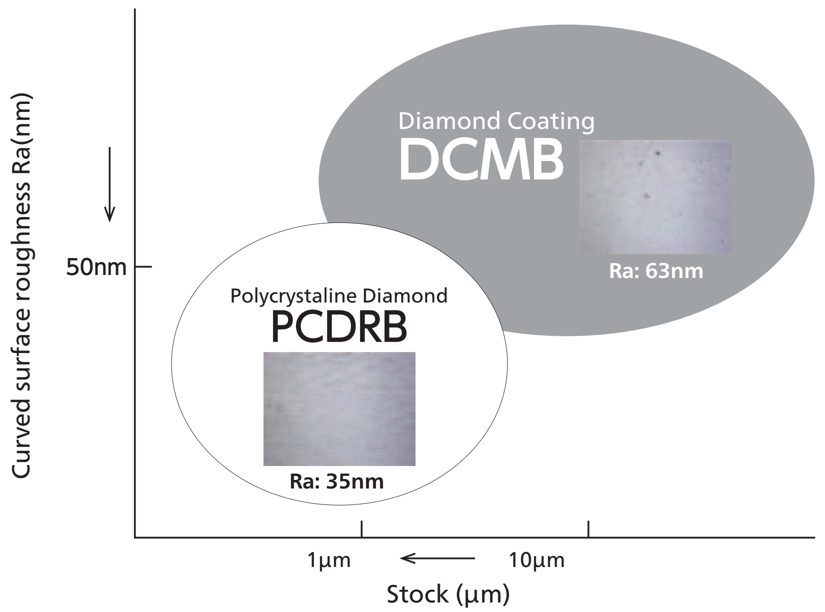
Notes

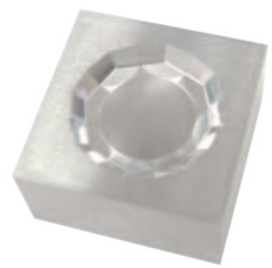
※1 Graphite should be machined by the machining center designed for graphite machining. When handling with graphite material, dust collector and respirator are recommended to protect against graphite dust.
※2 Air blow cooling is recommended for the machining of graphite.
※3 Reduce the feed for high accurate machining and to avoid breakage of work piece.
※4 Adjust both spindle speed and feed at the same rate when chattering.

Hard Brittle Material Milling

Diamond coating realizes direct milling even on hard brittle materials

Machining area of polycrystalline diamond and diamond coating





Productivity improvement by direct milling

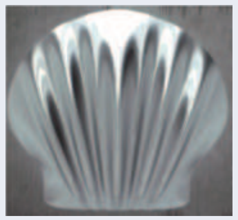
Tool : DCMB R0.5
Work Material : Cemented Carbide (92.5HRA)
Work Size : 15×15mm

EDM

- CAD/CAM operation
- Produce copper electrode
- EDM process

Total 3hr 30 min | 3 processes

Milling

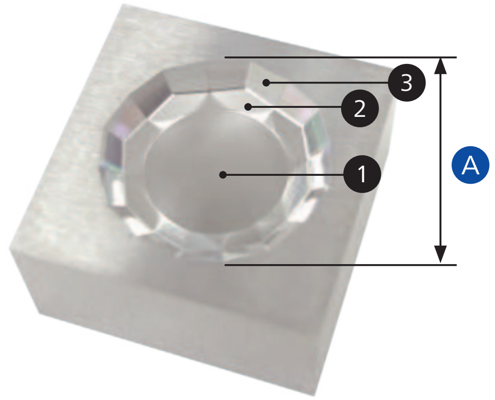


- CAD/CAM Toperation
- Machining process

Total 2hr 50 min | 2 processes

By reducing the process, shorten the cutting time

Tool : DCMB R0.3
Work Material : Cemented Carbide (92.5HRA)
Work Size : 15×15mm



Surface Roughness

Unit [μm]

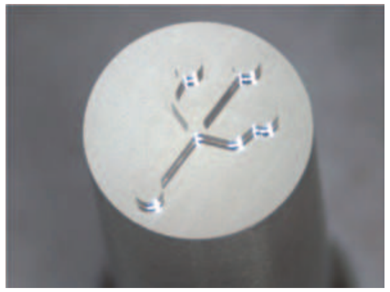
Measuring position	Ra	Rz
1 Bottom	0.15	1.31
2 Incline 20°	0.09	1.60
3 Incline 45°	0.05	1.10

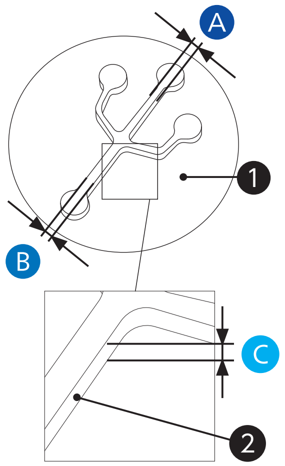
Accuracy

Unit [mm]

Measuring position	Target	Actual	Error
A Width	11.560	11.563	0.003

Tool : DCMS ϕ0.5/ϕ0.3
Work Material : Cemented Carbide (92.5HRA)
Work Size : Φ6 mm





Surface Roughness

Unit [μm]

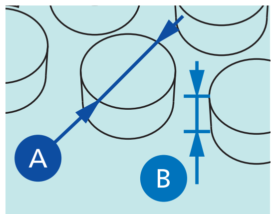
Measuring position	Ra	Rz
1 Bottom	0.017	0.109
2 Side	0.063	0.392

Accuracy

Unit [mm]

Measuring position	Target	Actual	Error
A Width	0.157	0.155	0.002
B Width	0.229	0.227	0.002
C Height	0.4	0.398	0.002

Tool : DCMS ϕ0.5
Work Material : Heat-resistant glass
Work Size : 20 × 20 mm



Accuracy

Unit [mm]

Measuring position	Target	Actual	Error
A Width	1.260	1.259	0.001
B Machining depth	1.000	0.999	0.001

Diamond coating realizes direct milling even on hard brittle materials

Hard Brittle Material Milling

Model	Size	Maximum Cutting Depth	Length of Cut	Coating	Number of Flute	Helix Angle	Side Milling	Slot Milling	Face Milling	3D Milling	Work Material													Number of Sizes	Page
											P	P	P	H			M	S	N	N	O	O	O		
											Carbon Steel	Alloy Steel	Prehardened Steel	Hardened Steel ～55 HRC	Hardened Steel ～65 HRC	Hardened Steel ～70 HRC	Stainless Steel	Heat Resistant Alloy etc	Aluminium Alloy	Copper	Resin	Graphite	Hard Brittle Material		
Long neck Square																									
DCMS	φ0.3 ～ φ2	4D	0.5D	DIA	6 / 8 / 10	30°	-	-	Face	-	-	-	-	-	-	-	-	-	-	-	-	-	◎	14	N-006
Square end mill for direct milling on cemented carbide, ceramic and glass																									
Ball • Long Neck Ball																									
DCMB	R0.1 ～ R1	2.5D	≒0.7D	DIA	2	20°	-	-	-	3D	-	-	-	-	-	-	-	-	-	-	-	-	◎	12	N-008
Ball end mill for direct milling on cemented carbide, ceramic and glass																									

DCMS

Size ϕ 0.3～ϕ 2

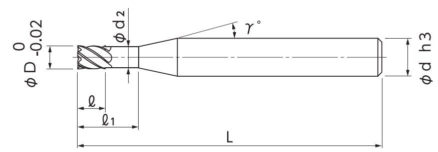
DIA ≦92.5 HRA

End Mill for Hard Brittle Materials

Total 14 sizes

MG 6 8 10 30° ϕd h3 Face

Square end mill for direct milling on cemented carbide, ceramic and glass



● Machinable on hard brittle materials such as cemented carbide and ceramic.
● High adhered DIAMOND COATING makes tool life long.

Unit : mm

Code No.	Dia. (D)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Number of Flute
05-00100-03006	0.3	0.6	0.15	0.28	12°	4	45	6
05-00100-03012		1.2	0.15	0.28	12°	4	45	6
05-00100-04008	0.4	0.8	0.2	0.38	12°	4	45	6
05-00100-04016		1.6	0.2	0.38	12°	4	45	6
05-00100-05010	0.5	1	0.25	0.46	12°	4	45	8
05-00100-05020		2	0.25	0.46	12°	4	45	8
05-00100-08016	0.8	1.6	0.4	0.76	12°	4	45	8
05-00100-08032		3.2	0.4	0.76	12°	4	45	8
05-00100-10020	1	2	0.5	0.95	12°	4	45	10
05-00100-10040		4	0.5	0.95	12°	4	45	10
05-00100-15030	1.5	3	0.75	1.45	12°	4	45	10
05-00100-15060		6	0.75	1.45	12°	4	45	10
05-00100-20040	2	4	1	1.94	12°	4	45	10
05-00100-20080		8	1	1.94	12°	4	45	10

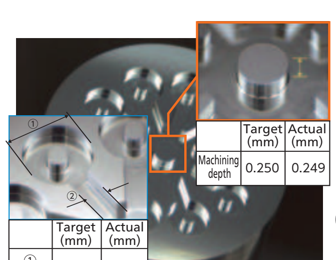
How to Order When you order, indicate DCMS (D)×(ℓ1). ※(γ) is reference value.

Machining case S-033

Machining Case 1

Work Material : Cemented Carbide (92.5HRA) Tool size : ϕ0.3

Work size : ϕ6mm Machining depth: 0.25mm



	Target (mm)	Actual (mm)
Machining depth	0.250	0.249

	Target (mm)	Actual (mm)
① Width	0.980	0.983
② Width of groove	0.335	0.334

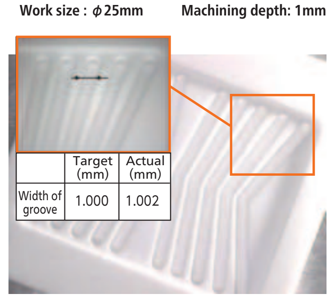
Spindle speed	40,000min^{-1}
Feed	80mm/min
Depth of cut	0.001mm×0.13mm (ap×ae)
Cutting length	39.2m
Machining time	8hr 30min
Coolant	Water-insoluble fluid

Surface roughness (Rz) : 0.12μm

Machining Case 2

Work Material : Aluminium Oxide (96%) Tool size : ϕ1

Work size : ϕ25mm Machining depth: 1mm



	Target (mm)	Actual (mm)
Width of groove	1.000	1.002

Spindle speed	20,000min^{-1}
Feed	100mm/min
Depth of cut	0.002mm×0.6mm (ap×ae)
Cutting length	91.3m
Machining time	17hr 50min
Coolant	Water-soluble fluid

Surface roughness (Rz) : 1μm

Recommended Milling Conditions

Dia.	Under Neck Length	Cemented Carbide Spindle Speed min^{-1}	Cemented Carbide Feed mm/min	Cemented Carbide Depth of Cut ap mm	Cemented Carbide Depth of Cut ae mm	Al_2O_3 Spindle Speed min^{-1}	Al_2O_3 Feed mm/min	Al_2O_3 Depth of Cut ap mm	Al_2O_3 Depth of Cut ae mm	Heat-resistant Glass Spindle Speed min^{-1}	Heat-resistant Glass Feed mm/min	Heat-resistant Glass Depth of Cut ap mm	Heat-resistant Glass Depth of Cut ae mm
0.3	0.6	40,000	50	0.001	0.15	40,000	80	0.002	0.15	40,000	80	0.002	0.15
	1.2	40,000	50	0.001	0.15	40,000	80	0.002	0.15	40,000	80	0.002	0.15
0.4	0.8	30,000	50	0.001	0.25	30,000	80	0.002	0.25	30,000	80	0.002	0.25
	1.6	30,000	50	0.001	0.25	30,000	80	0.002	0.25	30,000	80	0.002	0.25
0.5	1	20,000	80	0.001	0.3	20,000	120	0.002	0.3	20,000	120	0.002	0.3
	2	20,000	80	0.001	0.3	20,000	120	0.002	0.3	20,000	120	0.002	0.3
0.8	1.6	20,000	80	0.001	0.5	20,000	120	0.002	0.5	20,000	120	0.002	0.5
	3.2	20,000	80	0.001	0.5	20,000	120	0.002	0.5	20,000	120	0.002	0.5
1	2	20,000	100	0.001	0.6	20,000	150	0.002	0.6	20,000	150	0.002	0.6
	4	20,000	100	0.001	0.6	20,000	150	0.002	0.6	20,000	150	0.002	0.6
1.5	3	20,000	100	0.001	0.9	20,000	150	0.002	0.9	20,000	150	0.002	0.9
	6	15,000	100	0.001	0.9	15,000	150	0.002	0.9	15,000	150	0.002	0.9
2	4	20,000	100	0.001	1.2	20,000	150	0.002	1.2	20,000	150	0.002	1.2
	8	15,000	100	0.001	1.2	15,000	150	0.002	1.2	15,000	150	0.002	1.2

Notes

※1 Follow the recommended milling conditions to prevent possible tool breakage and coating flake.
※2 Minimize tool rotation runout for machining accuracy and to prevent tool breakage.
※3 Control characteristic of machine and spindle extension amount for such small cutting depth(ap) process.
※4 Recommend use water-insoluble fluid is recommended.

DCMB

Size R0.1 ~ R1

DIA ≦92.5 HRA

Hard Brittle Material Milling

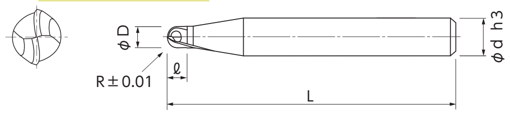
Ball End Mill for Hard Brittle Material

Total 12 sizes

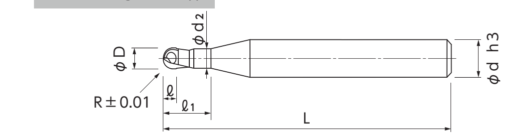
WC 2 20° ϕd h3 3D

Ball end mill for direct milling on cemented carbide, ceramic and glass

TYPE A : Standard Type



TYPE B : Long Neck Type



- Spiral ball shape with balanced strength and sharpness of cutting edges adopted newly-developed DIAMOND COATING with enhanced sticking force.

[Neck Profile]

Reference value of interference angle after length of cut is 12°. Actual measurement required, in order to avoid interference between tool and work material.

Unit : mm

Code No.	Radius (R)	Under Neck Length (ℓ1)	Length of Cut (ℓ)	Type	Neck Dia. (d2)	Shank Dia. (d)	Overall Length (L)
05-00500-00100	R0.1	–	0.15	A	–	4	45
05-00500-00101		0.5	0.12	B	0.18	4	45
05-00500-00200	R0.2	–	0.3	A	–	4	45
05-00500-00201		1	0.25	B	0.37	4	45
05-00500-00300	R0.3	–	0.45	A	–	4	45
05-00500-00301		1.5	0.35	B	0.56	4	45
05-00500-00500	R0.5	–	0.75	A	–	4	45
05-00500-00501		2.5	0.6	B	0.95	4	45
05-00500-00750	R0.75	–	1.1	A	–	4	45
05-00500-00751		3.8	0.9	B	1.45	4	45
05-00500-01000	R1	–	1.5	A	–	4	45
05-00500-01001		5	1.2	B	1.94	4	45

How to Order When you order, indicate DCMB (R) [×(ℓ1)].

Machining Case 1

Work Material : Cemented Carbide (89HRA)

Tool size : DCMB R1

Work size : 20×20×10mm

Finishing

Spindle speed	20,000min^{-1}
Feed	200mm/min
Depth of cut	0.005mm×0.01mm (ap×ae)
Machining time	3hr 55min
Coolant	Oil mist

Surface roughness (Rz) : 0.51μm~1.04μm

Recommended Milling Conditions

Work Material		Cemented Carbide			
(R) Radius	Under Neck Length	Spindle Speed	Feed	Depth of Cut	
		min^{-1}	mm/min	ap mm	ae mm
R0.1	–	30,000	100	0.004	0.004
	0.5	30,000	30	0.002	0.003
R0.2	–	30,000	150	0.008	0.03
	1	30,000	100	0.006	0.025
R0.3	–	30,000	200	0.01	0.05
	1.5	30,000	200	0.01	0.05
R0.5	–	30,000	300	0.02	0.10
	2.5	30,000	300	0.02	0.10
R0.75	–	30,000	300	0.03	0.15
	3.8	30,000	300	0.03	0.15
R1	–	20,000	300	0.04	0.15
	5	20,000	300	0.04	0.15

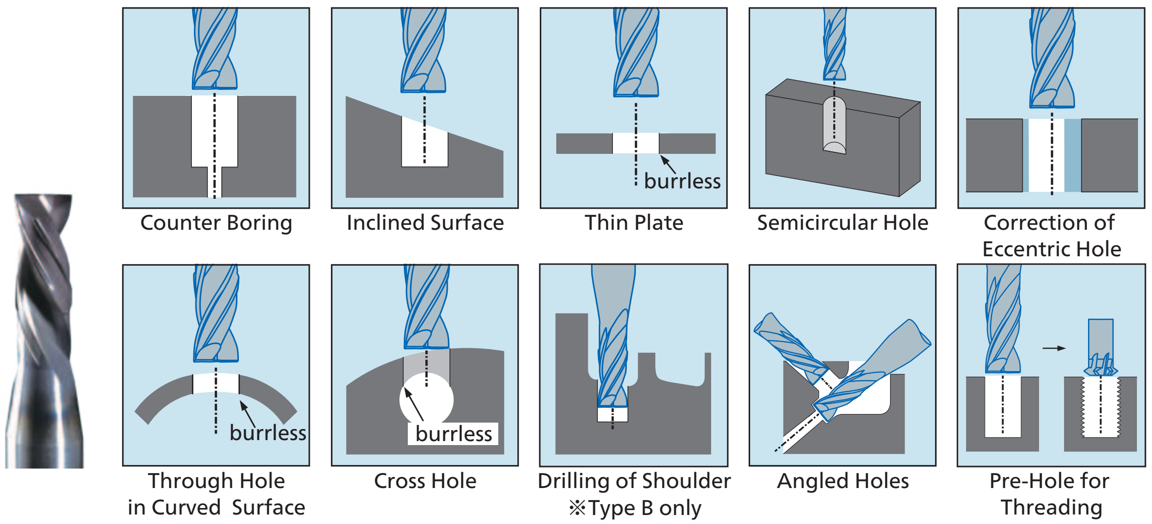
Notes

※1 Follow the recommended milling conditions to prevent tool breakage and coating peeling.
※2 Minimal tool runout is required to avoid the tool breakage and to increase the work accuracy.
※3 Recommend to assess the machine characters, such as expansion of the spindle and others before using the tool.
※4 Accurate tool path for approach method, tolerance setting and etc. is required to reduce the cutting load.

Drill

Lineup for three categories

Usage of a flat drill for various scenes



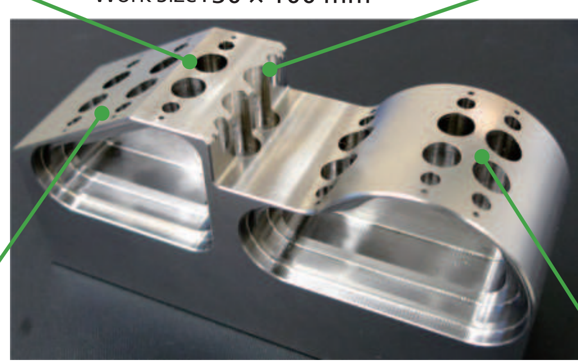
Drilling on flat surface

Drilling for semicircular hole

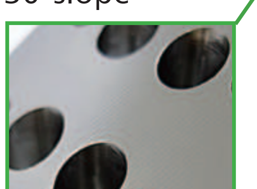
MFD

Work Material : SUS304

Work Size : 30 × 100 mm



Drilling on 30°slope

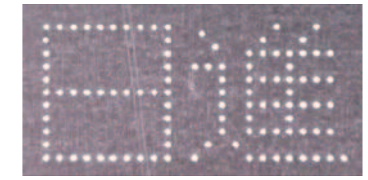


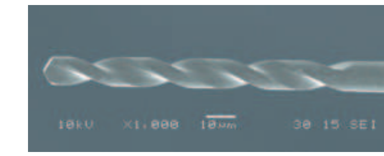
Through hole drilling on curved surface

Micro Drill Standardized from minimum ϕ 0.01

NSMD ϕ0.03

Work Material : SUS304

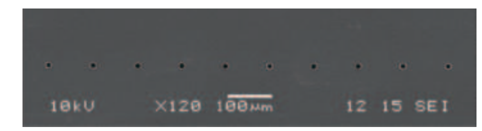




ϕ0.03 Through hole, plate thickness 0.15mm

NSMD ϕ0.01

Work Material : A5052

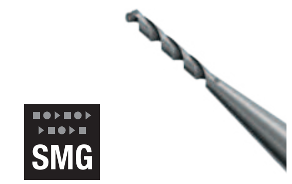


ϕ0.01 blind hole, cutting depth 0.1mm

Micro Drill

MUGEN MICRO COATING

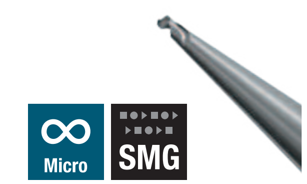
NSMD-MS　NSMD-M



Non coating

NSMD-S　NSMD

Micro Point Drill



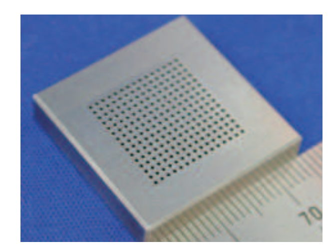
MUGEN MICRO COATING

Non coating

NSPD-M　NSPD

Lineup for steels, hardened steels

H



MSDH ϕ0.5

Work Material : DC53 (60HRC)

Work Size : 25 × 25 mm

Through hole, cutting depth 4.9mm (85sec/hole)Usable even after 1,000 holes drilling

P M N

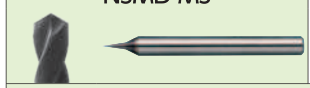
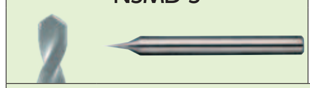
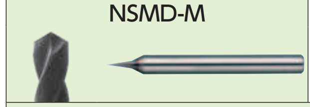
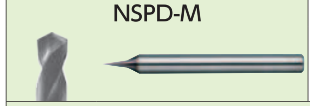
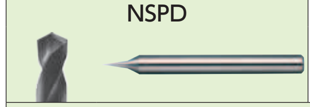
Lineup from ϕ0.1～ϕ1 in 0.01mm increments

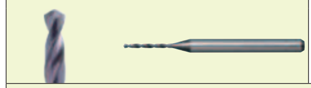
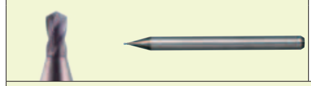
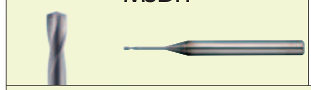
UGEN COATING Miniature Drill

MDR-R

MUGEN COATING Point Drill

MDR-PD

Model	Size	Flute Length	Point Angle	Coating	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Flat Drill																			
MFD 	ϕ0.1 ~ ϕ6	2D	-	∞	◎	◎	○	-	-	-	○	-	○	○	-	-	-	69	O-006
Stable drilling is realized in various scenes such as inclined surface and curved surface																			
Micro Drill																			
NSMD-MS 	ϕ0.01 ~ ϕ0.05	6D	120°	∞ Micro	○	○	○	-	-	-	○	○	○	-	-	-	-	9	O-010
Coated micro drill Dia.0.1mm or smaller to drill hole depth L/D=6																			
NSMD-S 	ϕ0.01 ~ ϕ0.05	6D	120°	-	-	-	-	-	-	-	○	-	○	○	○	-	-	7	O-012
Micro drill Dia.0.1mm or smaller to drill hole depth L/D=6																			
NSMD-M 	ϕ0.01 ~ ϕ0.1	10D	120°	∞ Micro	○	○	○	-	-	-	○	○	○	-	-	-	-	19	O-014
Coated micro drill Dia.0.1mm or smaller to drill hole depth L/D=10																			
NSMD 	ϕ0.01 ~ ϕ0.1	10D	120°	-	-	-	-	-	-	-	○	-	○	○	○	-	-	12	O-016
Micro drill Dia.0.1mm or smaller to drill hole depth L/D=10																			
NSPD-M 	ϕ0.01 ~ ϕ0.1	1.5~2D	120°	∞ Micro	○	○	○	-	-	-	○	○	○	-	-	-	-	12	O-018
For making a guide hole for coated micro drill																			
NSPD 	ϕ0.01 ~ ϕ0.1	1.5~2D	120°	-	-	-	-	-	-	-	○	-	○	○	○	-	-	12	O-020
For making a guide hole for micro drill																			

Model	Size	Flute Length	Point Angle	Coating	P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Drill																			
MDR-R 	ϕ0.1 ~ ϕ1	10D	120°	∞	◎	◎	○	-	-	-	○	-	○	○	-	-	-	91	O-022
Miniature pivot drill. Maximum flute length is L/D=10																			
MDR-PD 	ϕ0.1 ~ ϕ1	2D	120°	∞	◎	◎	○	-	-	-	○	-	○	○	-	-	-	10	O-026
Miniature point drill for aiming at guide hole which brings stable drilling																			
MSDH 	ϕ0.1 ~ ϕ1	10D	150°	∞ Premium	-	-	○	◎	◎	-	-	-	-	-	-	-	-	19	O-028
Available for drilling on hardened steel which has 65HRC																			

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Stainless Steel M
Aluminium Alloy N
Copper N

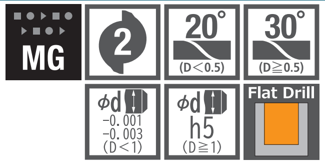
MFD

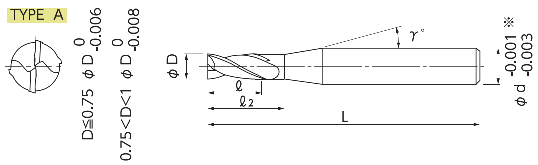
Size ϕ0.1 ～ ϕ6

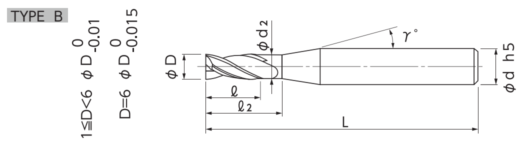
MUGEN COATING Flat Drill

Total 69 sizes

Stable drilling is realized in various scenes such as inclined surface and curved surface







- Small diameter drill with flat end profile, tool design developed and optimized for different sizes.
- Developed for the precise drilling field. Standardized every 0.05 sizes from ϕ0.1～ϕ0.95, and every 0.1 for over ϕ1.
- Stable drilling is realized in various scenes such as inclined surface and curved surface!
- High efficient counter boring is available, also possible to reduce the back burr.

※ Shank tolerance is h4(JIS), NS TOOL produces within 0.002mm from -0.001mm ～ -0.003mm.

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Under Neck Length (ℓ2)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00230-00010	0.1	0.2	0.3	A	–	9°	4	45
04-00230-00015	0.15	0.3	0.45	A	–	9°	4	45
04-00230-00020	0.2	0.4	0.6	A	–	9°	4	45
04-00230-00025	0.25	0.5	0.75	A	–	9°	4	45
04-00230-00030	0.3	0.6	0.9	A	–	9°	4	45
04-00230-00035	0.35	0.7	1.05	A	–	9°	4	45
04-00230-00040	0.4	0.8	1.2	A	–	9°	4	45
04-00230-00045	0.45	0.9	1.35	A	–	9°	4	45
04-00230-00050	0.5	1	1.5	A	–	9°	4	45
04-00230-00055	0.55	1.1	1.65	A	–	9°	4	45
04-00230-00060	0.6	1.2	1.8	A	–	9°	4	45
04-00230-00065	0.65	1.3	1.95	A	–	9°	4	45
04-00230-00070	0.7	1.4	2.1	A	–	9°	4	45
04-00230-00075	0.75	1.5	2.25	A	–	9°	4	45
04-00230-00080	0.8	1.6	2.4	A	–	9°	4	45
04-00230-00085	0.85	1.7	2.55	A	–	9°	4	45
04-00230-00090	0.9	1.8	2.7	A	–	9°	4	45
04-00230-00095	0.95	1.9	2.85	A	–	9°	4	45
04-00230-00100	1	2	3	B	0.95	9°	4	55
04-00230-00110	1.1	2.2	3.3	B	1.05	9°	4	55

How to Order When you order, indicate MFD (D). ※(γ) is reference value.

Machining case S-035

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Under Neck Length (ℓ2)	Type	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00230-00120	1.2	2.4	3.6	B	1.15	9°	4	55
04-00230-00130	1.3	2.6	3.9	B	1.25	9°	4	55
04-00230-00140	1.4	2.8	4.2	B	1.35	9°	4	55
04-00230-00150	1.5	3	4.5	B	1.45	9°	4	55
04-00230-00160	1.6	3.2	4.8	B	1.55	9°	4	55
04-00230-00170	1.7	3.4	5.1	B	1.65	9°	4	55
04-00230-00180	1.8	3.6	5.4	B	1.75	9°	4	55
04-00230-00190	1.9	3.8	5.7	B	1.84	9°	4	55
04-00230-00200	2	4	6	B	1.94	9°	4	55
04-00230-00210	2.1	4.2	6.3	B	2	9°	4	60
04-00230-00220	2.2	4.4	6.6	B	2.1	9°	4	60
04-00230-00230	2.3	4.6	6.9	B	2.2	9°	4	60
04-00230-00240	2.4	4.8	7.2	B	2.3	9°	4	60
04-00230-00250	2.5	5	7.5	B	2.4	9°	4	60
04-00230-00260	2.6	5.2	7.8	B	2.45	9°	4	60
04-00230-00270	2.7	5.4	8.1	B	2.55	9°	4	60
04-00230-00280	2.8	5.6	8.4	B	2.65	9°	4	60
04-00230-00290	2.9	5.8	8.7	B	2.75	9°	4	60
04-00230-00300	3	6	9	B	2.85	9°	6	60
04-00230-00310	3.1	6.2	9.3	B	2.9	9°	6	60
04-00230-00320	3.2	6.4	9.6	B	3	9°	6	60
04-00230-00330	3.3	6.6	9.9	B	3.1	9°	6	60
04-00230-00340	3.4	6.8	10.2	B	3.2	9°	6	60
04-00230-00350	3.5	7	10.5	B	3.3	9°	6	60
04-00230-00360	3.6	7.2	10.8	B	3.4	9°	6	60
04-00230-00370	3.7	7.4	11.1	B	3.5	9°	6	60
04-00230-00380	3.8	7.6	11.4	B	3.6	9°	6	60
04-00230-00390	3.9	7.8	11.7	B	3.7	9°	6	60
04-00230-00400	4	8	12	B	3.8	9°	6	60
04-00230-00410	4.1	8.2	12.3	B	3.9	9°	6	60
04-00230-00420	4.2	8.4	12.6	B	4	9°	6	60
04-00230-00430	4.3	8.6	12.9	B	4.1	9°	6	60
04-00230-00440	4.4	8.8	13.2	B	4.2	9°	6	60
04-00230-00450	4.5	9	13.5	B	4.3	9°	6	60
04-00230-00460	4.6	9.2	13.8	B	4.4	9°	6	60
04-00230-00470	4.7	9.4	14.1	B	4.5	9°	6	60
04-00230-00480	4.8	9.6	14.4	B	4.6	9°	6	60
04-00230-00490	4.9	9.8	14.7	B	4.7	9°	6	60
04-00230-00500	5	10	15	B	4.8	9°	6	60
04-00230-00510	5.1	10.2	15.3	B	4.9	9°	6	60
04-00230-00520	5.2	10.4	15.6	B	5	9°	6	60
04-00230-00530	5.3	10.6	15.9	B	5.1	9°	6	60
04-00230-00540	5.4	10.8	16.2	B	5.2	9°	6	60
04-00230-00550	5.5	11	16.5	B	5.3	9°	6	60
04-00230-00560	5.6	11.2	16.8	B	5.4	9°	6	60
04-00230-00570	5.7	11.4	17.1	B	5.5	9°	6	60
04-00230-00580	5.8	11.6	17.4	B	5.6	9°	6	60
04-00230-00590	5.9	11.8	17.7	B	5.7	9°	6	60
04-00230-00600	6	12	18	B	5.8	–	6	60

Recommended Milling Conditions

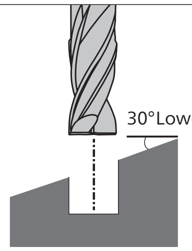
Work Material	Carbon Steels S50C			Alloy Steels SCM440			Stainless Steels SUS304			Aluminium Alloy A5052			Aluminium Alloy Die Casting ADC		
Dia.	Spindle Speed	Feed	Feed per Revolution	Spindle Speed	Feed	Feed per Revolution	Spindle Speed	Feed	Feed per Revolution	Spindle Speed	Feed	Feed per Revolution	Spindle Speed	Feed	Feed per Revolution
	mim^{-1}	mm/min	mm/rev	mim^{-1}	mm/min	mm/rev	mim^{-1}	mm/min	mm/rev	mim^{-1}	mm/min	mm/rev	mim^{-1}	mm/min	mm/rev
0.1	36,000	15	0.0004	34,000	10	0.0003	20,000	5	0.0003	40,000	45	0.0011	40,000	35	0.0009
0.2	32,000	30	0.0009	30,000	20	0.0007	17,000	10	0.0006	36,000	90	0.0025	36,000	70	0.0019
0.3	30,000	60	0.002	28,000	40	0.0014	15,000	15	0.001	34,000	140	0.0041	34,000	110	0.0032
0.4	28,000	90	0.0032	26,000	60	0.0023	13,000	15	0.0012	32,000	180	0.0056	32,000	140	0.0044
0.5	26,000	120	0.0046	24,000	85	0.0035	11,000	20	0.0018	30,000	210	0.007	30,000	170	0.0057
0.6	24,000	140	0.0058	22,000	100	0.0045	10,000	20	0.002	28,000	240	0.0086	28,000	190	0.0068
0.7	22,000	160	0.0073	21,000	120	0.0057	9,000	25	0.0028	26,000	260	0.01	26,000	210	0.0081
0.8	21,000	180	0.0086	20,000	140	0.007	8,000	25	0.0031	24,000	280	0.0117	24,000	220	0.0092
0.9	20,000	200	0.01	19,000	160	0.0084	7,000	30	0.0043	22,000	300	0.0136	22,000	240	0.0109
1	19,000	250	0.013	18,000	180	0.01	6,500	35	0.005	20,000	360	0.018	20,000	300	0.015
2	10,500	370	0.035	10,000	200	0.02	3,600	35	0.01	20,000	720	0.036	20,000	600	0.03
3	8,000	430	0.054	6,800	300	0.044	2,500	40	0.016	15,000	1,000	0.067	13,000	760	0.058
4	6,000	430	0.072	5,200	320	0.062	2,400	60	0.025	11,000	1,000	0.091	10,000	760	0.076
5	4,800	430	0.09	4,200	320	0.076	1,900	60	0.032	9,000	1,000	0.111	8,000	760	0.095
6	4,000	430	0.108	3,600	320	0.089	1,600	80	0.05	7,500	1,000	0.133	6,600	760	0.115

Notes

※1 Recommend drilling depth is 2D.
※2 Coolant must supply correctly to the point of drilling or flute.
※3 Adjust drilling condition conforming to machine rigidity, holder rigidity and clamping condition.
※4 Refer below table for recommended drilling condition in case of drilling on curved surface, inclined surface or semicircular hole.
※5 Minimize chucking runout.
※6 When chip can not be disposed, apply step feed.
※7 Water soluble fluid is recommended.

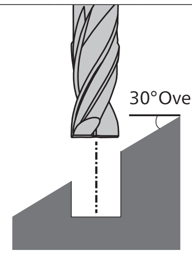
Recommended Drilling Conditions Depending on Work Shape

Slope (Inclination angle 30° lower)



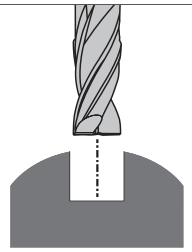
Dia.	Feed
ϕ0.1~4.5	70%
ϕ4.6~6	40%

Slope (Inclination angle 30° over)



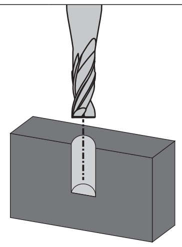
Dia.	Spindle Speed	Feed
ϕ0.1~4.5	80%	50%
ϕ4.6~6	80%	30%

Curved Surface



Dia.	Feed
ϕ0.1~6	90%

Semicircular Hole



Dia.	Spindle Speed	Feed
ϕ0.1~4.5	80%	40%
ϕ4.6~6	80%	30%

NSMD-MS

Size ϕ 0.01 ~ ϕ 0.05

Micro ≦40 HRC

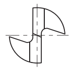
NSMD-MS

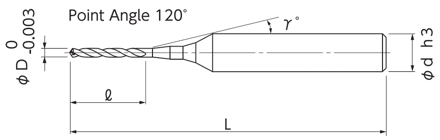
MUGEN MICRO COATING Micro Drill Short

Total 9 sizes

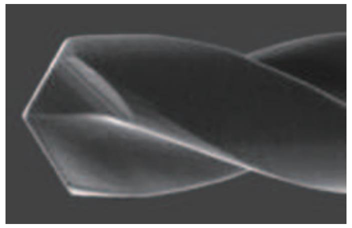
SMG 2 30° ϕd h3 Drill

Coated micro drill Dia.0.1mm or smaller to drill hole depth L/D=6





- L/D=6 short type.
- Special thin film coating for Micro Drill exercise high drilling performance on steels include stainless steels.
- Thinning on the cutting edge to reduce cutting load for accurate drilling. (Dia. 0.02~)



NSMD-MS ϕ0.03

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00006-00100	0.01	0.06	15°	4	40
04-00006-00150	0.015	0.09	15°	4	40
04-00006-00200	0.02	0.12	15°	4	40
04-00006-00250	0.025	0.15	15°	4	40
04-00006-00300	0.03	0.18	15°	4	40
04-00006-00350	0.035	0.24	15°	4	40
04-00006-00400	0.04	0.24	15°	4	40
04-00006-00450	0.045	0.3	15°	4	40
04-00006-00500	0.05	0.3	15°	4	40

How to Order When you order, indicate NSMD-MS (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Aluminium Alloy A5052		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	μm	min^{-1}	mm/min	μm
0.01	20,000	1	0.1	30,000	2	0.5
0.03	20,000	2	0.5	30,000	3	1.5
0.05	20,000	2	3	30,000	4	5
Notes	※1 Use appropriate coolant for work material and machining description. ※2 Minimize chucking runout by setting spindle speed at minimum oscillation. (Recommend to measure actual runout at activated Spindle Speed.) ※3 Set up flat surface before start machining. ※4 Take extra care when chucking in and out.					

NSMD-S

Size ϕ 0.01 ～ ϕ 0.05

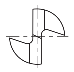
SMG

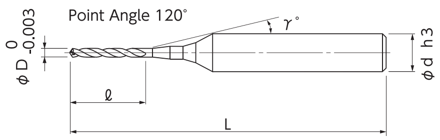
Micro Drill Short

Total 7 sizes

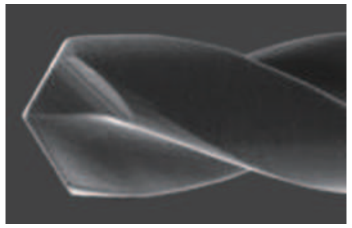
Micro drill Dia.0.1mm or smaller to drill hole depth L/D=6

2 | 30° | ϕd h3 | Drill





- L/D=6 short type, realized stable drilling.
- Thinning on the cutting edge to reduce cutting load for accurate drilling. (Dia. 0.02～)



NSMD-S　ϕ0.03

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00005-00100	0.01	0.06	15°	4	40
04-00005-00150	0.015	0.09	15°	4	40
04-00005-00200	0.02	0.12	15°	4	40
04-00005-00250	0.025	0.15	15°	4	40
04-00005-00300	0.03	0.18	15°	4	40
04-00005-00400	0.04	0.24	15°	4	40
04-00005-00500	0.05	0.3	15°	4	40

How to Order　When you order, indicate NSMD-S (D).　※(γ) is reference value.

○ Stainless Steel M
○ Aluminium Alloy N
○ Copper N
○ Resin O

Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Aluminium Alloy A5052		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	μm	min^{-1}	mm/min	μm
0.01	20,000	1	0.1	30,000	2	0.5
0.03	20,000	2	0.5	30,000	3	1.5
0.05	20,000	2	3	30,000	4	5

Notes

※1 Use appropriate coolant for work material and machining description.
※2 Minimize chucking runout by setting spindle speed at minimum oscillation.
(Recommend to measure actual runout at activated Spindle Speed.)
※3 Set up flat surface before start machining.
※4 Take extra care when chucking in and out.

M Stainless Steel ○
N Aluminium Alloy ○
N Copper ○
O Resin ○

NSMD-M

Size ϕ 0.01 ～ ϕ 0.1

Micro ≤40 HRC

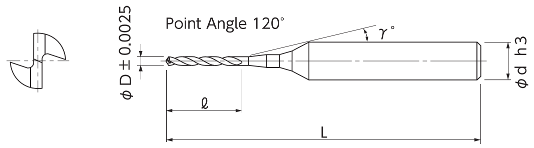
NSMD-M

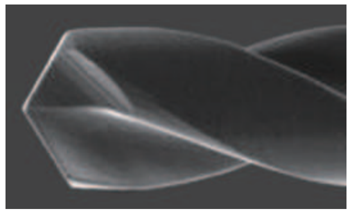
MUGEN MICRO COATING Micro Drill

Total 19 sizes

Coated micro drill Dia.0.1mm or smaller to drill hole depth L/D=10

SMG 2 30° ϕd h3 Drill





NSMD-M ϕ0.03

- L/D=10 standard type.
- Special thin film coating for Micro Drill exercise high drilling performance on steels include stainless steels.
- Thinning on the cutting edge to reduce cutting load for accurate drilling. (Dia. 0.02～)

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00002-00100	0.01	0.1	15°	4	40
04-00002-00150	0.015	0.15	15°	4	40
04-00002-00200	0.02	0.2	15°	4	40
04-00002-00250	0.025	0.25	15°	4	40
04-00002-00300	0.03	0.3	15°	4	40
04-00002-00350	0.035	0.4	15°	4	40
04-00002-00400	0.04	0.4	15°	4	40
04-00002-00450	0.045	0.5	15°	4	40
04-00002-00500	0.05	0.5	15°	4	40
04-00002-00550	0.055	0.6	15°	4	40
04-00002-00600	0.06	0.6	15°	4	40
04-00002-00650	0.065	0.7	15°	4	40
04-00002-00700	0.07	0.7	15°	4	40
04-00002-00750	0.075	0.8	15°	4	40
04-00002-00800	0.08	0.8	15°	4	40
04-00002-00850	0.085	0.9	15°	4	40
04-00002-00900	0.09	0.9	15°	4	40
04-00002-00950	0.095	1	15°	4	40
04-00002-01000	0.1	1	15°	4	40

How to Order When you order, indicate NSMD-M (D). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Aluminium Alloy A5052		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	μm	min^{-1}	mm/min	μm
0.01	20,000	1	0.1	30,000	2	0.5
0.03	20,000	2	0.5	30,000	3	1.5
0.05	20,000	2	3	30,000	4	5
0.1	20,000	5	5	25,000	10	10
Notes	※1 Use appropriate coolant for work material and machining description. ※2 Minimize chucking runout by setting spindle speed at minimum oscillation. (Recommend to measure actual runout at activated Spindle Speed.) ※3 Set up flat surface before start machining. ※4 Take extra care when chucking in and out.					

Drill

P Carbon Steel
P Alloy Steel
P Prehardened Steel
M Stainless Steel
S Titanium Alloy Heat Resistant Alloy
N Aluminium Alloy

NSMD

Size ϕ 0.01 ~ ϕ 0.1

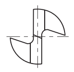
SMG

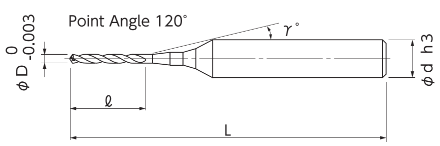
Micro Drill

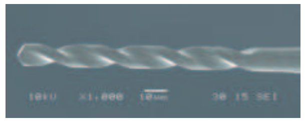
Total 12 sizes

Micro drill Dia.0.1mm or smaller to drill hole depth L/D=10

2 | 30° | φd h3 | Drill

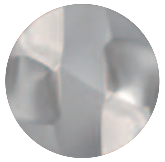






NSMDϕ0.01

- Standardized from dia. 0.01mm by concentrating NS manufacturing technology!
- Micro Drill develops new drilling capability.
- Thinning on the cutting edge to reduce cutting load for accurate drilling.(Dia. 0.02~)
- L/D=10 standard type.



Thinning

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00001-00100	0.01	0.1	15°	4	40
04-00001-00150	0.015	0.15	15°	4	40
04-00001-00200	0.02	0.2	15°	4	40
04-00001-00250	0.025	0.25	15°	4	40
04-00001-00300	0.03	0.3	15°	4	40
04-00001-00400	0.04	0.4	15°	4	40
04-00001-00500	0.05	0.5	15°	4	40
04-00001-00600	0.06	0.6	15°	4	40
04-00001-00700	0.07	0.7	15°	4	40
04-00001-00800	0.08	0.8	15°	4	40
04-00001-00900	0.09	0.9	15°	4	40
04-00001-01000	0.1	1	15°	4	40

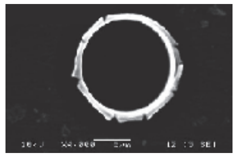
How to Order When you order, indicate NSMD (D). ※(γ) is reference value.

Machining Case 1

Aluminium Alloy

■ Hole description: ϕ0.01mm (Blind hole) Depth 0.1mm (L/D=10)

Spindle speed	60,000min^{-1}
Feed	2mm/min
Step feed	0.2μm
Coolant	Oil mist



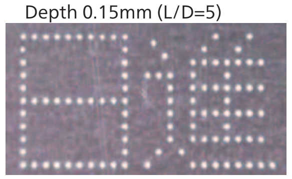
Magnification : × 4,000

Drill size : ϕ 0.01
Work Material : A5052
No. of holes: 10holes
Machining time: 1hr 20min

Machining Case 2

SUS304

■ Hole description: ϕ0.03mm (Through hole) Depth 0.15mm (L/D=5)



Spindle speed	60,000min^{-1}
Feed	1mm/min
Step feed	1μm
Coolant	Oil mist

Drill size : ϕ 0.03
Work Material : SUS304
No. of holes: 105holes
Machining time: 16hr

NSMD

Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Aluminium Alloy A5052		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	μm	min^{-1}	mm/min	μm
0.01	20,000	1	0.1	30,000	2	0.5
0.03	20,000	2	0.5	30,000	3	1.5
0.05	20,000	2	3	30,000	4	5
0.1	20,000	5	5	25,000	10	10
Notes	※1 Use appropriate coolant for work material and machining description. ※2 Minimize chucking runout by setting spindle speed at minimum oscillation. (Recommend to measure actual runout at activated Spindle Speed.) ※3 Set up flat surface before start machining. ※4 Take extra care when chucking in and out.					

NSPD-M

Size φ 0.01 ∼ φ 0.1

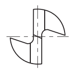
Micro ≦40 HRC

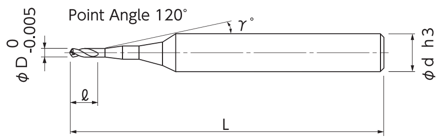
MUGEN MICRO COATING Micro Point Drill (Drill for Guide Hole)

Total 12 sizes

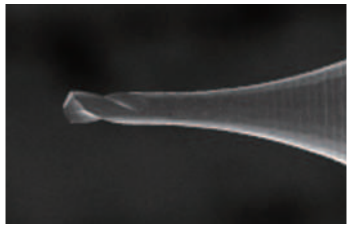
For making a guide hole for coated micro drill

SMG 2 30° φd h3 Drill





- Guide hole for Micro Drill.
- Special thin film coating for Micro Drill exercise high drilling performance on steels include stainless steels.
- Thinning on the cutting edge to reduce cutting load for accurate drilling. (Dia. 0.025∼)



NSPD-M φ0.03

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00012-00100	0.01	0.015	15°	4	40
04-00012-00150	0.015	0.025	15°	4	40
04-00012-00200	0.02	0.04	15°	4	40
04-00012-00250	0.025	0.05	15°	4	40
04-00012-00300	0.03	0.06	15°	4	40
04-00012-00400	0.04	0.08	15°	4	40
04-00012-00500	0.05	0.1	15°	4	40
04-00012-00600	0.06	0.12	15°	4	40
04-00012-00700	0.07	0.14	15°	4	40
04-00012-00800	0.08	0.16	15°	4	40
04-00012-00900	0.09	0.18	15°	4	40
04-00012-01000	0.1	0.2	15°	4	40

How to Order When you order, indicate NSPD-M (D). ※(γ) is reference value

NSPD-M

Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Aluminium Alloy A5052		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	μm	min^{-1}	mm/min	μm
0.01	20,000	1	0.1	20,000	1	0.1
0.03	20,000	2	0.5	20,000	2	0.5
0.05	20,000	2	1	20,000	2	1
0.1	20,000	5	2	25,000	5	2

Notes

※1 Use appropriate coolant for work material and machining description.
※2 Minimize chucking runout by setting spindle speed at minimum oscillation.
(Recommend to measure actual runout at activated rpm)
※3 Set up flat surface before start machining.
※4 Take extra care when chucking in and out.

NSPD

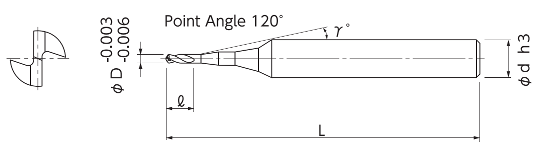
Size ϕ 0.01 ～ ϕ 0.1

SMG

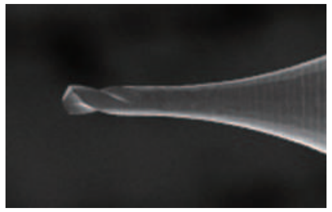
Micro Point Drill (Drill for Guide Hole)

Total 12 sizes

For making a guide hole for micro drill



- Micro Point Drill for guide hole.
- Thinning on the cutting edge to reduce cutting load for accurate drilling. (Dia. 0.025～)



NSPD　ϕ0.03

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00010-00100	0.01	0.015	15°	4	40
04-00010-00150	0.015	0.025	15°	4	40
04-00010-00200	0.02	0.04	15°	4	40
04-00010-00250	0.025	0.05	15°	4	40
04-00010-00300	0.03	0.06	15°	4	40
04-00010-00400	0.04	0.08	15°	4	40
04-00010-00500	0.05	0.1	15°	4	40
04-00010-00600	0.06	0.12	15°	4	40
04-00010-00700	0.07	0.14	15°	4	40
04-00010-00800	0.08	0.16	15°	4	40
04-00010-00900	0.09	0.18	15°	4	40
04-00010-01000	0.1	0.2	15°	4	40

How to Order　When you order, indicate NSPD (D).　※(γ) is reference value.

Recommended Milling Conditions

Work Material	Stainless Steels SUS304			Aluminium Alloy A5052		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	μm	min^{-1}	mm/min	μm
0.01	20,000	1	0.1	20,000	1	0.1
0.03	20,000	2	0.5	20,000	2	0.5
0.05	20,000	2	1	20,000	2	1
0.1	20,000	5	2	25,000	5	2

Notes

※1 Use appropriate coolant for work material and machining description.
※2 Minimize chucking runout by setting spindle speed at minimum oscillation. (Recommend to measure actual runout at activated rpm)
※3 Set up flat surface before start machining.
※4 Take extra care when chucking in and out.

M Stainless Steel
N Aluminium Alloy
N Copper
O Resin
Drill

◎ Carbon Steel P
◎ Alloy Steel P
○ Prehardened Steel P
○ Stainless Steel M
○ Aluminium Alloy N
○ Copper N

MDR-R

Size ϕ0.1 ～ ϕ1

∞ ≦40HRC

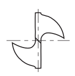
MUGEN COATING Miniature Drill

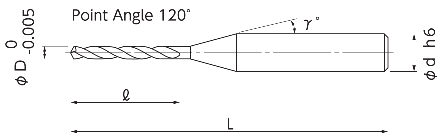
Total 91 sizes

MUGEN COATING Miniature Drill

MG 2 30° Drill

Miniature pivot drill. Maximum flute length is L/D=10





- Stable and long-life drill realized by MUGEN COATING.
- High accuracy suitable for precision machining. Tolerance of diameter : 0/-0.005mm.

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00200-00100	0.1	1.2	15°	3	38
04-00200-00110	0.11	1.2	15°	3	38
04-00200-00120	0.12	1.4	15°	3	38
04-00200-00130	0.13	1.4	15°	3	38
04-00200-00140	0.14	1.4	15°	3	38
04-00200-00150	0.15	1.8	15°	3	38
04-00200-00160	0.16	1.8	15°	3	38
04-00200-00170	0.17	1.8	15°	3	38
04-00200-00180	0.18	2.1	15°	3	38
04-00200-00190	0.19	2.1	15°	3	38
04-00200-00200	0.2	2.4	15°	3	38
04-00200-00210	0.21	2.4	15°	3	38
04-00200-00220	0.22	2.6	15°	3	38
04-00200-00230	0.23	2.6	15°	3	38
04-00200-00240	0.24	2.6	15°	3	38
04-00200-00250	0.25	3	15°	3	38
04-00200-00260	0.26	3	15°	3	38
04-00200-00270	0.27	3	15°	3	38
04-00200-00280	0.28	3.3	15°	3	38
04-00200-00290	0.29	3.3	15°	3	38
04-00200-00300	0.3	5	15°	3	38
04-00200-00310	0.31	5	15°	3	38
04-00200-00320	0.32	5	15°	3	38
04-00200-00330	0.33	5	15°	3	38
04-00200-00340	0.34	5	15°	3	38
04-00200-00350	0.35	5	15°	3	38
04-00200-00360	0.36	5	15°	3	38
04-00200-00370	0.37	5	15°	3	38
04-00200-00380	0.38	5	15°	3	38
04-00200-00390	0.39	5	15°	3	38

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00200-00400	0.4	6	15°	3	38
04-00200-00410	0.41	6	15°	3	38
04-00200-00420	0.42	6	15°	3	38
04-00200-00430	0.43	6	15°	3	38
04-00200-00440	0.44	6	15°	3	38
04-00200-00450	0.45	6	15°	3	38
04-00200-00460	0.46	6	15°	3	38
04-00200-00470	0.47	6	15°	3	38
04-00200-00480	0.48	6	15°	3	38
04-00200-00490	0.49	6	15°	3	38
04-00200-00500	0.5	6	15°	3	38
04-00200-00510	0.51	6	15°	3	38
04-00200-00520	0.52	6	15°	3	38
04-00200-00530	0.53	6	15°	3	38
04-00200-00540	0.54	6	15°	3	38
04-00200-00550	0.55	6	15°	3	38
04-00200-00560	0.56	6	15°	3	38
04-00200-00570	0.57	6	15°	3	38
04-00200-00580	0.58	6	15°	3	38
04-00200-00590	0.59	6	15°	3	38
04-00200-00600	0.6	7	15°	3	38
04-00200-00610	0.61	7	15°	3	38
04-00200-00620	0.62	7	15°	3	38
04-00200-00630	0.63	7	15°	3	38
04-00200-00640	0.64	7	15°	3	38
04-00200-00650	0.65	7	15°	3	38
04-00200-00660	0.66	7	15°	3	38
04-00200-00670	0.67	7	15°	3	38
04-00200-00680	0.68	7	15°	3	38
04-00200-00690	0.69	7	15°	3	38

How to Order When you order, indicate MDR-R (D). ※(γ) is reference value.

Unit : mm

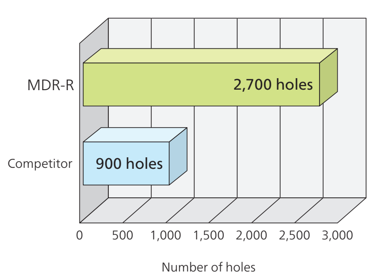
Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00200-00700	0.7	8	15°	3	38
04-00200-00710	0.71	8	15°	3	38
04-00200-00720	0.72	8	15°	3	38
04-00200-00730	0.73	8	15°	3	38
04-00200-00740	0.74	8	15°	3	38
04-00200-00750	0.75	8	15°	3	38
04-00200-00760	0.76	8	15°	3	38
04-00200-00770	0.77	8	15°	3	38
04-00200-00780	0.78	8	15°	3	38
04-00200-00790	0.79	8	15°	3	38
04-00200-00800	0.8	8	15°	3	38
04-00200-00810	0.81	8	15°	3	38
04-00200-00820	0.82	8	15°	3	38
04-00200-00830	0.83	8	15°	3	38
04-00200-00840	0.84	8	15°	3	38
04-00200-00850	0.85	8	15°	3	38

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00200-00860	0.86	8	15°	3	38
04-00200-00870	0.87	8	15°	3	38
04-00200-00880	0.88	8	15°	3	38
04-00200-00890	0.89	8	15°	3	38
04-00200-00900	0.9	8	15°	3	38
04-00200-00910	0.91	8	15°	3	38
04-00200-00920	0.92	8	15°	3	38
04-00200-00930	0.93	8	15°	3	38
04-00200-00940	0.94	8	15°	3	38
04-00200-00950	0.95	8	15°	3	38
04-00200-00960	0.96	8	15°	3	38
04-00200-00970	0.97	8	15°	3	38
04-00200-00980	0.98	8	15°	3	38
04-00200-00990	0.99	8	15°	3	38
04-00200-01000	1	10	15°	3	38

Machining Case 1

S50C Through hole drilling

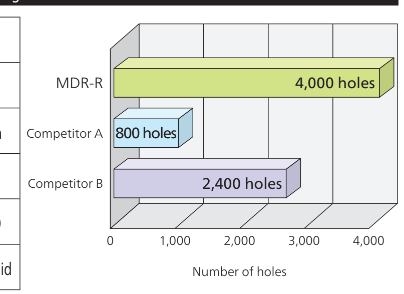
Tool	MDR-R ϕ1
Spindle speed	10,000 min^{-1}
Feed	500 mm/min
Step feed	0.5 mm
Depth of hole	9mm(Through)
Coolant	Water soluble fluid



Machining Case 2

SUS304 Through hole drilling

Tool	MDR-R ϕ0.5
Spindle speed	7,000 min^{-1}
Feed	105 mm/min
Step feed	0.1 mm
Depth of hole	4mm(Through)
Coolant	Water soluble fluid



Drill
P Carbon Steel ◎
P Alloy Steel ◎
P Prehardened Steel ○
M Stainless Steel ○
N Aluminium Alloy ○
N Copper ○

Drill Coating

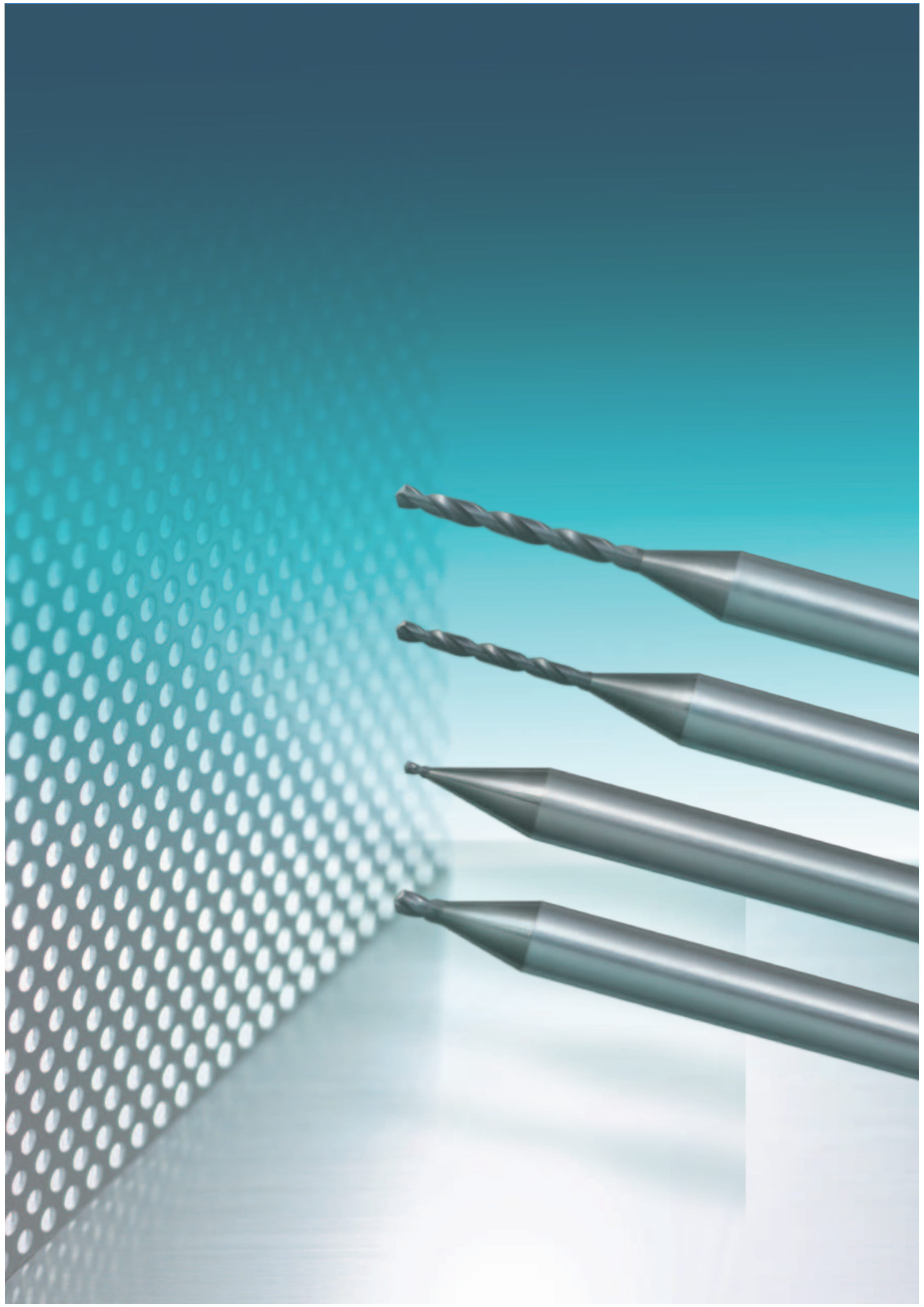
MDR-R

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM·SKD			Prehardened Steels HPM·NAK (~40HRC)			Aluminium Alloy A5052			Stainless Steels SUS304		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	mim^{-1}	mm/min	mm	mim^{-1}	mm/min	mm	mim^{-1}	mm/min	mm	mim^{-1}	mm/min	mm	mim^{-1}	mm/min	mm
0.1	25,000	50	0.02	20,000	40	0.02	17,000	35	0.02	25,000	50	0.05	15,000	30	0.005
0.15	25,000	50	0.02	20,000	40	0.02	17,000	35	0.02	25,000	50	0.05	15,000	30	0.005
0.2	25,000	75	0.04	20,000	60	0.04	17,000	50	0.04	25,000	100	0.1	15,000	45	0.01
0.25	25,000	75	0.04	20,000	60	0.04	17,000	50	0.04	25,000	100	0.2	15,000	45	0.01
0.3	20,000	120	0.05	15,000	60	0.05	13,000	50	0.05	22,000	400	0.3	11,000	45	0.02
0.35	20,000	120	0.05	15,000	60	0.05	13,000	50	0.05	22,000	400	0.3	11,000	45	0.02
0.4	20,000	160	0.06	15,000	75	0.06	13,000	65	0.06	22,000	700	0.4	8,500	45	0.04
0.45	20,000	160	0.06	15,000	75	0.06	13,000	65	0.06	22,000	700	0.4	8,500	45	0.07
0.5	18,000	180	0.1	13,000	100	0.1	10,000	80	0.1	20,000	1,000	0.5	7,000	55	0.1
0.55	18,000	180	0.1	13,000	100	0.1	10,000	80	0.1	20,000	1,000	0.5	7,000	55	0.1
0.6	18,000	360	0.15	13,000	100	0.15	10,000	80	0.15	20,000	1,000	0.6	7,000	55	0.12
0.65	18,000	360	0.15	13,000	100	0.15	10,000	80	0.15	20,000	1,000	0.6	7,000	55	0.12
0.7	16,000	480	0.2	11,000	110	0.2	8,000	80	0.2	18,000	1,100	0.7	6,000	60	0.14
0.75	16,000	480	0.2	11,000	110	0.2	8,000	80	0.2	18,000	1,100	0.7	6,000	60	0.14
0.8	16,000	640	0.3	11,000	220	0.3	8,000	160	0.3	18,000	1,100	0.8	6,000	120	0.16
0.85	16,000	640	0.3	11,000	220	0.3	8,000	160	0.3	18,000	1,100	0.8	6,000	120	0.16
0.9	15,000	750	0.4	9,000	270	0.4	7,000	210	0.4	16,000	1,200	0.8	5,000	150	0.18
0.95	15,000	750	0.4	9,000	270	0.4	7,000	210	0.4	16,000	1,200	0.8	5,000	150	0.18
1	15,000	750	0.5	9,000	270	0.5	7,000	210	0.5	16,000	1,200	1	5,000	150	0.2

Notes

※1 Use appropriate coolant for work material and machining description.
※2 Minimize chucking runout by setting spindle speed at minimum oscillation.
(Recommend to measure actual runout at activated Spindle Speed.)
※3 Set up flat surface before start machining.
※4 Take extra care when chucking in and out.



MDR-PD

Size ϕ0.1 ~ ϕ1

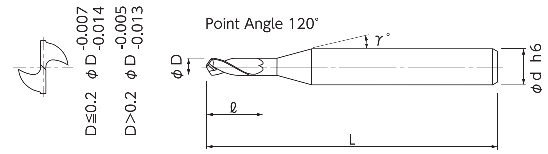
≦40 HRC

MUGEN COATING Point Drill (Drill for Guide Hole)

Total 10 sizes

Miniature point drill for aiming at guide hole which brings stable drilling

MG 2 25° Drill



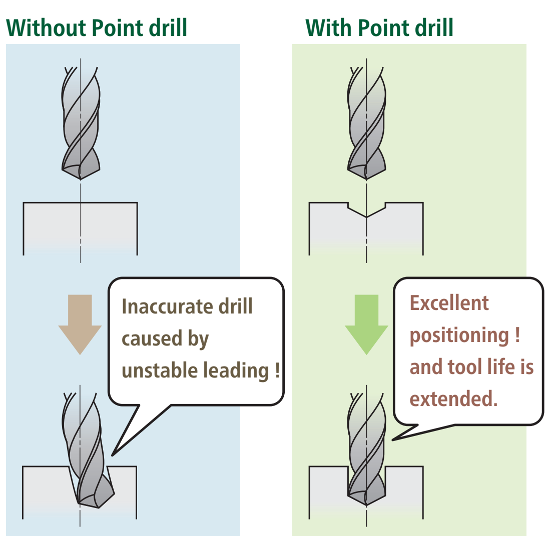
- Aiming at guide hole for MUGEN COATING miniature drill. Also used for drilling on thin materials.
- Positioning of drill center is improved by web thinning which brings stable drilling.

Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00210-00100	0.1	0.2	15°	3	38
04-00210-00200	0.2	0.4	15°	3	38
04-00210-00300	0.3	0.6	15°	3	38
04-00210-00400	0.4	0.6	15°	3	38
04-00210-00500	0.5	1	15°	3	38
04-00210-00600	0.6	1	15°	3	38
04-00210-00700	0.7	1.2	15°	3	38
04-00210-00800	0.8	1.2	15°	3	38
04-00210-00900	0.9	1.8	15°	3	38
04-00210-01000	1	2	15°	3	38

How to Order When you order, indicate MDR-PD (D). ※(γ) is reference value.

Effect of Point drill



Positioning of drill center is improved by point drill which brings stable drilling.
(Point drill is required for drilling on a curved surface.)

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM·SKD			Prehardened Steels HPM·NAK (~40HRC)			Aluminium Alloy A5052			Stainless Steels SUS304		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min⁻¹	mm/min	mm	min⁻¹	mm/min	mm	min⁻¹	mm/min	mm	min⁻¹	mm/min	mm	min⁻¹	mm/min	mm
0.1	20,000	20	0.01	16,000	16	0.01	14,000	10	0.01	25,000	25	0.01	10,000	10	0.003
0.2	20,000	40	0.02	16,000	32	0.02	14,000	25	0.02	25,000	50	0.02	10,000	20	0.005
0.3	16,000	48	0.02	12,000	35	0.02	10,000	30	0.02	22,000	110	0.02	8,000	20	0.01
0.4	16,000	64	0.03	12,000	40	0.03	10,000	30	0.03	22,000	440	0.03	8,000	25	0.02
0.5	14,000	70	0.05	10,000	40	0.05	8,000	35	0.05	20,000	500	0.05	5,000	25	0.05
0.6	14,000	140	0.07	10,000	40	0.07	8,000	35	0.07	20,000	500	0.07	5,000	25	0.06
0.7	12,000	180	0.1	8,000	40	0.1	6,000	30	0.1	18,000	540	0.1	4,000	20	0.07
0.8	12,000	240	0.15	8,000	80	0.15	6,000	60	0.15	18,000	540	0.15	4,000	40	0.08
0.9	10,000	250	0.2	6,000	90	0.2	5,000	75	0.2	16,000	560	0.2	3,000	45	0.09
1	10,000	250	0.2	6,000	90	0.2	5,000	75	0.2	16,000	560	0.2	3,000	45	0.1

Notes

※1 Use appropriate coolant for work material and machining description.
※2 Minimize chucking runout by setting spindle speed at minimum oscillation.
(Recom mend to measure actual runout at activated Spindle Speed.)
※3 Set up flat surface before start machining.
※4 Take extra care when chucking in and out.

MSDH

Size ϕ0.1 ~ ϕ1

∞ Premium ≦65 HRC

MUGEN COATING PREMIUM Precision Drill for Hardened Steel

Total 19 sizes

Recommended Milling Conditions

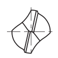
MG 2 20° ϕd h5 Drill

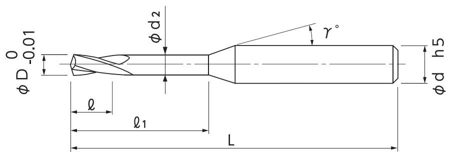
Available for drilling on hardened steel which has 65HRC

Prehardened Steel P

Hardened Steel ~55 HRC H

Hardened Steel ~65 HRC H





Point Angle 150°(Original design)

- Precise drilling on hardened steel (65HRC)!
- Equable hole accuracy and stably long tool life!
- Drilling on high hardened steel (ϕ0.1~)!

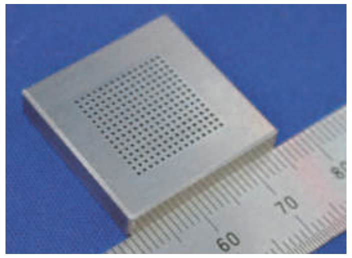
Unit : mm

Code No.	Dia. (D)	Flute Length (ℓ)	Under Neck Length (ℓ1)	Neck Dia. (d2)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)
04-00050-01000	0.1	0.2	1	0.085	15°	4	45
04-00050-01500	0.15	0.3	1.5	0.13	15°	4	45
04-00050-02000	0.2	0.4	2	0.18	15°	4	45
04-00050-02500	0.25	0.5	2.5	0.23	15°	4	45
04-00050-03000	0.3	0.6	3	0.28	15°	4	45
04-00050-03500	0.35	0.7	3.5	0.32	15°	4	45
04-00050-04000	0.4	0.8	4	0.37	15°	4	45
04-00050-04500	0.45	0.9	4.5	0.41	15°	4	45
04-00050-05000	0.5	1	5	0.46	15°	4	45
04-00050-05500	0.55	1.1	5.5	0.51	15°	4	45
04-00050-06000	0.6	1.2	6	0.56	15°	4	45
04-00050-06500	0.65	1.3	6.5	0.61	15°	4	45
04-00050-07000	0.7	1.4	7	0.66	15°	4	45
04-00050-07500	0.75	1.5	7.5	0.71	15°	4	45
04-00050-08000	0.8	1.6	8	0.76	15°	4	45
04-00050-08500	0.85	1.7	8.5	0.81	15°	4	45
04-00050-09000	0.9	1.8	9	0.86	15°	4	45
04-00050-09500	0.95	1.9	9.5	0.9	15°	4	45
04-00050-10000	1	2	10	0.95	15°	4	45

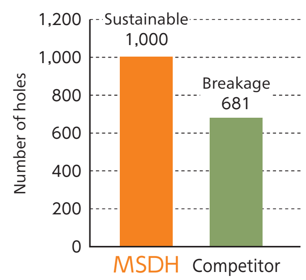
How to Order When you order, indicate MSDH (D). ※(γ) is reference value.

Machining Case 1

Work Material : DC53 60HRC



Work Size : 25×25×4.9mm



Tool	MSDH ϕ0.5
Spindle speed	15,000 min^{-1}
Feed	50 mm/min
Step feed	0.025 mm
Depth of hole	4.9 mm (Through)
Coolant	Oil mist
Number of holes	1,000 holes
Machining time	1min 25sec / 1 hole

Work Material	Hardened Steels HPM-38・STAVAX・SKD61 (~55HRC)			Hardened Steels SKD11・PD613 (~62HRC)			High Speed Tool Steels SKH (~65HRC)		
Dia.	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed	Spindle Speed	Feed	Step Feed
	min^{-1}	mm/min	mm	min^{-1}	mm/min	mm	min^{-1}	mm/min	mm
0.1	40,000	10	0.005	40,000	5	0.003	40,000	3	0.001
0.15	40,000	10	0.005	40,000	5	0.003	40,000	3	0.001
0.2	30,000	20	0.01	30,000	15	0.005	30,000	5	0.003
0.25	30,000	20	0.01	30,000	15	0.005	30,000	5	0.003
0.3	20,000	30	0.02	20,000	25	0.01	20,000	15	0.005
0.35	20,000	30	0.02	20,000	25	0.01	20,000	15	0.005
0.4	20,000	40	0.04	20,000	40	0.02	20,000	40	0.007
0.45	20,000	40	0.04	20,000	40	0.02	20,000	40	0.007
0.5	15,000	50	0.05	15,000	50	0.03	15,000	50	0.01
0.55	15,000	50	0.05	15,000	50	0.03	15,000	50	0.01
0.6	15,000	70	0.05	15,000	70	0.03	15,000	70	0.01
0.65	15,000	70	0.05	15,000	70	0.03	15,000	70	0.01
0.7	12,000	130	0.06	12,000	120	0.04	12,000	100	0.02
0.75	12,000	130	0.06	12,000	120	0.04	12,000	100	0.02
0.8	12,000	160	0.06	12,000	150	0.04	12,000	140	0.02
0.85	12,000	160	0.06	12,000	150	0.04	12,000	140	0.02
0.9	10,000	200	0.07	10,000	200	0.05	10,000	180	0.03
0.95	10,000	200	0.07	10,000	200	0.05	10,000	180	0.03
1	10,000	200	0.07	10,000	200	0.05	10,000	180	0.03

Notes

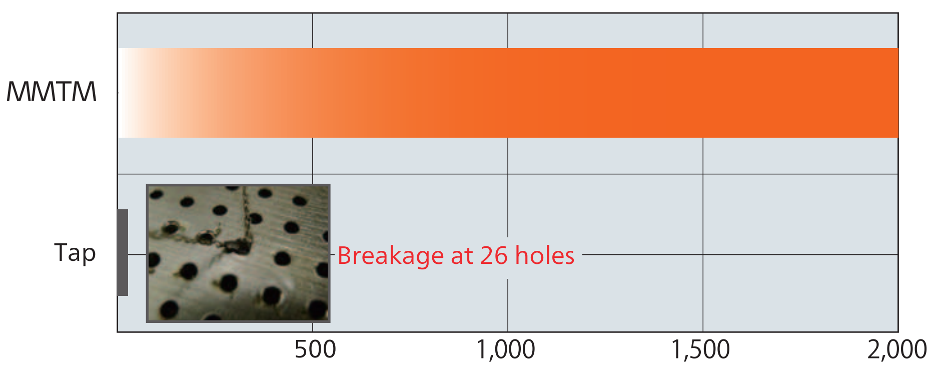
※1 Use appropriate coolant for work material and machining description.
※2 Minimize chucking runout by setting spindle speed at minimum oscillation.
(Recommend to measure actual runout at activated Spindle Speed.)
※3 Set up flat surface before start machining.
※4 Take extra care when chucking in and out.

Drill Coating

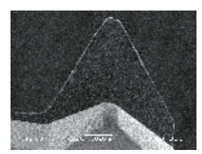
Fine thread milling is realized on different kind of work materials

Thread mills replace taps in threading operations.
Compared to a tap, the cutting load can be significantly reduced, and tool life and accuracy can be improved.
Also, in the case of tool breakage, the tool can be easily removed.

Tool life comparison with Taps (M2 SUS304)



Number of machined hole



Possible to use after 2,000 holes machining

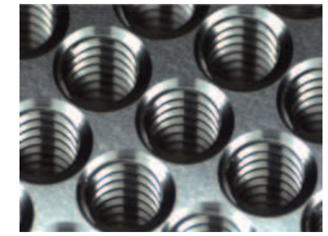
A state of 2,000th hole

MMTM n: 12,000min^{-1}, vf: 600mm/min, Pitch 0.4mm, Effective thread length 4.8mm
Helical R : R0.3 (ae0.12mm×2) , Down-cut

Tap n: 500min^{-1}, vf: 200mm/min, Pitch 0.4mm, Effective thread length 5.0mm

Machining case

Tool : MMTM M2
Work Material : Ti-6Al-4V
Machining depth : 4.8 mm
Machining time : 9 sec/hole
Coolant : Water-soluble fluid



Cutting edge retreat amount after 250 holes

Cutting edge retreat amount: 0.004 mm

Process	Pre-hole	Thread
Tool	ϕ1.6	MMTM M2
Spindle speed [min^{-1}]	8,000	10,000
Feed [mm/min]	150	500
Step [mm]	0.2	-
Machining depth [mm]	5.6	4.8
Machining time [sec/hole]	18	9

Software

We distribute NC program creation software on our website for the use of tools.

Thread Mill

Fine thread milling is realized on different kind of work materials

Model	Size	Under Neck Length	Coating	Number of Flute	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55HRC	H Hardened Steel ~65HRC	H Hardened Steel ~70HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Thread Mill																			
MMTM	M1 ～ M6	≒3D	∞	4, 6	◎	◎	◎	-	-	-	○	-	○	○	○	-	-	11	P-006
Specialized for metric internal thread. Available for precise micro threading																			
MMTU	No.0-80UNF ～ 1/4-28UNF	≒2.5D	∞ Premium	4, 6	○	○	◎	-	-	-	◎	◎	○	○	○	-	-	21	P-008
Specialized for unify internal thread. Available for precise micro threading																			
MMTS	S0.1 ～ S1.4	≒4D	∞	2	◎	◎	◎	-	-	-	○	-	○	○	○	-	-	13	P-010
Specialized for miniature internal thread. NS TOOL original standard of S0.1 and S0.2 for precise micro threading																			

MMTM

Threading Size M1 ～ M6

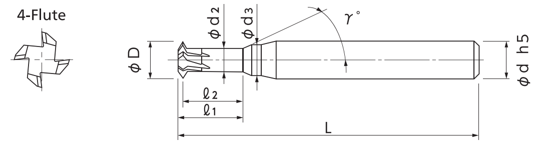
MUGEN COATING M-Thread Mill (for Internal Thread)

Total 11 sizes

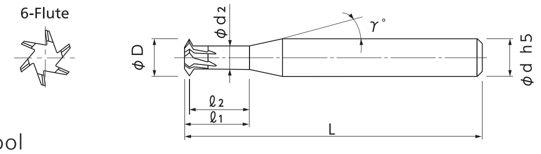
MG 4 6 φd h5 Thread

Specialized for metric internal thread. Available for precise micro threading

4-Flute



6-Flute



- Improvement of cutting accuracy by adoption of tool design focusing on sharpness.
- MUGEN COATING realized long tool life.
- When the tool is broken during thread milling, the wreckages can be easily removed as the tool diameter is smaller than the pilot hole.

※This Product should be used in the forward rotation.

Cutting edge shape
4-Flute

Cutting edge shape
6-Flute

Unit : mm

Code No.	Thread Size	Dia. (D)	Under Neck Length (ℓ1)	Effective Thread Length (ℓ2)	Neck Dia. (d2)	Neck Dia. (d3)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Number of Flute	Thread Milling Size
06-00002-00100	M1	0.72	2.64	2.5	0.36	0.75	30°	4	45	4	M1 M1.1
06-00002-00120	M1.2	0.92	2.67	2.5	0.56	0.95	30°	4	45	4	M1.2
06-00002-00140	M1.4	1.05	3.18	3	0.62	1.08	30°	4	45	4	M1.4
06-00002-00160	M1.6	1.20	3.71	3.5	0.68	1.23	30°	4	45	4	M1.6
06-00002-00170	M1.7	1.30	3.71	3.5	0.78	1.33	30°	4	45	4	M1.7 M1.8
06-00002-00200	M2	1.50	5.02	4.8	0.89	–	12°	4	45	6	M2 M2.3
06-00002-00250	M2.5	1.95	5.7	5.4	1.28	–	12°	4	45	6	M2.5 M2.6
06-00002-00300	M3	2.36	6.3	6	1.63	–	12°	4	45	6	M3
06-00002-00400	M4	3.08	8.8	8.4	2.08	–	12°	6	60	6	M4
06-00002-00500	M5	3.97	10.1	9.6	2.86	–	12°	6	60	6	M5
06-00002-00600	M6	4.72	12.6	12	3.35	–	12°	6	60	6	M6

How to Order When you order, indicate MMTM Thread Size. ※(γ) is reference value.

Machining case S-036

NC programming software is available on our website.

URL
https://www.ns-tool.com/en/download/thread_nc_maker/

※ Please read the manual before use.

Recommended Milling Conditions

Thread Size	Thread Milling Size	Dia.	Pitch	Helical R	Recommended Process	Carbon Steels S50C			Stainless Steels SUS304			Titanium Alloy Ti-6Al-4V			Aluminium Alloy A5052		
						Spindle Speed	Feed	Feed per Tooth	Spindle Speed	Feed	Feed per Tooth	Spindle Speed	Feed	Feed per Tooth	Spindle Speed	Feed	Feed per Tooth
				mm		min^{-1}	mm/min	mm/tooth	min^{-1}	mm/min	mm/tooth	min^{-1}	mm/min	mm/tooth	min^{-1}	mm/min	mm/tooth
M1	M1	0.72	0.25	R0.155	Up-cut	35,000	600	0.004	35,000	600	0.004	18,000	150	0.002	45,000	1,000	0.006
M1	M1.1	0.72	0.25	R0.205	Up-cut	35,000	600	0.004	35,000	600	0.004	18,000	150	0.002	45,000	1,000	0.006
M1.2	M1.2	0.92	0.25	R0.155	Up-cut	27,000	600	0.005	27,000	600	0.005	14,000	160	0.003	35,000	1,000	0.007
M1.4	M1.4	1.05	0.3	R0.195	Up-cut	24,000	600	0.006	24,000	600	0.006	12,000	180	0.004	30,000	1,000	0.008
M1.6	M1.6	1.2	0.35	R0.22	Up-cut	21,000	600	0.007	21,000	600	0.007	10,000	220	0.005	26,000	1,000	0.01
M1.7	M1.7	1.3	0.35	R0.22	Up-cut	20,000	600	0.007	20,000	600	0.007	10,000	250	0.006	24,000	1,000	0.01
M1.7	M1.8	1.3	0.35	R0.27	Up-cut	20,000	600	0.007	20,000	600	0.007	10,000	250	0.006	24,000	1,000	0.01
M2	M2	1.5	0.4	R0.28	Down-cut	12,000	600	0.008	12,000	600	0.008	10,000	500	0.008	20,000	1,200	0.01
M2	M2.3	1.5	0.4	R0.43	Down-cut	12,000	600	0.008	12,000	600	0.008	10,000	500	0.008	20,000	1,200	0.01
M2.5	M2.5	1.95	0.45	R0.305	Down-cut	12,000	600	0.008	12,000	600	0.008	10,000	500	0.008	16,000	1,200	0.012
M2.5	M2.6	1.95	0.45	R0.355	Down-cut	12,000	600	0.008	12,000	600	0.008	10,000	500	0.008	16,000	1,200	0.012
M3	M3	2.36	0.5	R0.36	Down-cut	8,000	600	0.012	8,000	600	0.012	8,000	500	0.01	10,000	1,200	0.02
M4	M4	3.08	0.7	R0.5	Down-cut	5,700	400	0.012	5,700	400	0.012	4,600	350	0.013	7,000	800	0.019
M5	M5	3.97	0.8	R0.555	Down-cut	4,000	400	0.017	4,000	400	0.017	3,200	350	0.018	5,500	800	0.024
M6	M6	4.72	1	R0.68	Down-cut	3,200	400	0.021	3,200	400	0.021	3,000	350	0.019	4,500	800	0.03

Notes

※1 This Product should be used in the forward rotation.
※2 Software for generating NC program Will be provided on NS web site.
※3 The above Recommended Milling Conditions is provided as a guide for cutting when the depth of cut is divided into twice with water-soluble fluid.
※4 Recommend making pilot hole in advance by using drill, etc.
※5 Depending on environment, adjustments of spindle speed based on feed per tooth, feed, number of paths and cutting direction are needed.
※6 Helical R, 5H for M1.4 and under and 6H for more than M1.6, is a guideline for thread milling and it is R value in the final cutting.
※7 When use helical R in the Recommended Milling Conditions, set pilot hole dia. for avoiding interference between the area of under neck and pilot hole.
※8 Add zero-cut process in case completed thread left deflection angle.
※9 Choose appropriate coolant for each working material.

MMTU

Threading Size No.0-80UNF～1/4-28UNF

∞ Premium ≦40 HRC

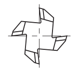
MUGEN COATING PREMIUM Thread Cutting Tool (Unify : for Internal Thread)

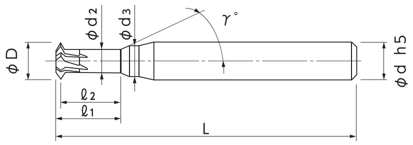
Total 21 sizes

MG 4 6 φd h5 Thread

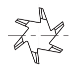
Specialized for unify internal thread.
Available for precise micro threading

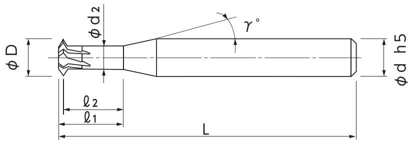
4-Flute





6-Flute





- Improvement of cutting accuracy by adoption of tool design focusing on sharpness.
- MUGEN COATING PREMIUM realized long tool life.
- When the tool is broken during thread milling, the wreckages can be easily removed as the tool diameter is smaller than the pilot hole.

Cutting edge shape 4-Flute

Cutting edge shape 6-Flute

※This Product should be used in the forward rotation.

Unit : mm

Code No.	Thread Size	Dia. (D)	Under Neck Length (ℓ1)	Effective Thread Length (ℓ2)	Neck Dia. (d2)	Neck Dia. (d3)	Neck Taper Angle (γ)	Shank Dia. (d)	Overall Length (L)	Number of Flute
▌06-00003-00800	No.0-80UNF	1.16	3.28	3.05	0.72	1.19	30°	4	45	4
▌06-00003-01640	No.1-64UNC	1.4	3.98	3.71	0.84	–	12°	4	45	6
▌06-00003-01720	No.1-72UNF	1.45	3.97	3.71	0.93	–	12°	4	45	6
▌06-00003-02560	No.2-56UNC	1.63	4.67	4.37	0.99	–	12°	4	45	6
▌06-00003-02640	No.2-64UNF	1.69	4.67	4.37	1.11	–	12°	4	45	6
▌06-00003-03480	No.3-48UNC	1.88	5.37	5.03	1.15	–	12°	4	45	6
▌06-00003-03560	No.3-56UNF	1.96	5.36	5.03	1.31	–	12°	4	45	6
▌06-00003-04400	No.4-40UNC	2.09	6.08	5.69	1.23	–	12°	4	45	6
▌06-00003-04480	No.4-48UNF	2.21	6.06	5.69	1.46	–	12°	4	45	6
▌06-00003-05400	No.5-40UNC	2.38	6.76	6.35	1.52	–	12°	4	45	6
▌06-00003-05440	No.5-44UNF	2.45	6.75	6.35	1.65	–	12°	4	45	6
▌06-00003-06320	No.6-32UNC	2.54	7.48	7.01	1.50	–	12°	4	45	6
▌06-00003-06400	No.6-40UNF	2.72	7.45	7.01	1.86	–	12°	4	45	6
▌06-00003-08320	No.8-32UNC	3.14	8.86	8.34	2.04	–	12°	6	60	6
▌06-00003-08360	No.8-36UNF	3.24	8.84	8.34	2.24	–	12°	6	60	6
▌06-00003-10240	No.10-24UNC	3.52	10.29	9.66	2.14	–	12°	6	60	6
▌06-00003-10320	No.10-32UNF	3.8	10.22	9.66	2.70	–	12°	6	60	6
▌06-00003-12240	No.12-24UNC	4.14	11.65	10.98	2.72	–	12°	6	60	6
▌06-00003-12280	No.12-28UNF	4.29	11.62	10.98	3.02	–	12°	6	60	6
▌06-00003-14200	1/4-20UNC	4.77	13.48	12.7	3.12	–	12°	6	60	6
▌06-00003-14280	1/4-28UNF	5.16	13.39	12.7	3.89	–	12°	6	60	6

How to Order When you order, indicate MMTU Thread Size. ※(γ) is reference value.

▌Semi-standard products, please inquire for price and delivery.

NC programming software is available on our website.

URL
https://www.ns-tool.com/en/download/thread_nc_maker/

※ Please read the manual before use.

Recommended Milling Conditions

Thread Size	Dia.	Pitch	Helical R	Stainless Steels SUS304			Titanium Alloy Ti-6Al-4V			Heat Resistance Alloy Inconel®			Aluminium Alloy A7075		
				Spindle Speed	Feed	Feed per Tooth	Spindle Speed	Feed	Feed per Tooth	Spindle Speed	Feed	Feed per Tooth	Spindle Speed	Feed	Feed per Tooth
			mm	min^{-1}	mm/min	mm/tooth	min^{-1}	mm/min	mm/tooth	min^{-1}	mm/min	mm/tooth	min^{-1}	mm/min	mm/tooth
No.0-80UNF	1.16	0.318	R0.21	12,000	250	0.005	12,000	200	0.004	6,800	120	0.004	20,000	400	0.005
No.1-64UNC	1.4	0.397	R0.26	10,000	300	0.005	8,000	240	0.005	5,600	150	0.004	15,000	450	0.005
No.1-72UNF	1.45	0.353	R0.23	10,000	300	0.005	8,000	240	0.005	5,600	150	0.004	15,000	450	0.005
No.2-56UNC	1.63	0.454	R0.32	8,000	300	0.006	6,400	240	0.006	4,500	150	0.005	12,000	600	0.008
No.2-64UNF	1.69	0.397	R0.28	8,000	300	0.006	6,400	240	0.006	4,500	150	0.005	12,000	600	0.008
No.3-48UNC	1.88	0.529	R0.36	8,000	300	0.006	6,400	240	0.006	4,500	150	0.006	12,000	600	0.008
No.3-56UNF	1.96	0.454	R0.31	8,000	300	0.006	6,400	240	0.006	4,500	150	0.006	12,000	600	0.008
No.4-40UNC	2.09	0.635	R0.43	6,000	300	0.008	4,800	240	0.008	3,400	150	0.007	9,000	600	0.011
No.4-48UNF	2.21	0.529	R0.36	6,000	300	0.008	4,800	240	0.008	3,400	150	0.007	9,000	600	0.011
No.5-40UNC	2.38	0.635	R0.45	6,000	300	0.008	4,800	240	0.008	3,400	150	0.007	9,000	600	0.011
No.5-44UNF	2.45	0.577	R0.4	6,000	300	0.008	4,800	240	0.008	3,400	150	0.007	9,000	600	0.011
No.6-32UNC	2.54	0.794	R0.55	5,500	300	0.009	4,300	240	0.009	3,000	150	0.008	7,700	600	0.013
No.6-40UNF	2.72	0.635	R0.44	5,500	300	0.009	4,300	240	0.009	3,000	150	0.008	7,700	600	0.013
No.8-32UNC	3.14	0.794	R0.57	5,000	300	0.01	4,000	240	0.01	2,800	150	0.009	7,700	600	0.013
No.8-36UNF	3.24	0.706	R0.51	5,000	300	0.01	4,000	240	0.01	2,800	150	0.009	7,700	600	0.013
No.10-24UNC	3.52	1.058	R0.72	4,200	300	0.012	3,400	240	0.012	2,400	150	0.01	6,300	600	0.016
No.10-32UNF	3.8	0.794	R0.57	4,200	300	0.012	3,400	240	0.012	2,400	150	0.01	6,300	600	0.016
No.12-24UNC	4.14	1.058	R0.74	4,200	300	0.012	3,400	240	0.012	2,400	150	0.01	6,300	600	0.016
No.12-28UNF	4.29	0.907	R0.65	4,200	300	0.012	3,400	240	0.012	2,400	150	0.01	6,300	600	0.016
1/4-20UNC	4.77	1.27	R0.86	2,600	300	0.019	2,200	240	0.018	1,500	150	0.017	3,800	600	0.026
1/4-28UNF	5.16	0.907	R0.65	2,600	300	0.019	2,200	240	0.018	1,500	150	0.017	3,800	600	0.026

Notes	
Notes	※1 This Product should be used in the forward rotation. ※2 The above milling conditions are provided as a reference for cutting when the depth of cut is divided into twice with water-soluble fluid. Also milling conditions for size 1/4 are for reference when it is divided into three times. ※3 Down-cut is recommended. ※4 Recommend making pilot hole in advance by using drill, etc. ※5 Depending on environment, adjustments of spindle speed based on fee per tooth, feed, number of paths and cutting direction are needed. ※6 When use helical R in the Recommended Milling Conditions, setting of pilot hole dia. for avoiding interference between the area of under neck and pilot hole is required. ※7 Add zero-cut process in case completed thread has deflection. ※8 Choose appropriate coolant for each working material.

MMTS

Threading Size S0.1 ～ S1.4

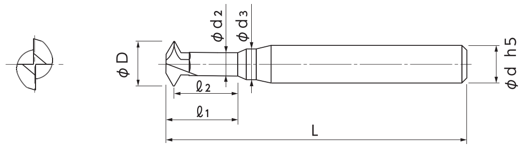
≦40 HRC

MUGEN COATING Micro Thread Cutting Tool (for Internal Thread)

Total 13 sizes

Specialized for miniature internal thread.
NS TOOL original standard of S0.1 and S0.2 for precise micro threading

MG 2 ϕd h5 Thread



- World smallest threaded size 0.1mm is possible to cut.
- When the tool is broken during thread milling, the wreckages can be easily removed as the tool diameter is smaller than the pilot hole.
- MUGEN COATING realized long tool life.

Cutting edge shape
2-Flute

※This Product should be used in the forward rotation.

Unit : mm

Code No.	Thread Size	Dia. (D)	Under Neck Length (ℓ1)	Effective Thread Length (ℓ2)	Neck Dia. (d2)	Neck Dia. (d3)	Shank Dia. (d)	Overall Length (L)	Number of Flute
06-00001-01000	S0.1	0.066	0.15	0.14	0.032	0.185	4	45	2
06-00001-02000	S0.2	0.14	0.31	0.28	0.07	0.185	4	45	2
06-00001-03000	S0.3	0.2	0.48	0.44	0.085	0.235	4	45	2
06-00001-04000	S0.4	0.28	0.61	0.55	0.15	0.315	4	45	2
06-00001-05000	S0.5	0.35	0.77	0.69	0.17	0.39	4	45	2
06-00001-06000	S0.6	0.43	0.93	0.83	0.22	0.47	4	45	2
06-00001-08000	S0.8	0.58	1.24	1.1	0.31	0.62	4	45	2
06-00001-10000	S1.0	0.73	1.55	1.38	0.41	0.77	4	45	2
06-00001-10001		0.73	3.17	3	0.41	0.77	4	45	2
06-00001-12000	S1.2	0.93	1.6	1.38	0.61	0.97	4	45	2
06-00001-12001		0.93	3.22	3	0.61	0.97	4	45	2
06-00001-14000	S1.4	1.08	1.9	1.65	0.7	1.14	4	45	2
06-00001-14001		1.08	3.86	3.6	0.7	1.14	4	45	2

How to Order — When you order, indicate MMTS Thread Size×(ℓ1).

- S0.1 and S0.2 are original standard by NS Tool Co., LTD. as a miniature thread standard of JIS is from S0.3.

NC programming software is available on our website.

URL
https://www.ns-tool.com/en/download/thread_nc_maker/

※ Please read the manual before use.

MMTS

Recommended Milling Conditions

Thread Size	Dia.	Pitch	Recommended pilot hole Dia.	Recommended process Helical R※1	Carbon Steels S50C		Stainless Steels SUS304		Aluminium Alloy A5052		Titanium Ti	
					Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
			mm	mm	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min	min⁻¹	mm/min
S0.1	0.066	0.025	0.075	R0.017※3	20,000	5	20,000	5	20,000	5	20,000	5
S0.2	0.14	0.05	0.15	R0.035※3	20,000	5	20,000	5	20,000	5	20,000	5
S0.3	0.2	0.08	0.23	R0.061※3	20,000	5	20,000	5	20,000	5	20,000	5
S0.4	0.28	0.1	0.32	R0.070	18,000	5	18,000	5	18,000	5	18,000	5
S0.5	0.35	0.125	0.4	R0.088	15,000	10	15,000	10	15,000	10	15,000	10
S0.6	0.43	0.15	0.48	R0.110	12,000	10	12,000	10	12,000	10	12,000	10
S0.8	0.58	0.2	0.64	R0.130	10,000	20	10,000	20	10,000	20	10,000	20
S1.0	0.73	0.25	0.8	R0.155	7,000	50	7,000	50	7,000	50	7,000	50
S1.2	0.93	0.25	1	R0.155	6,000	80	6,000	80	6,000	80	6,000	80
S1.4	1.08	0.3	1.15	R0.190	5,000	100	5,000	100	5,000	100	5,000	100

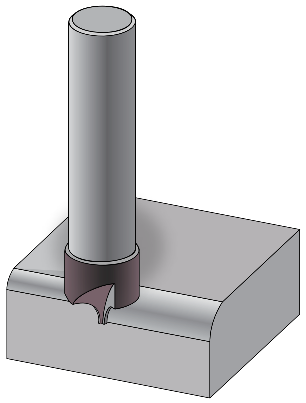
Notes

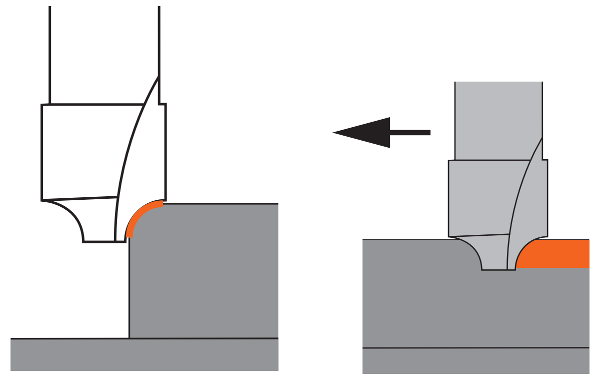
※1 This Product should be used in the forward rotation.
※2 Radial depth of cut may be divided into multiple cutting approaches by condition of spindle runout and machine.
※3 Radial depth of cut must be divided into multiple cutting approaches for the sizes, S0.1, S0.2, and S0.3.
※4 Adjust process helical final value based on measured actual Dia. of the tool if possible.
※5 Care differences of actual pilot hole Dia. caused by runout of a pilot drill and rotation.
※6 Process Helical is a circular radius value of actual tool movement when helical process by MMTS.
※7 Add zero-cut process in case completed thread left deflection angle.
※8 Tool overhang to be as short as possible.
※9 Extra care of handling when tool setting and measuring.
※10 Choose appropriate coolant for each working material.
※11 Care with cutting chip removal.

Chamfering

R chamfering is easily machined with a special tool

R chamfering to each part of the shape





High machinable cutting edge shape for good machining surface and burr suppression

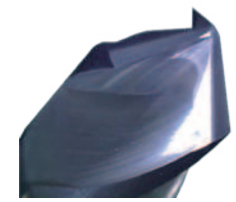
Extensive size lineup and supports various work materials

MIR200 Size R0.1 ～ R5 Total 29 sizes (R0.05 increment up to size R1)

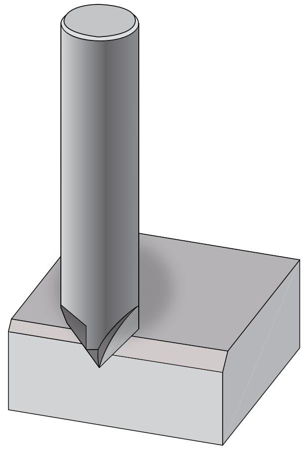
Corresponding work material

- **P** Carbon Steel, Alloy Steel, Prehardened Steel
- **N** Aluminium alloy, Copper
- **M** Stainless Steel
- **O** Resin

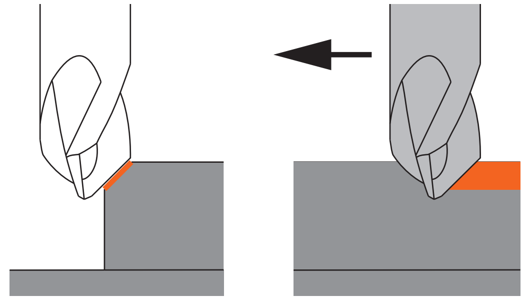
High efficient machining with 3-flute C chamfering tool



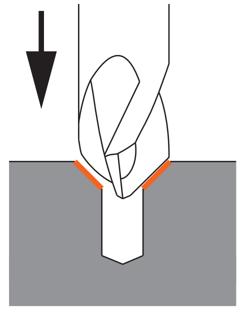
High machinable cutting edge shape for good machining surface and burr suppression



C chamfering on outside corner

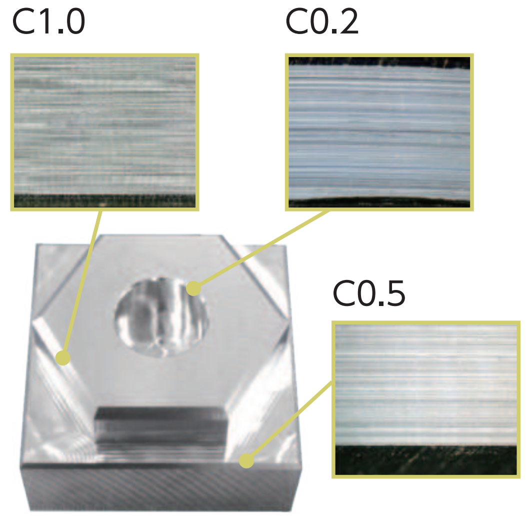


Hole chamfering with plunging



NSCV-M ϕ6

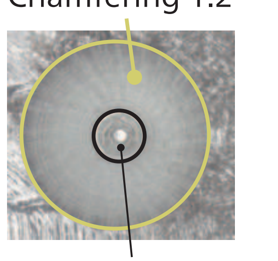
Work Material : SUS304
Work Size : 30 × 30 mm



NSCV-M ϕ4

Work Material : S50C
Chamfer : C1.2 mm

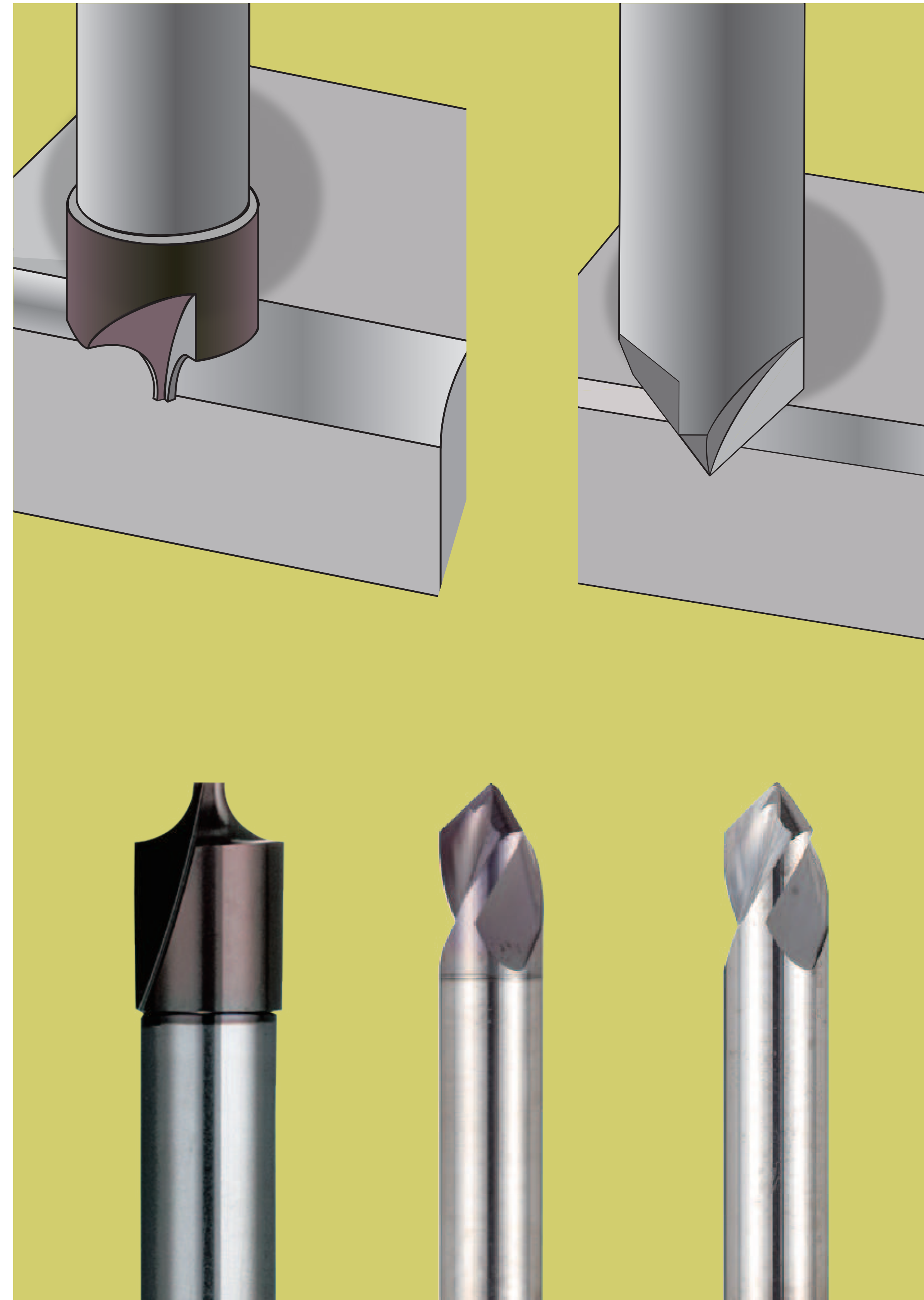
Chamfering 1.2



Hole part by ϕ0.9 drill

Chamfering cutter enables R chamfering and C chamfering

Model	Size	Length of Cut	Coating	Number of Flute	Chamfering	R Chamfering	Work Material: P Carbon Steel	P Alloy Steel	P Prehardened Steel	H Hardened Steel ~55 HRC	H Hardened Steel ~65 HRC	H Hardened Steel ~70 HRC	M Stainless Steel	S Heat Resistant Alloy etc	N Aluminium Alloy	N Copper	O Resin	O Graphite	O Hard Brittle Material	Number of Sizes	Page
Chamfering																					
MIR200 	R0.1 ～ R5	-	∞	2	-	R	◎	◎	◎	○	-	-	○	-	○	○	○	-	-	29	Q-006
Specialized for cutting at corner radius on various materials																					
NSCV 	ϕ4 ϕ6	2 3	-	3	C	-	-	-	-	-	-	-	-	-	◎	◎	◎	-	-	2	Q-008
Specialized for cutting at chamfering. Sharp edge with high rake angle realizes good surface quality and reduces burr. For non-ferrous metal																					
NSCV-M 	ϕ4 ϕ6	2 3	∞	3	C	-	◎	◎	◎	-	-	-	○	-	-	-	-	-	-	2	Q-010
Specialized for cutting at chamfering. Sharp edge with high rake angle realizes good surface quality and reduces burr. For steel																					



MIR200

Size R0.1 ～ R5

≦55 HRC

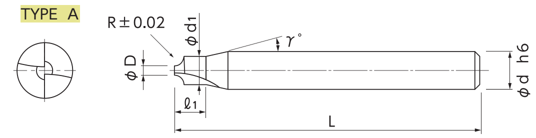
MUGEN COATING 2-Flute Inner Radius Cutter

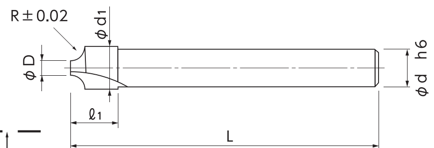
Total 29 sizes

Carbon Steel P
Alloy Steel P
Prehardened Steel P
Hardened Steel ~55 HRC H
Stainless Steel M
Aluminium Alloy N
Copper N
Resin O

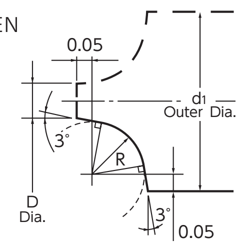
Specialized for cutting at corner radius on various materials

SMG 2 R





- It is suitable for both machining NC and MC and can be cut at the corner radius easily.
- Tool life is exceptionally extended as MUGEN COATING provides additional wear resistance.



Unit : mm

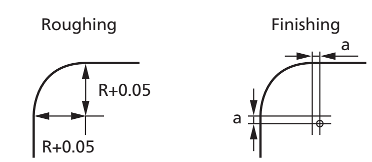
Code No.	Radius (R)	Dia. (D)	Outer Dia. (d1)	Outer Dia. Length (ℓ1)	Neck Taper Angle (γ)	Type	Shank Dia. (d)	Overall Length (L)
08-00900-00100	R0.1	0.5	0.8	3	12°	A	4	45
08-00900-00150	R0.15	0.5	0.9	3	12°	A	4	45
08-00900-00200	R0.2	0.5	1	3	12°	A	4	45
08-00900-00250	R0.25	0.5	1.1	3	12°	A	4	45
08-00900-00300	R0.3	0.5	1.2	3	12°	A	4	45
08-00900-00350	R0.35	0.5	1.3	3	12°	A	4	45
08-00900-00400	R0.4	0.5	1.4	3	12°	A	4	45
08-00900-00450	R0.45	0.5	1.5	3	12°	A	4	45
08-00900-00500	R0.5	0.5	1.6	5	12°	A	4	45
08-00900-00550	R0.55	0.5	1.7	5	12°	A	4	45
08-00900-00600	R0.6	0.5	1.8	5	12°	A	4	45
08-00900-00650	R0.65	0.5	1.9	5	12°	A	4	45
08-00900-00700	R0.7	0.5	2	5	12°	A	4	45
08-00900-00750	R0.75	0.5	2.1	5	12°	A	4	45
08-00900-00800	R0.8	0.8	2.5	5	12°	A	4	45
08-00900-00850	R0.85	0.8	2.6	5	12°	A	4	45
08-00900-00900	R0.9	0.8	2.7	5	12°	A	4	45
08-00900-00950	R0.95	0.8	2.8	5	12°	A	4	45
08-00900-01000	R1	0.8	2.9	8	12°	A	4	45
08-00900-01250	R1.25	0.8	3.4	8	12°	A	4	45
08-00900-01500	R1.5	1.5	4.6	8	–	B	4	45
08-00900-01750	R1.75	1.5	5.1	8	–	B	4	45
08-00900-02000	R2	1.5	5.6	10	–	B	4	45
08-00900-02500	R2.5	1.5	6.6	10	–	B	6	45
08-00900-03000	R3	1.5	7.6	12	45°	A	8	55
08-00900-03500	R3.5	2	9.1	12	45°	A	10	55
08-00900-04000	R4	2	10.1	12	–	B	10	55
08-00900-04500	R4.5	2	11.1	15	45°	A	12	65
08-00900-05000	R5	2	12.1	15	–	B	12	65

How to Order When you order, indicate MIR200 (R). ※(γ) is reference value.

Recommended Milling Conditions

Work Material	Carbon Steels S50C			Alloy Steels SCM・SKD・SUS			Prehardened Steels HPM・NAK		
Cutting Speed	30～40m/min			20～30m/min			15～25m/min		
R	Spindle Speed (min⁻¹)	Feed (mm/min) Roughing	Feed (mm/min) Finishing	Spindle Speed (min⁻¹)	Feed (mm/min) Roughing	Feed (mm/min) Finishing	Spindle Speed (min⁻¹)	Feed (mm/min) Roughing	Feed (mm/min) Finishing
0.1	18,500	60	100	13,300	50	70	10,600	40	60
0.2	16,000	60	100	11,400	50	70	9,100	40	60
0.3	14,000	60	100	10,000	50	70	8,000	40	60
0.4	12,500	60	100	8,800	50	70	7,100	40	60
0.5	11,000	60	100	8,000	50	70	6,400	40	60
0.75	9,000	60	100	6,400	50	70	5,100	40	60
0.8	7,000	60	100	5,000	50	70	4,900	40	60
1	6,200	60	100	4,400	50	70	4,200	40	60
1.25	5,400	60	100	3,900	50	70	3,600	40	60
1.5	3,700	60	100	2,700	50	70	3,200	40	60
1.75	3,400	60	100	2,400	50	70	2,800	40	60
2	3,200	60	100	2,300	50	70	2,500	40	60
2.5	2,800	60	100	2,000	50	70	2,100	40	60
3	2,500	60	100	1,800	50	70	1,800	40	60
3.5	2,000	60	100	1,400	50	70	1,600	40	60
4	1,850	60	100	1,300	50	70	1,400	40	60
4.5	1,700	60	100	1,200	50	70	1,300	40	60
5	1,600	60	100	1,100	50	70	1,200	40	60

Depth of Cut (R: Radius)



a
R 0.1～0.4=0.02mm
R 0.5～5=0.05mm

Notes

※1 Use cutting fluid.
※2 Divide the cutting depth into several paths.

NSCV

Size ϕ 4 　 ϕ 6

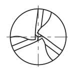
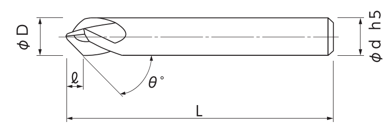
MG ≤40 HRC

Chamfer Cutter

Total 2 sizes

Specialized for cutting at chamfering.
Sharp edge with high rake angle realizes good surface quality and reduces burr.
For non-ferrous metal

3 　 φd h5 　 C

- It can be cut at the corner easily.

Aluminium Alloy N ◎
Copper N ◎
Resin O ◎

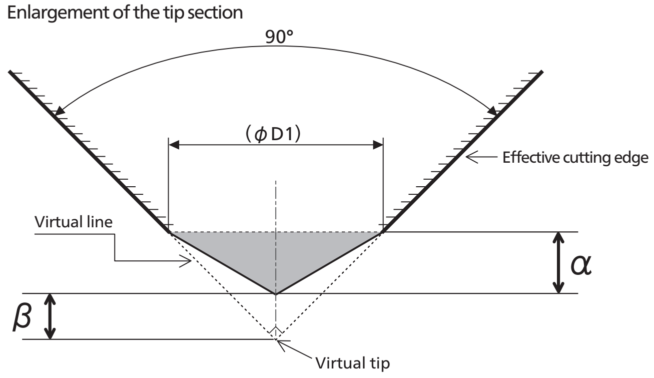
Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Shank Dia. (d)	Overall Length (L)
04-00250-00400	4	45°	2	4	60
04-00250-00600	6	45°	3	6	70

How to Order 　 When you order, indicate NSCV (D).

Precaution for use

Enlargement of the tip section



Unit : mm

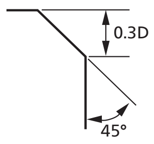
Dia.	α	β	(φD1)
4	0.15	0.06	0.42
6	0.45	0.15	1.2

※Required adjustments of the cut points to avoid using α part because its tool tip has no cutting edges.
※Because the tool tip α part of point angle is not 90°, the value of β must be offset in the ap direction during machining on virtual tip basis.
In case of no adjustments, it requires attention because chamfer will be bigger than targeted value.

Recommended Milling Conditions

Dia.	Aluminium Alloy A5052	
	Spindle Speed	Feed
	min^{-1}	mm/min
4	11,000	2,400
6	7,500	1,800

Depth of Cut



Notes

※1 The above milling conditions are the value of reference for 4D, it needs adjustments of the conditions when it is longer.
※2 Adjust both spindle speed and feed at the same rate.
※3 Machine, tool chuck must be sufficiently rigid.
※4 Choose appropriate coolant for each working material.

N Aluminium Alloy ◎
N Copper ◎
O Resin ◎

NSCV-M

Size ϕ 4　ϕ 6

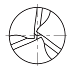
≦55 HRC

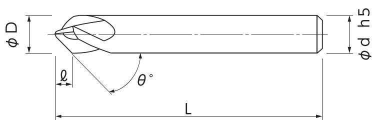
MUGEN COATING Chamfer Cutter

Total 2 sizes

MG　3　ϕd h5　C

Specialized for cutting at chamfering.
Sharp edge with high rake angle realizes good surface quality and reduces burr.
For steel





- It can be cut at the corner easily.
- Tool life is exceptionally as MUGEN COATING provides additional wear resistance.

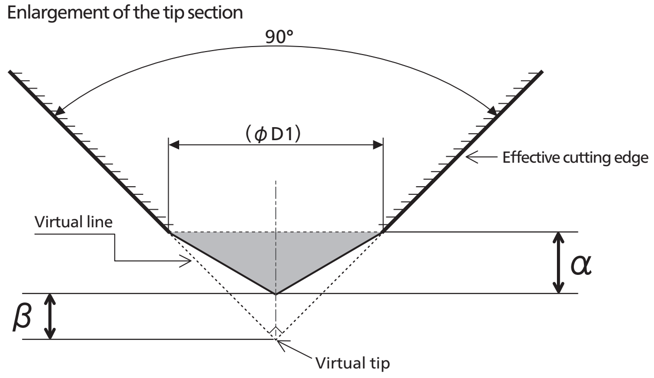
Unit : mm

Code No.	Dia. (D)	Taper Angle (θ)	Length of Cut (ℓ)	Shank Dia. (d)	Overall Length (L)
04-00260-00400	4	45°	2	4	60
04-00260-00600	6	45°	3	6	70

How to Order　When you order, indicate NSCV-M (D).

Precaution for use

Enlargement of the tip section



Unit : mm

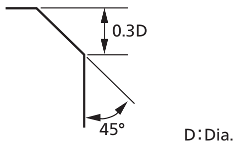
Dia.	α	β	(ϕD1)
4	0.15	0.06	0.42
6	0.45	0.15	1.2

※Required adjustments of the cut points to avoid using α part because its tool tip has no cutting edges.
※Because the tool tip α part of point angle is not 90°, the value of β must be offset in the ap direction during machining on virtual tip basis.
In case of no adjustments, it requires attention because chamfer will be bigger than targeted value.

Recommended Milling Conditions

Dia.	Carbon Steels S50C		Stainless Steels SUS304		Prehardened Steels HPM・NAK	
	Spindle Speed	Feed	Spindle Speed	Feed	Spindle Speed	Feed
	min^{-1}	mm/min	min^{-1}	mm/min	min^{-1}	mm/min
4	6,500	580	6,000	540	4,500	400
6	4,300	380	4,000	360	3,000	270

Depth of Cut



Notes

※1 The above milling conditions are the value of reference for 4D, it needs adjustments of the conditions when it is longer.
※2 Adjust both spindle speed and feed at the same rate.
※3 Machine, tool chuck must be sufficiently rigid.
※4 Choose appropriate coolant for each working material.

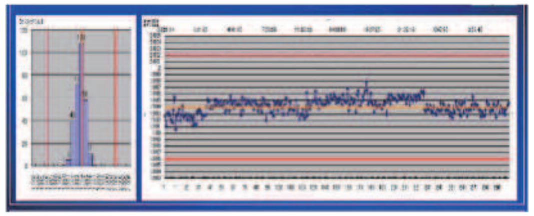
3

Features of NS TOOL

Being particular manufacturing that continues to maintain stable accuracy and quality

What is important in NS TOOL's product manufacturing is not only the high quality, but also the absolute quality of always maintaining the high quality and continuing to deliver the same high-precision products.

In- house development tool grinder TGM



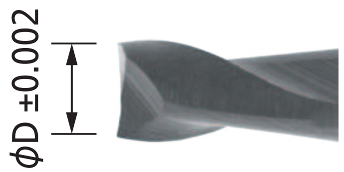
Realize stable production accuracy

Strengths for small diameter sizes under 6mm

The accuracy and quality of NS TOOL's end mills support micro and precision machining

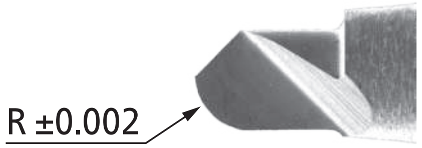
NS TOOL, which delivers small-diameter end mills to customers, is responsible for product stability. The in-house developed tool grinding machine TGM, which was developed to realize that desire, has made it possible to suppress product variations and deliver products with stable accuracy and quality to customers every time.

Dia. tolerance



NSME230 ϕ0.03 mm

R tolerance

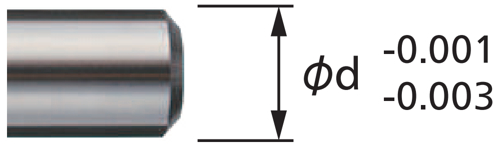


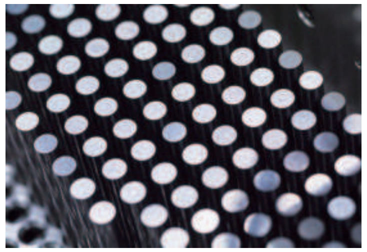
NSMB100 R0.005 mm

Uncompromising on shank accuracy as the basis of the tools

The end mill shank is the part that is attached to the machine tool both when using the end mill and when manufacturing the end mill. The shank is the standard for end mills and is a very important part of the basis of high precision. NS TOOL is particular about the accuracy of the shank, which is the standard, and manufactures it in the 2 µm range of "-0.001 mm to -0.003 mm". (Excludes some products.)

shank accuracy





Inspections in each process

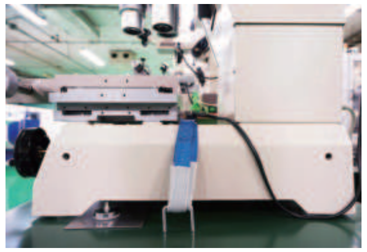
Support micro precision machining with NS TOOL accuracy and quality

NS TOOL inspects end mills in each process to ensure high quality, and find out any occurred abnormalities at early process by inspective system



Responsibility for stable supply

End mills have become indispensable for cutting, and we are working on various earthquake countermeasures so that supply will not be interrupted. In addition to the measures for buildings mentioned above, we also take thorough measures to prevent falls, prevent glass from scattering, and protect measuring instruments and production equipment. As one of them, we also develop our own seismic detector device. We aim to be the most disaster-resistant factory in the world without stopping the production of our customers.

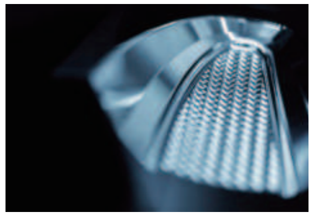



R&D center with the most advanced environment and equipment

Development of new products and technologies that embody customer needs by adopting "all-round seismic isolation" that combines micro-vibration dampers with seismic isolation devices, which are devices that dampen micro-vibrations that hinder microfabrication. We are accelerating. In addition, we have set up a seminar room that can accommodate 150 people, and actively hold seminars by inviting customers, aiming to be a base for disseminating information on precision and microfabrication technology.

Be aware of the technology to "use" as well as "make"

At our company, we are always conscious of the user's perspective on how it will be used by our customers, and we are working on technological development not only for "making" but also for "using".

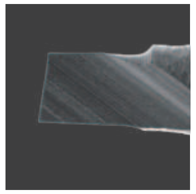


We are conscious of developing things not yet in the world from the perspective of being used.
We will keep to contiune to be bold with any challenge for development while looking a little ahead of the customer's perspective.

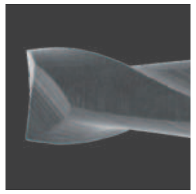
Features of NS TOOL Development

Tool development realizes micro and precision machining

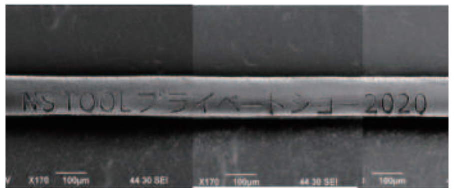
NS TOOL's great strength is that other companies cannot imitate the manufacturing technology for small diameter sizes, such as standardizing end mills that are thinner than hair and have an outer diameter of 0.01 mm. In particular, the requirements for tolerances have become even more stringent when the diameter is small, and we are currently achieving a tolerance range of 0.004 mm for non-coated products with an outer diameter, ball radius, and corner radius.



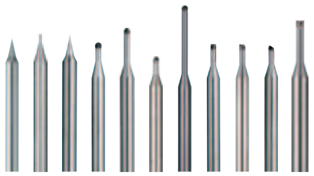
NSME100 ϕ0.01 mm



NSME230 ϕ0.03 mm



Milling on hair



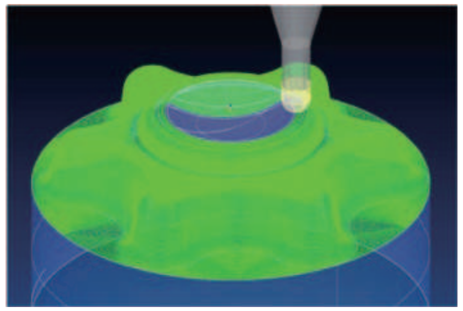
CBN end mill series

PCD end mill series

Long neck end mill series

Development of CAD / CAM specialized for fine and precision machining

Tool paths are a very important factor in researching precision and micro fabrication technology. While researching a tool path that allows end mills with a small diameter to fully demonstrate their capabilities, we have also developed a CAD / CAM "NS-Micro CAM".



Features of NS TOOL

NS TOOL Tool Material Introduction

CBN End Mill

CBN(Cubic Boron Nitride) sintered alloy is 3 times harder than Tungsten carbide, second hardest material next to diamond,moreover strong heat-resistant and high thermal conductivity. However less tough characteristic of CBN often causes chipping of tool edge easily. Accordingly, CBN is recommended for finishing of hard materials with less cutting load on the tool edge, which guarantees extra long tool life.

PCD End Mill

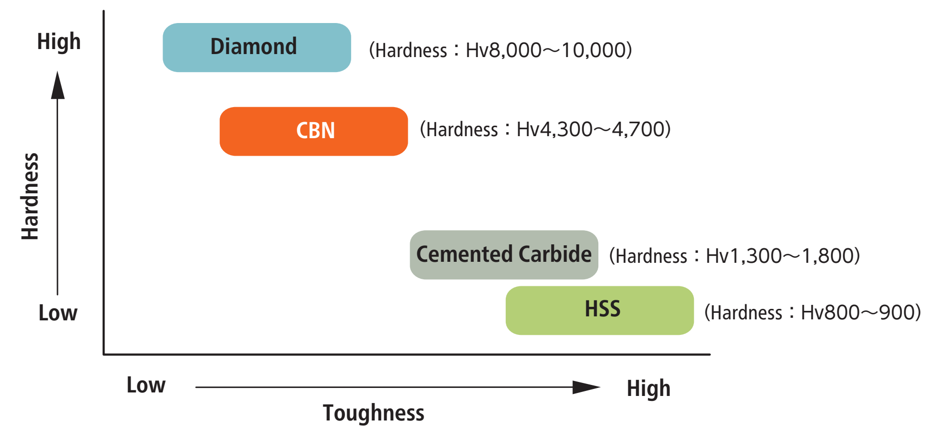
PCD consists micron-size artificial diamond powders sintered with binding materials such as Co and etc. at high pressure and temperature.
PCD is as hard as Monocrystalline Diamond featuring strong wear-resistance. However the use is limited as being fragile against heat. It is mostly used for the machining of brittle materials.

Cemented Carbide End Mill

Cemented Carbide End Mill is made by WC (Tungsten carbide) -based sintered metal composed with power materials of Co (Cobalt) and etc. Its hardness higher than HSS (High speed steel) takes advantage on wear-resistance. It is widely used for the machining of various materials from Roughing to Finishing.

Monocrystalline Diamond End Mill

Monocrystalline Diamond End Mill by the hardest material on earth is made by a single crystal on flute unlike PCD consisting various binding materials. Its perfect sharp edge allows milling stress at minimum, while its application range may be limited due to behavior gap of flute wearing against material types. It is mostly used for the machining of brittle materials and non-ferrous metals.



MUGEN COATING PREMIUM Plus

MUGEN COATING PREMIUM Plus realizes machining on high hardened steels up to 70HRC. Three layers, oxidation resistant layer, hard coating layer (ultra micro crystal structure), and high adhesion coating layer (micro crystal structure), support excellent tool life.

MUGEN COATING PREMIUM

MUGEN COATING PREMIUM supports the tool life when directly milling on high hardened steels. Suitable for machining on high hardened materials from 48HRC to 65HRC.

MUGEN COATING

MUGEN COATING is a TiAIN (titanium aluminide) based coating, but it also has strong wear resistance and lubricity against hardened steel, heat-treated steel, raw materials, and copper.

DLC COATING

DLC (diamond-like carbon) COATING is a carbon film with diamond-like properties and is an amorphous (non-crystalline) structure coating that has both diamond and graphite. The hardness is high, the coefficient of friction is low, and the surface roughness of the film is Ra 0.02 μm, which is extremely smooth. In addition, it has excellent welding resistance, so it is possible to maintain a good finished surface by processing aluminium alloys.

DIAMOND COATING

High stability is achieved by excellent wear resistance and high adhesion technology made of high-purity diamond that does not contain binders and impurities.

MUGEN MICRO COATING

This is a TiAIN (titanium aluminide) -based coating developed as a special coating for ultra-small diameter sizes with an outer diameter of 0.1 mm or less, which NS TOOL specializes in.

X COATING *Distributor Stock Only

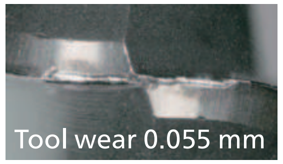
X COATING is based on TiCN (Titanium Carbon Nitride) with high hardness and strong adhesion. It has good performance in general cutting (cutting speed 100 m / min or less) by wet coolant.

NS TOOL Original Coating

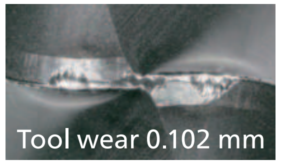
MUGEN COATING PREMIUM Plus

New developed coating with high oxidation resistance and abrasion resistance realizes machining on high hardened steels up to 70HRC. Three layers, Oxidation resistant layer, Hard coating layer (Ultra micro crystal structure), and High adhesion coating layer (micro crystal structure), support excellent tool life.

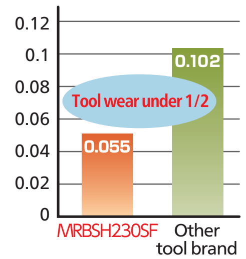
HAP72 70HRC Powder HSS



MRBSH230SF R1 × 6



Other tool brand



Comparison of tool wear

n：16,000 min^{-1}　vf：1,200 mm/min　ap 0.1 mm × ae 0.3 mm
Oil mist　Machining time : 80 min

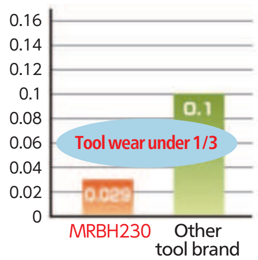
MUGEN COATING PREMIUM

MUGEN COATING PREMIUM, improved from MUGEN COATING, supports the extended tool life for direct milling on high hardened steels. Suitable for machining on high hard materials from 48HRC to 65HRC.

HAP40 65HRC Powder HSS

MRBH230 R1 × 6

Other tool brand



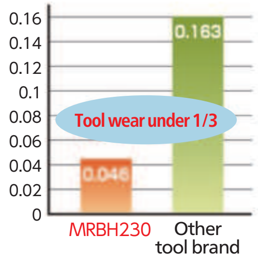
Comparison of tool wear

n：20,000 min^{-1}　vf：1,600 mm/min　ap 0.15 mm × ae 0.3 mm
Oil mist　Machining time : 18 min　Cutting length : 25 m

PD613 60HRC（SKD11）

MRBH230 R1 × 6

Other tool brand



Comparison of tool wear

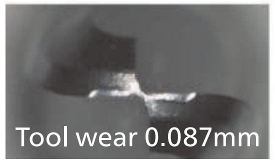
n：25,000 min^{-1}　vf：2,000 mm/min　ap 0.2 mm × ae 0.3 mm
Oil mist　Machining time : 62 min　Cutting length : 100 m

Features of NS TOOL

MUGEN COATING

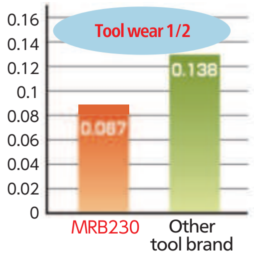
MUGEN COATING based on TiAlN (Titanium Aluminium Nitride), is recommended for hardened steels, pre-hardened steel, raw materials, and copper machining. In addition, the coating supports various type of coolant, such as water soluble fluid, water insoluble fluid, air blow, and oil mist.

STAVAX 52HRC（SUS420J2)



MRB230 R1 × 10

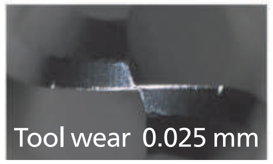
Other tool brand



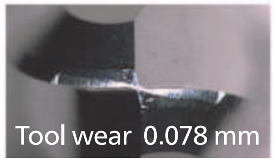
Comparison of tool wear

n：10,000min^{-1}　vf：1,500 mm/min　ap 0.1 mm × ae 0.2 mm
Water soluble fluid　Machining time : 132 min　Cutting length : 150 m

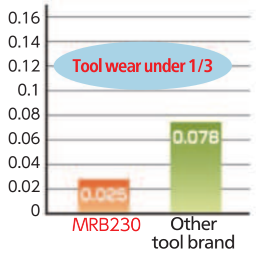
Copper



MRB230 R1 × 20



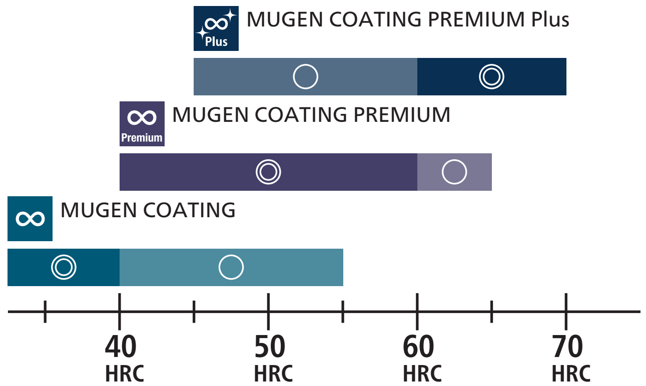
Other tool brand



Comparison of tool wear

Roughing n：12,000 min^{-1}　vf：1,200 mm/min　ap 0.2 mm × ae 0.3 mm
Finishing n：5,000 min^{-1}　vf：700 mm/min　ap 0.05 mm × ae 0.03 mm
Water soluble fluid　Machining time : 8 hr 54 min

Range of NS TOOL original coating by work material hardness



Features of NS TOOL

4

NS TOOL Machining Case

Narrow pitch connector

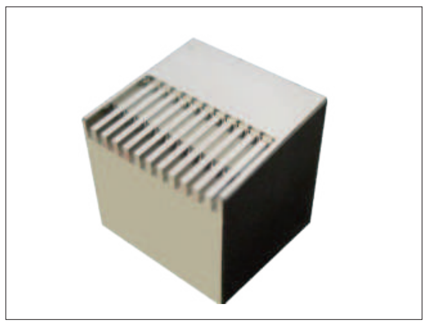
Work Material HAP40
Hardness 64HRC

CBN Square End Mill

Page ➡ B-010

SSE600 ϕ 0.2 ～ ϕ 1 Total 14 sizes

Possible to high-precision machining with reduced wear even for requiring corner edges with high hardened steels of 60HRC or higher

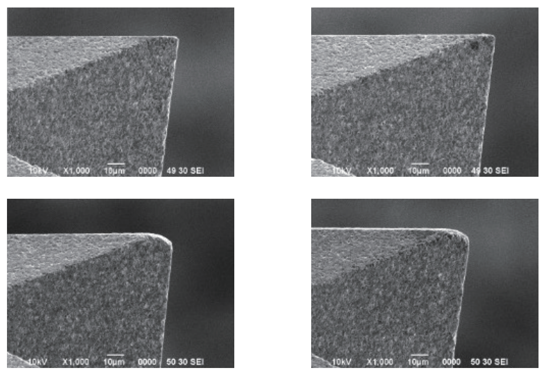


Work size	15 × 15 mm (Machining depth 2mm)
Work material	HAP40(64HRC)
Coolant	Oil mist
Total machining time	13 hr 32 min

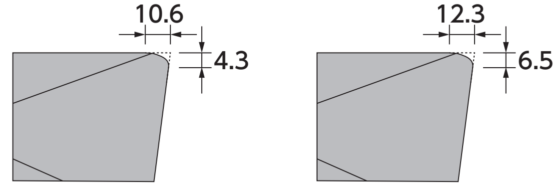
Bottom cutting edge 1 Bottom cutting edge 2

Before machining

After machining



Cutting edge retreat amount (µm)



Process	Roughing	Contour line semi-finishing	Scanning line semi-finishing	Contour line finishing	Scanning line finishing
Tool	SSR200 ϕ 0.5×R0.05×2.5	SSR200 ϕ 0.5×R0.05×2.5		SSE600 ϕ 0.5×2.5	
Spindle speed [min^{-1}]	30,000	30,000		30,000	
Feed [mm/min]	500	500	300	400	300
Feed apxae [mm]	0.005×0.2	0.005×0.01	0.01×0.01	0.005×0.002	0.002×0.01
Machining time	7 hr 20 min	2 hr 52 min		3 hr 20 min	

" N " letter engraving

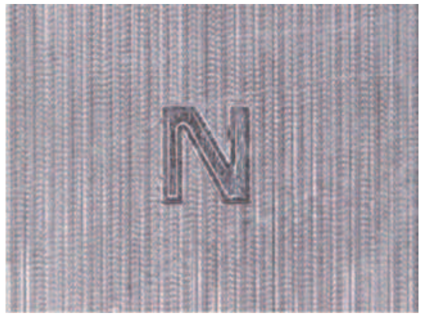
Work Material PD613
Hardness 60HRC

CBN Ball End Mill for precision machining "CBN Micro Ball"

Page ➡ B-012

SMB120 R0.01 ～ R0.05 Total 7 sizes

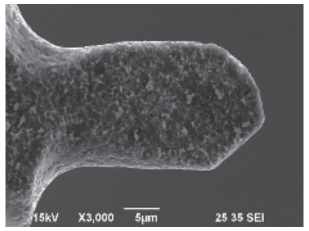
Micro manufacturing cutting into high hardened steels
Long tool life CBN enables making of highly accurate corners even with a small diameter



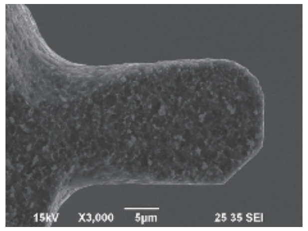
Bottom surface roughness
Rz 0.80 μm

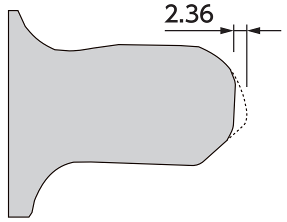
Work size	0.31 × 0.28 mm (Machining depth 0.01 mm)
Work material	PD613 (60HRC)
Coolant	Oil mist
Total machining time	3 hr 10 min

Before machining



After machining





Cutting edge retreat amount (µm)

Tool	SMB120 R0.01
Spindle speed [min^{-1}]	80,000
Feed [mm/min]	5
Depth of cut apxae [mm]	0.0005×0.001
Machining time	3 hr 10 min

Punch model

Work Material HAP40
Hardness 65HRC

CBN Super Spiral Ball End Mill

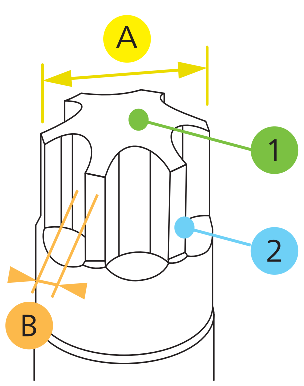
Page ➡ B-016

SSPB220 R0.1 ～ R3 Total 30 sizes

The spiral ball shape is ideal for finishing process. It provides stable, excellent surface roughness and machining accuracy

Work size	ϕ 25 (Machining depth 30 mm)
Work material	HAP40(65HRC)
Coolant	Oil mist
Total machining time	4 hr 36 min

Process	Finishing
Tool	SSPB220 R3 × 18
Spindle speed [min^{-1}]	6,000
Feed [mm/min]	600
Depth of cut apxae [mm]	0.05 × 0.05
Machining time	1 hr 58 min



Machining accuracy [mm]			
	pcs	1 pc	6 pc
A	Actual	23.006	23.008
	Error	+0.006	+0.008
B	Actual	3.005	3.008
	Error	+0.005	+0.008

Machining accuracy [μm]			
	pcs	1 pc	6 pc
1	Ra	0.145	0.162
	Rz	1.054	1.122
2	Ra	0.167	0.185
	Rz	1.355	1.355

Machining Case
CBN
Core Line

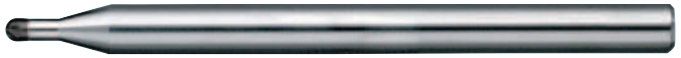
Reflector

Work Material ELMAX
Hardness 60HRC

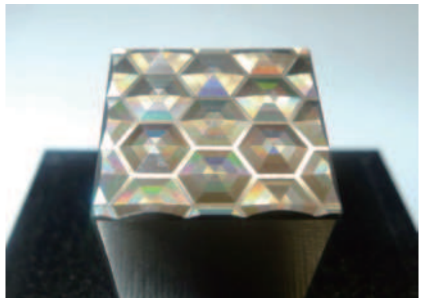
CBN Super Speed Ball End Mill

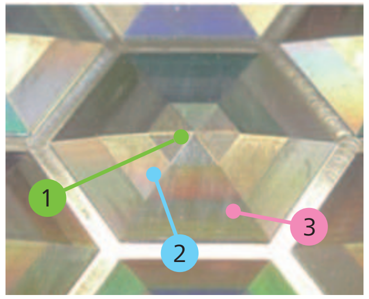
Page ➡ B-018

SSB200 R0.1 ～ R1 Total 15 sizes



Suitable for long finishing operation in high-hardened steel





Work size	15 × 15 mm (Machining depth 0.35 mm)
Work material	ELMAX(60HRC)
Coolant	Oil mist
Total machining time	9 hr 34 min

Surface roughness [μm]		
1	2	3
		
Rz 0.87 μm	Rz 0.89 μm	Rz 0.57 μm

Process	Roughing	Slot	Semi-finishing	Finishing
Tool	MRBH230 R0.5 × 2	MHRH230R ϕ 0.4×R0.05×1	MRBH230 R0.5 × 2	SSB200 R0.5 × 2.5
Spindle speed [min^{-1}]	40,000	30,000	40,000	40,000
Feed [mm/min]	800	125	800	400
Depth of cut apxae [mm]	0.02 × 0.1	ap 0.003	0.02 × 0.08	0.004 × 0.004
Machining time	52 min	38 min	1 hr 45 min	6 hr 19 min

Machining Case
CBN
Core Line

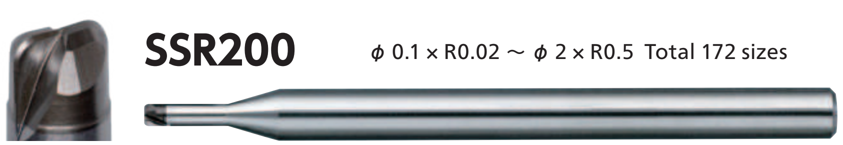
Micro-slotting

Work Material YXR7
Hardness 63HRC

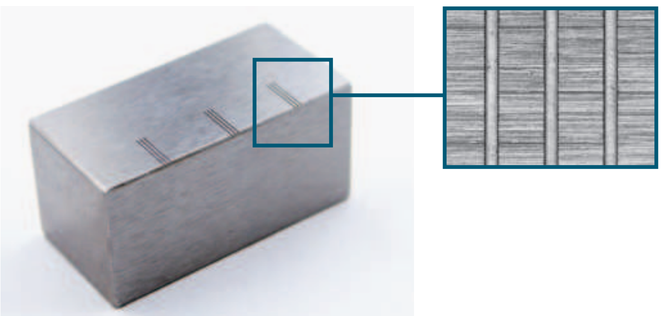
CBN Super Speed Radius End Mill

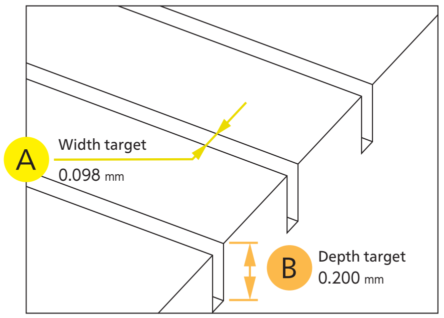
Page ➡ B-028

SSR200 ϕ 0.1 × R0.02 ～ ϕ 2 × R0.5 Total 172 sizes



High-precision machining to YXR7 (63HRC) is possible even with an ultra-fine diameter of 0.1 mm





Work size	30 × 15 mm (Machining depth 0.2 mm)
Work material	YXR7(63HRC)
Coolant	Oil mist
Total machining time	3 hr 51 min

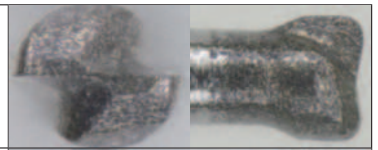
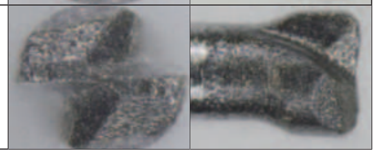
※Actual tool diameter ϕ 0.098.

	Target	Actual
A Slot width	0.098 mm ※	0.099 mm
B Depth	0.2 mm	0.198 mm

Machining Case CBN Core Line

Tool	SSR200 ϕ 0.1×R0.02×0.2
Spindle speed [min^{-1}]	31,000
Feed [mm/min]	50
Depth of cut [mm]	ap 0.001

Tool ware after machining

Before machining	
After machining 1 hr 17 min	

Three slots machined by one tool

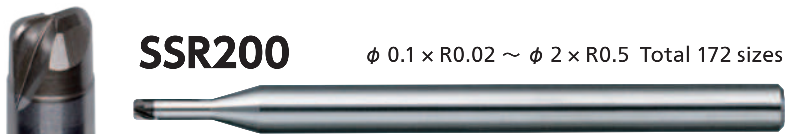
Combined Micro-machining

Work Material PD613
Hardness 60HRC

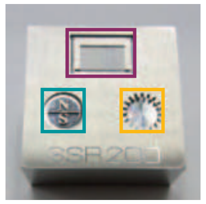
CBN Super Speed Radius End Mill

Page ➡ B-028

SSR200 ϕ 0.1 × R0.02 ～ ϕ 2 × R0.5 Total 172 sizes



CBN End Mill ensures high quality surface and accuracy for a long time machining to high-hardened steel (60HRC) even with 0.2mm cutter diameter



Slot

Slot width
: 0.2 mm
Depth
: 0.5 mm
Length
: 5 mm
Number of groove
: 36

Work size	30 × 30 mm
Work material	PD613(60HRC)
Coolant	Oil mist
Total machining time	14 hr 47 min

NS Logo

2.001 mm
(Target 2.000 mm)

Magnified photo for corner edge

Top Bottom

Gear (Gear dia. 8 mm)

Bottom surface roughness
Rz 0.25 μ m

Corner radius after finishing

Magnification rate : 1,000

Cutting Part	Slot		NS Logo		Gear	
Process	Slotting (to Z-0.03)	Slotting (to Z-0.5)	Finishing (Side)	Finishing (Bottom)	Finishing (Side)	Finishing (Bottom)
Tool	SSR200 ϕ 0.2×R0.02×0.5				SSR200 ϕ 0.2×R0.02×1	
Spindle speed [min^{-1}]	40,000					
Feed [mm/min]	100	300	300		200	
Depth of cut apxae [mm]	ap 0.001	ap 0.003	0.001× 0.005	0.005× 0.005	0.003× 0.005	0.005× 0.005
Machining time	1 hr 8 min	2 hr 19 min	1 hr 55 min	20 min	1 hr 45 min	30 min

Machining Case CBN Core Line

Micro needle

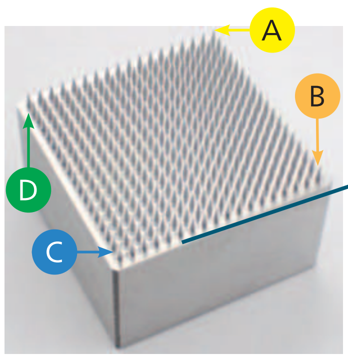
Work Material STAVAX
Hardness 52HRC

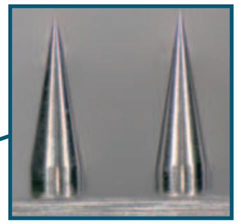
CBN Super High Precision Radius End Mill

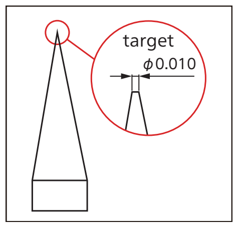
Page ➡ B-036

SHPR400 ϕ 0.1 × R0.01 ~ ϕ 3 × R0.2 Total 142 sizes

Achieves long tool life machining with 4-flutes CBN edge despite its small diameter of ϕ 0.3







Measuring position	Tip diameter [mm]	
	Target	Actual
A	0.010	0.009
B		0.013
C		0.013
D		0.013

Work size	15 × 15 mm (Machining depth 1.2mm)
Work material	STAVAX(52HRC)
Coolant	Oil mist
Total machining time	24 hr 53 min

Machining Case
CBN
Core Line

Process	Finishing
Tool	SHPR400 ϕ 0.3×R0.02×1.5
Spindle speed [min^{-1}]	40,000
Feed [mm/min]	25 ~ 300
Depth of cut apxae [mm]	0.003×0.04
Stock [mm]	—
Machining time	14 hr 50 min

※ 2 end mills used for finishing

Micro flow channel

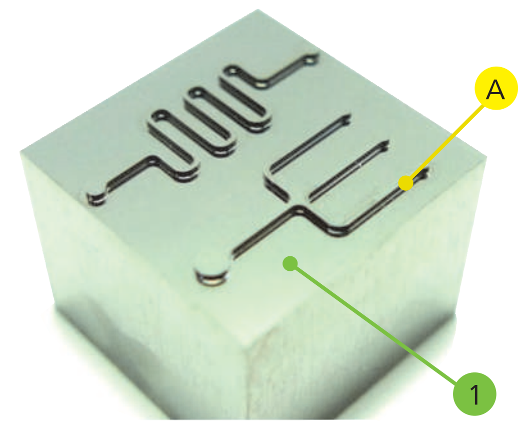
Work Material Cemented Carbide
Hardness 92.5HRA

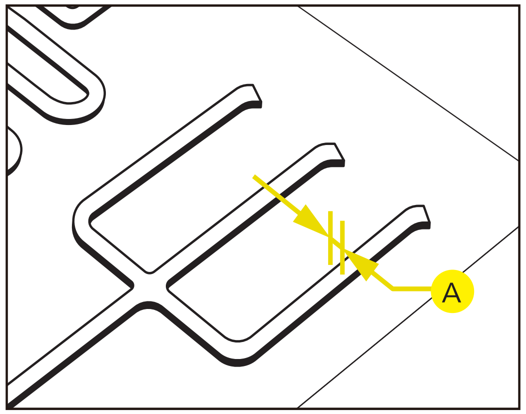
PCD Square End Mill

Page ➡ C-006

PCDSE ϕ 0.1 ~ ϕ 1 Total 8 sizes

Realizes stable machined surface in milling of cemented carbides. Possible to achieve the nano-level surface roughness required in ultra-precision machining





Work size	10 × 10 mm (Machining depth 0.25 mm)
Work material	Cemented carbide(92.5HRA)
Coolant	Water-insoluble fluid
Total machining time	12 hr 50 min

1	Bottom surface roughness
Ra	0.002 μ m
Rz	0.038 μ m

A	Passage width
Target	0.180 mm
Actual	0.182 mm
Error	+0.002 mm

Machining Case
PCD
Core Line

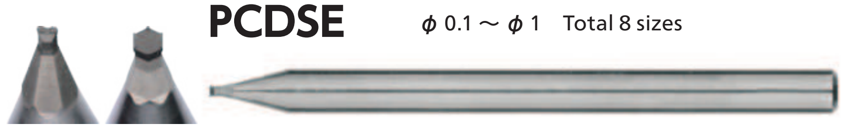
Cutting Part	Contour line finishing	Scanning line finishing
Tool	PCDSE ϕ 0.5	PCDSE ϕ 0.5
Spindle speed [min^{-1}]	56,000	56,000
Feed [mm/min]	70	50
Depth of cut apxae [mm]	0.001 × 0.002	0.001 × 0.01
Machining time	5 hr	7 hr 50 min

SD Card model

Work Material Cemented Carbide
Hardness 92.5HRA

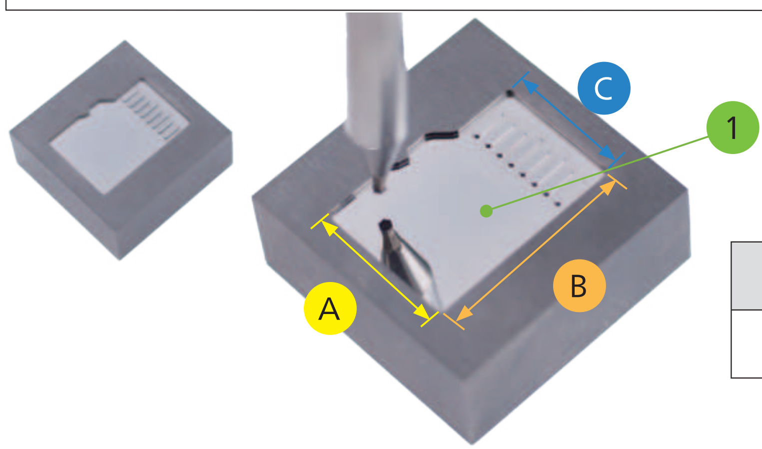
PCD Square End Mill

Page ➡ C-006



PCDSE ϕ 0.1 ～ ϕ 1 Total 8 sizes

In the finishing of cemented carbide, PCDSE realizes surface roughness nano-level machining



Unit [μm]

Surface Roughness	Ra	Rz
1	0.002	0.02

Work size	20 × 20 mm (Machining depth 0.415 mm)
Work material	Cemented carbide (92.5HRA)
Coolant	Water-insoluble fluid
Total machining time	24 hr 30 min

Unit [mm]

Measuring position	Target	Actual	Error
A	10.769	10.768	− 0.001
B	15.000	15.003	+ 0.003
C	9.423	9.425	+ 0.002

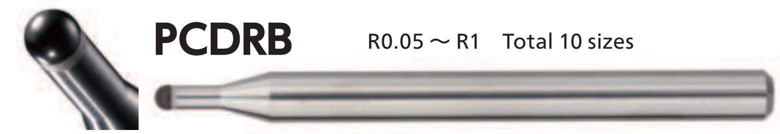
Process	Roughing	Semi-Finishing	Finishing
Tool	DCMS ϕ0.5	DCMS ϕ0.5	PCDSE ϕ0.5
Spindle speed [min-1]	20,000	20,000	40,000
Feed [mm/min]	150	150 ～ 300	100 ～ 200
Depth of cut ap × ae [mm]	0.002 × 0.3	0.002 × 0.002 ～ 0.05	0.0005 ～ 0.002 × 0.001 ～ 0.025
Stock [mm]	0.003	0.0005 ～ 0.002	-
Machining time	14 hr	2 hr 30 min	8 hr

Carbide Mirror Surface Sample

Work Material Cemented Carbide
Hardness 92.5HRA

PCD Ball End Mill

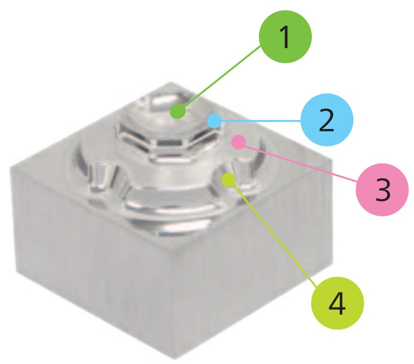
Page ➡ C-008



PCDRB R0.05 ～ R1 Total 10 sizes

High-quality mirror machining is achieved by exposing diamond particles to the surface and setting the R accuracy of the ball radius to ± 0.003 mm

PCDRB R0.5



Work size	10 × 10 mm (Machining depth 2.5 mm)
Work material	Cemented carbide (92.5HRA)
Coolant	Water-insoluble fluid
Total machining time	5 hr 9 min

Unit [μm]

Surface Roughness	Ra
1 Lens part	0.038
2 Incline 0°	0.014
3 Incline 15°	0.022
4 Incline 60°	0.009

Process	Roughing	Semi-Finishing	Finishing
Tool	DCMB R0.75	DCMB R0.5	PCDRB R0.5 × 2.5
Spindle speed [min-1]	30,000	30,000	40,000
Feed [mm/min]	300	300	300
Depth of cut ap × ae [mm]	0.03 × 0.15	0.01 × 0.01	0.003 × 0.005
Stock [mm]	0.013	0.003	-
Machining time	1 hr 40 min	1 hr 17 min	2 hr 12 min

Tail lamp mold

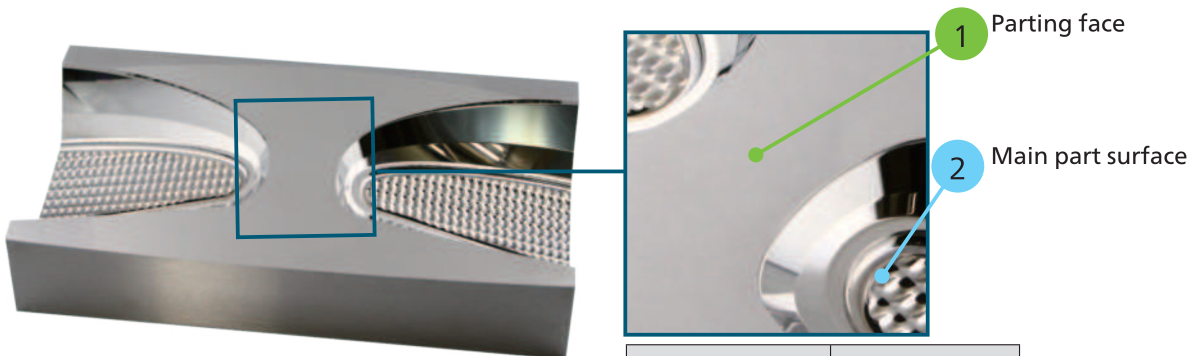
Work Material STAVAX
Hardness 52HRC

PCD Ball End Mill

Page ➡ C-008

PCDRB R0.05 ~ R1 Total 10 sizes

Finished surface looks “smooth, even and shiny” such as the mirror surface
Realized the roughness : Ra 30nm



Work size	200 × 100 mm (Machining depth 38.02 mm)
Work material	STAVAX(52HRC)
Coolant	Water-insoluble fluid
Total machining time	158 hr 8 min

Measuring position	Ra [μm]
1 Parting face	0.028
2 Main part surface	0.026

Process	Roughing		Semi-finishing	Finishing
Tool	MRBH230 R2×8	MRBH230 R1×6	SSPB200 R1×5	PCDRB R1×5
Spindle speed [min^{-1}]	20,000	20,000	40,000	40,000
Feed [mm/min]	2,000	1,500	1,000	1,000
Depth of cut apxae [mm]	0.2×1.5	0.05×0.05	0.02×0.02	0.005 × 0.005
Stock	0.05	0.02	0.005	-
Machining time	9 hr 49 min	6 hr 33 min	26 hr 57 min	114 hr 49 min

Punch pin

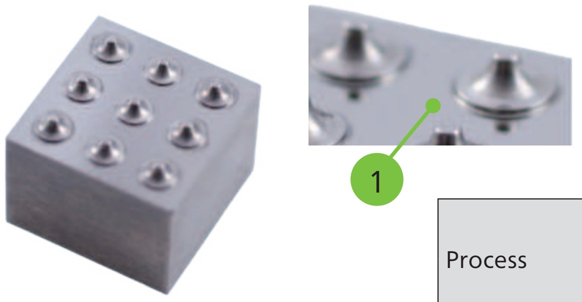
Work Material Cemented Carbide
Hardness 92.5HRA

PCD Corner Radius End Mill

Page ➡ C-010

PCDRS ϕ 0.3 × R0.05 ~ ϕ 1 × R0.1 Total 10 sizes

PCD corner radius end mill
Realized nano level finishined surface roughness on hard brittle materials



Measuring position	Ra [μm]	Rz [μm]
1 Bottom	0.0027	0.0192

Work size	10 × 10 mm (Machining depth 0.864 mm)
Work material	Cemented carbide (92.5HRA)
Coolant	Water-insoluble fluid
Total machining time	5 hr 12 min

Process	Roughing	
	Contour line	Scanning line
Tool	DCMB R1	
Spindle speed [min^{-1}]	30,000	
Feed [mm/min]	350	200
Depth of cut apxae [mm]	0.04 × 0.15	ae 0.1
Stock [mm]	0.005	0.005
Machining time	45 min	

Process	Semi-Finishing			Finishing	
	Contour line	Contour line	Scanning line	Contour line	Scanning line
Tool	DCMB R 0.5	DCMS ϕ 1 × 2		PCDRS ϕ 0.5 × R0.1 × 5	
Spindle speed [min^{-1}]	40,000	20,000		40,000	
Feed [mm/min]	200	120		120	
Depth of cut apxae [mm]	ap 0.02	ap 0.002	0.002 × 0.05 ~ 0.1	ap 0.008	ae 0.02
Stock [mm]	0.001	0.001	0.001	-	-
Machining time	36 min	1 hr 6 min		1 hr 40 min	

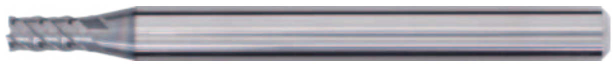
Multi Profile Sample

Work Material HAP40
Hardness 65HRC

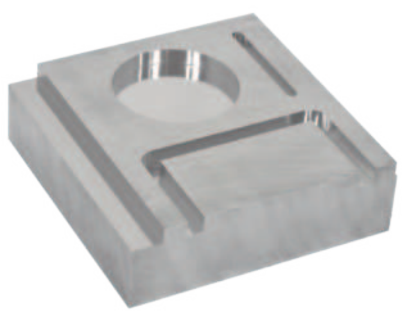
MUGEN COATING PREMIUM Plus
4-Flute Square End Mill for or Hardened steel

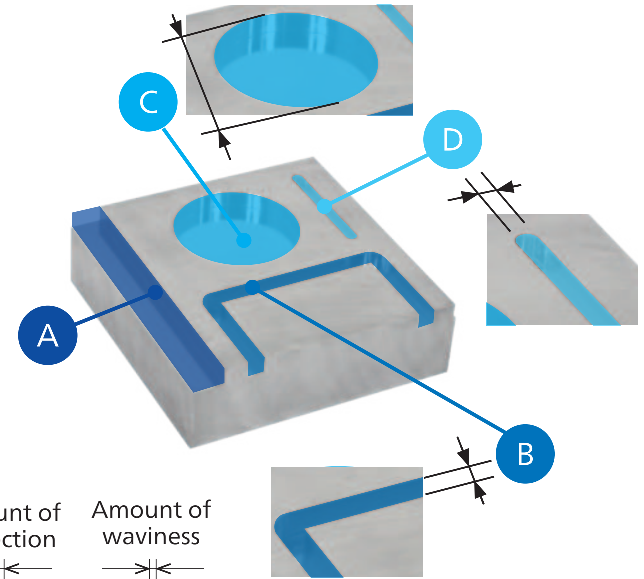
Page ➡ E-006

MHDSH445 ϕ1～ϕ4 Total 10 sizes

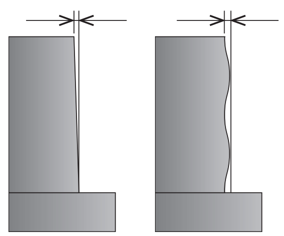


Support many requests of machining, such as slotting, side milling and trochoid milling





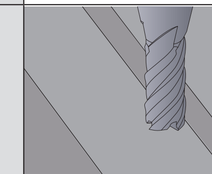
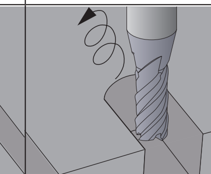
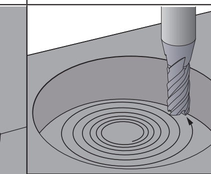
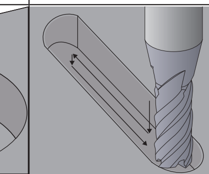
Work size	100 × 100 mm (Machining depth 6 mm)
Work material	HAP40 (65HRC)
Coolant	Oil mist
Total machining time	1 hr 55 min



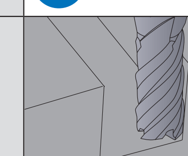
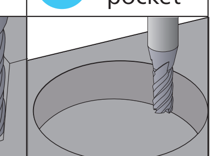
Unit [mm]

Measuring position	A Side	B Slot	C ircle pocket	D Slot
Amount of deflection	0.003	0.001	0.001	0.001 or less
Amount of waviness	0.006	0.002	0.001	0.001 or less
Target ※1	-	5.995	44.995	3.995
Actual	-	5.982	44.982	3.987
Error	-	0.013	0.013	0.008

※1 Referenced to the tool outer diameter before machining

Process	Roughing			
Cutting part	A Side	B Slot	C Circle pocket	D Slot
Cutting method	 Side	 Trochoidal	 Side	 Slot (Reciprocating cutting)
Tool	MHDSH445 ϕ4 × 8			
Spindle speed [min^{-1}]	6,000			5,000
Feed [mm/min]	600			300
Depth of cut ap × ae [mm]	5.95 × 0.08	5.95 × 0.08	5.95 × 0.08 ※2	ap : 0.04
Stock [mm]	Side：0.01 Bottom：0.05			-
Machining time	33 min	26 min	31 min	15 min

※2 Approaches Helical: R0.7 mm Angle:0.5° Feed: 300 mm/min

Process	Finishing	
Cutting part	B Slot	C Circle pocket
Cutting method	 Side･Bottom	 Side･Bottom
Tool	MHDSH445 ϕ4 × 8	
Spindle speed [min^{-1}]	6,000	
Feed [mm/min]	Side: 300 Bottom：600	
Depth of cut ap × ae [mm]	Side：6 × 0.01 Bottom：0.025 × 1 (2 times)	
Stock [mm]	-	
Machining time	10 min	

Machining Case Regular Line MUGEN PREMIUM Plus

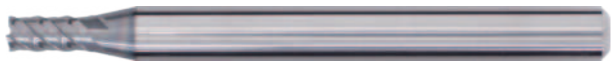
Two-stage Octagon Punch

Work Material YXM1
Hardness 63HRC

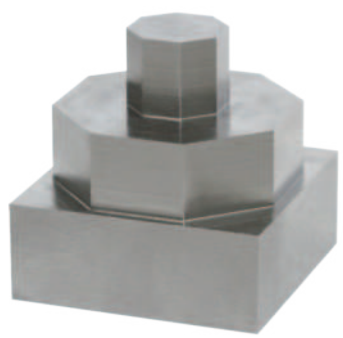
MUGEN COATING PREMIUM Plus
4-Flute Square End Mill for or Hardened steel

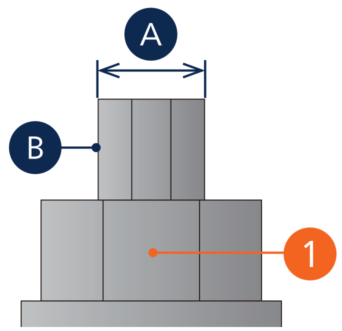
Page ➡ E-008

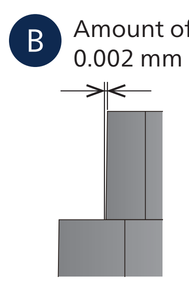
MHDSH645 ϕ 5 ～ ϕ 6 Total 4 sizes



High rigidity tool design suppresses deflection for hardened steel machining







High rigidity tool design suppresses deflection

Work size	30 × 30 mm (Machining depth 18 mm)
Work material	YXM1 (63HRC)
Coolant	Oil mist
Total machining time	25 min

Unit [µm]

Measuring position	1
Ra	0.33
Rz	1.99

Measuring position	A
Target [mm] ※	11.008
Actual [mm]	11.016
Error [mm]	0.008

※ Referenced to the tool outer diameter before machining

Process	Roughing	Finishing (Plane)	Finishing (Side)
Tool	MHDSH645 ϕ 6 × 12	MHDSH645 ϕ 6 × 12	
Spindle speed [min^{-1}]	5,300		
Feed [mm/min]	1,200	400	
Depth of cut ap × ae [mm]	9 × 0.12	0.05 × 3	9 × 0.05
Stock [mm]	0.05	-	
Machining time	21 min	3 min	1 min

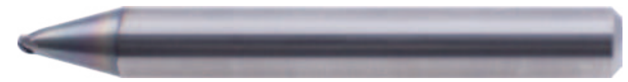
Punch pin

Work Material HAP40
Hardness 64HRC

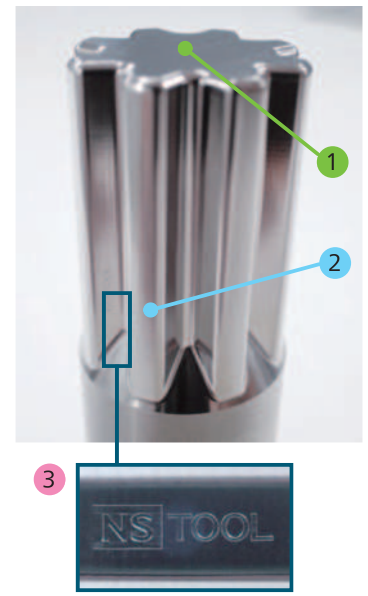
MUGEN COATING PREMIUM Plus
3-Flute Ball End Mill for 5-axis machining

Page ➡ E-010

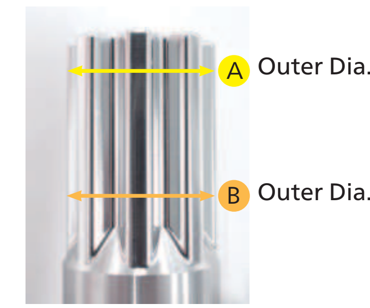
MSBSH330-5X R0.1 ～ R1 Total 8 sizes



Realize high precision deep milling by the tool design that conforms the advantage of the features of a 5-axis machine



Work size	ϕ 25 × 80 mm (Machining depth 35mm)
Work material	HAP40(64HRC)
Coolant	Oil mist
Total machining time	5 hr 52 min



Surface roughness	1	2	3
Ra[μ m]	0.07	0.13	0.09

Machining Accuracy	A	B
Target [mm]	24.000	
Actual [mm]	24.001	24.006

Process	Roughing		Semi-finishing	Finishing	Engraving
Tool	MSBSH330-5X R1	MSBSH330-5X R1	MSBSH330-5X R1	MSBSH330-5X R1	MSBSH330-5X R0.1
Spindle speed [min^{-1}]	20,000	20,000	20,000	20,000	40,000
Feed [mm/min]	3,000	1,500	1,500	1,200	200
Depth of cut apxae [mm]	0.08×0.3	0.09×0.09	0.06×0.06	0.03×0.03	0.005×0.005
Stock	0.07	0.04	0.02	-	-
Ting angle	20° ～ 90°	30° ～ 90°	30° ～ 65°	30° ～ 65°	90°
Machining time	2 hr	38 min	55 min	2 hr 13 min	6 min

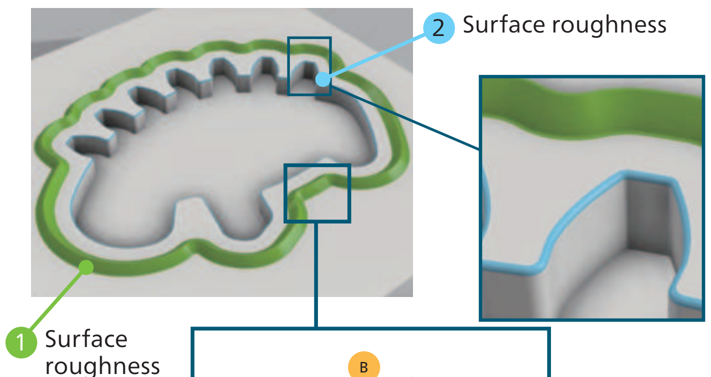
MUGEN COATING PREMIUM Plus

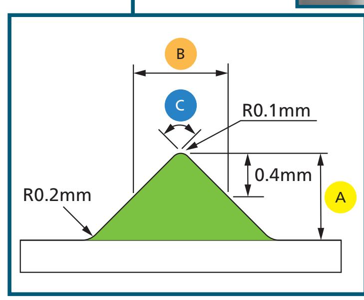
Page ➡ E-012

2-Flute Long Neck Ball End Mill for Hardened steel and High accuracy cutting

MRBSH230SF R 0.05 ～ R 3 Total 83 sizes

Achieves long tool life and high precision cutting even in 60 to 70HRC high-hardened steel





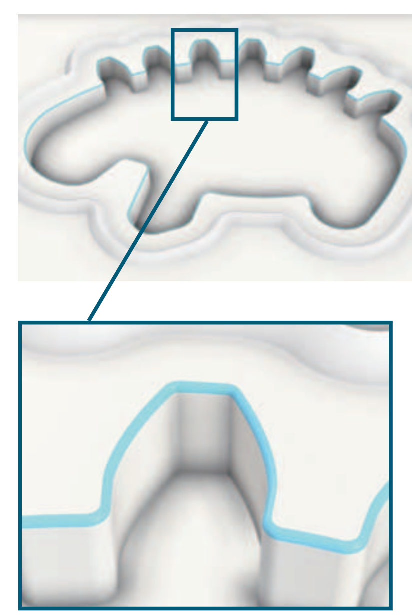
Work size	60 × 60 mm (Machining depth 4mm)
Work material	YXR3(61HRC)
Coolant	Oil mist
Total machining time	7 hr 27 min

Surface roughness	1	2
Ra	0.145	0.080
Rz	1.192	0.521

	A	B	C
Target	0.958 mm	0.883 mm	90°0'00"
Actual	0.958 mm	0.888 mm	90°15'10"
Error	0.000 mm	+0.005 mm	0°15'10"

Process	Blank holder	Roughing	Semi-finishing	Finishing	Stock removal	Finishing	Stock removal	Stock removal
Tool		MRBSH230SF R1×4	MRBSH230SF R1×4		MRBSH230SF R0.5×2		MRBSH230SF R0.25×1.5	MRBSH230SF R0.2×1
Spindle speed [min^{-1}]		25,000			30,000			
Feed [mm/min]		2,500			1,000		540	540
Depth of cut apxae [mm]		0.2 × 0.5	pf : 0.05	pf : 0.08	pf : 0.05	pf : 0.03	pf : 0.03	pf : 0.02
Stock		0.03	0.01	-	0.01	- (Only corner part0.005)		-
Machining time		39 min	40 min	1 hr 6 min	1 hr 3 min		47 min	1 hr 26 min

※ pf : Pick feed



Process	Die	Roughing	Finishing
Tool		MRBSH230SF R0.25×1.5	MRBSH230SF R0.2×1
Spindle speed [min^{-1}]		30,000	
Feed [mm/min]		540	
Depth of cut apxae [mm]		0.01 × 0.03	pf : 0.01
Stock		0.003	-
Machining time		1 hr 11 min	35 min

※ pf : Pick feed

Machining Case
Regular Line
MUGEN PREMIUM Plus

Sealed mold

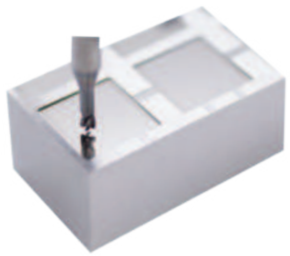
Work Material VANADIS23
Hardness 63HR

MUGEN COATING PREMIUM Plus
4-Flute Long Neck Corner Radius End Mill with short shank for Hardened Steel and High accuracy cutting

Page ➡ E-018

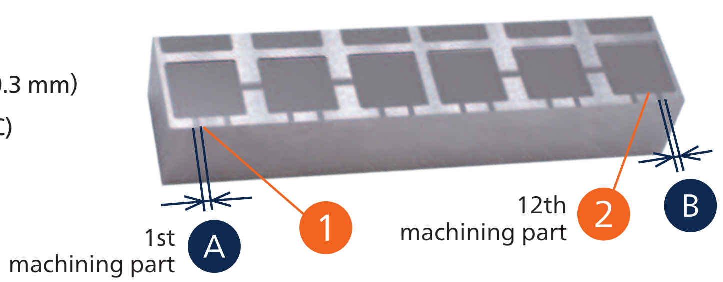
MHRSH430RSF ϕ 0.1 × R 0.01 ～ ϕ 2 × R 0.5 Total 131 sizes

Realized stable dimension accuracy on machining hardened steels
By adopting wiper at the end cutting edge achieves high precision surface roughness on plane machining



Work size	20 × 90 × 15 mm (Machining depth 0.3 mm)
Work material	VANADIS23 (63HRC)
Coolant	Oil mist
Total machining time	1 hr 44 min

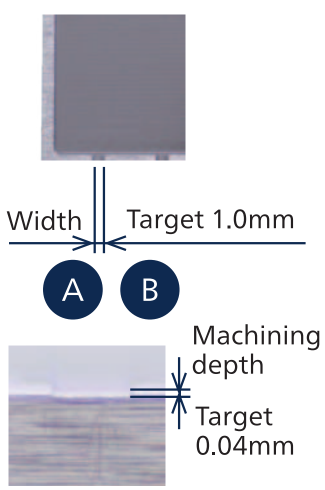
Machining at air vent Comparison between 1st and 12th places



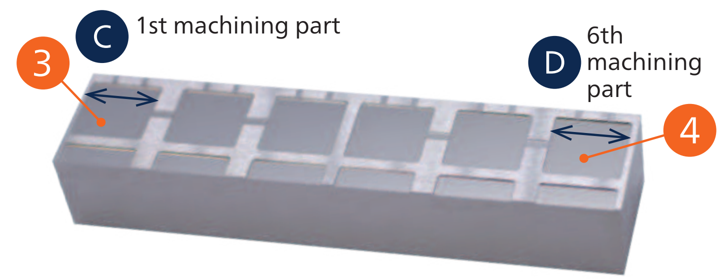
Surface roughness [μm]	1	2
Ra	0.055	0.066
Rz	0.387	0.445

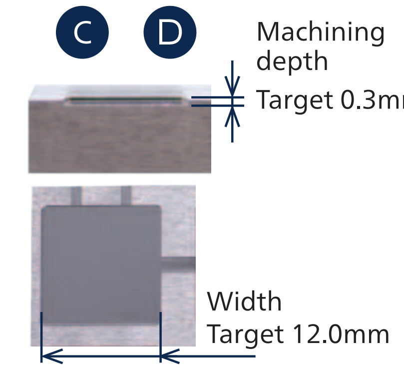
Measuring position [mm]	Groove A		Groove B	
	Width	Depth	Width	Depth
After machining	1.001	0.039	0.999	0.041

Process	Roughing	Finishing
Tool	MHRSH430RSF ϕ0.8 × R0.02 × 2	MHRSH430RSF ϕ0.8 × R0.02 × 2
Spindle speed $[min^{-1}]$	11,000	
Feed [mm/min]	500	300
Depth of cut ap × ae [mm]	0.003 × 0.18	0.005 × 0.01 Side 0.003 × 0.2 Bottom
Stock [mm]	0.01 Side 0.003 Bottom	-
Machining time	3 min	4 min



Machining at cavity Comparison between 1st and 6th places





Surface roughness [μm]	3	4
Ra	0.053	0.051
Rz	0.370	0.336

Measuring position [mm]	Cavity C		Cavity D	
	Width	Depth	Width	Depth
After machining	11.999	0.298	11.998	0.296

Process	Roughing	Stock removal	Bottom Semi-finishing
Tool	MHRSH430RSF ϕ1.5 × R0.1 × 4	MHRSH430RSF ϕ1 × R0.05 × 2	
Spindle speed $[min^{-1}]$	11,000	11,000	
Feed [mm/min]	800	800	
Depth of cut ap × ae [mm]	0.06 × 0.3	0.01 × 0.12	ae 0.2
Stock [mm]	0.01 Side 0.004 Bottom	0.01 Side 0.004 Bottom	0.004 Bottom
Machining time	40 min	14 min	8 min

Process	Finishing	Corner finishing
Tool	MHRSH430RSF ϕ1 × R0.05 × 2	
Spindle speed $[min^{-1}]$	11,000	
Feed [mm/min]	800	
Depth of cut ap × ae [mm]	0.01 × 0.01 Side 0.004 × 0.2 Bottom	0.01 × 0.05
Stock [mm]	-	-
Machining time	26 min	9 min

Machining Case
Regular Line
MUGEN PREMIUM Plus

High precision fitting sample

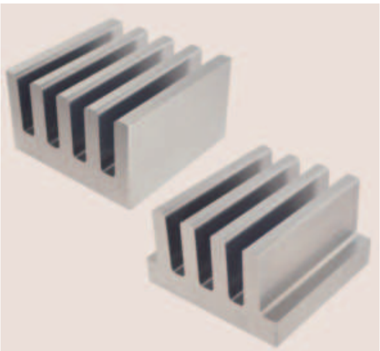
Work Material STAVAX
Hardness 52HRC

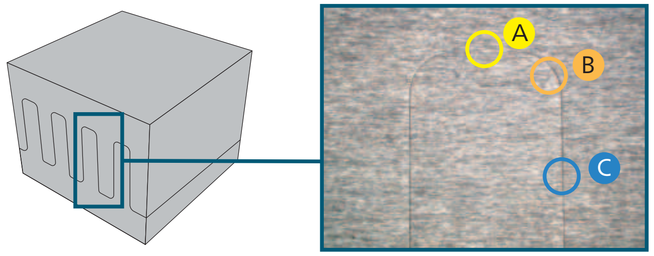
MUGEN COATING PREMIUM
2-Flute Long Taper Neck Ball End Mill

Page ➡ F-062

MRBTNH230 R 0.05 × Neck Taper Angle 3° ～ R 2 × Neck Taper Angle 1° Total 209 sizes

The tapered neck shape with high rigidity enables highly accurate and stable machining even in deep milling





	Stock removal
A	0.002 mm
B	0.014 mm
C	0.007 mm

Work size	50 × 50 mm (Machining depth 20 mm)
Work material	STAVAX(52HRC)
Coolant	Oil mist
Machining time	Concave 24 hr 11 min Convex 25 hr 13 min
Total machining time	49 hr 24 min

Process	Roughing	Semi-finishing	Stock removal	Finishing
Tool	MRBH230 R2×20	MRBH230 R2×20	MRBTNH230 R1×30'×20	MRBTNH230 R1×30'×20
Spindle speed [min^{-1}]	16,000	8,000	8,000	5,000
Feed [mm/min]	2,400	800	700	400
Depth of cut apxae [mm]	0.2 × 1.0	0.1 × 0.02	0.05 × 0.1	0.03 × 0.01
Stock	0.03	0.01	0.01	-
Concave Machining time	1 hr 24 min	2 hr 16 min	1 hr 15 min	19 hr 16 min
Convex Machining time	1 hr 43 min	2 hr 42 min	58 min	19 hr 50 min

ECU case mold

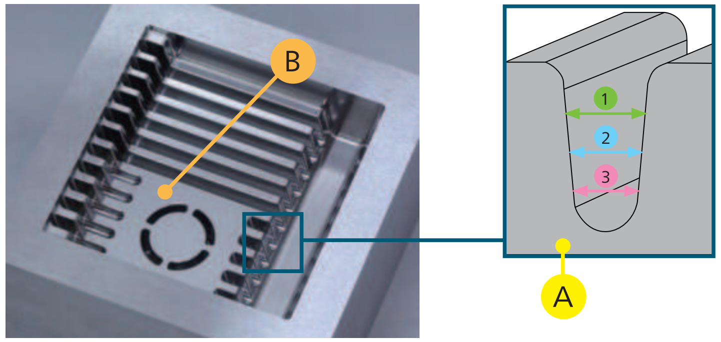
Work Material DH31-S
Hardness 48HRC

MUGEN COATING PREMIUM
3-Flute Long Taper Neck Ball End Mill

Page ➡ F-070

MRBTNH345 R0.5 × Neck Taper Angle 30′ ～ R2 × Neck Taper Angle 1° Total 69 sizes

The tapered neck shape with high rigidity enables highly accurate and stable machining even in deep milling



Unit : mm

Width	Target	Actual
1	2.479	2.465
2	2.339	2.319
3	2.199	2.168

Work size	80 × 80 mm
Work material	DH31-S(48HRC)
Coolant	Oil mist
Total machining time	13 hr 35 min

	Surface Roughness
A Side	Ra : 0.187 Rz : 1.092
B Top	Ra : 0.577 Rz : 2.643

Cutting Part	R1 slotting			R0.5 slotting		
Process	Slotting	Semi-Finishing	Finishing	Slotting	Semi-Finishing	Finishing
Tool	MRBTNH345 R1×2°×20		MRBTNH345 R1×2°×20	MRBTNH230 R0.5×2°×10		MRBTNH230 R0.5×2°×10
Spindle speed [min^{-1}]	10,000			20,000		
Feed [mm/min]	600	1,200	800	400	800	600
Depth of cut apxae [mm]	ap 0.05	0.1 × 0.7	ap 0.05	ap 0.02	0.04× 0.5	ap 0.02
Stock	0.05		-	0.03		-
Machining time	3 hr 14 min		5 hr 31 min	1 hr 9 min		1 hr 3 min

Machining Case
Regular Line
MUGEN PREMIUM
Long Neck Type

Valve body

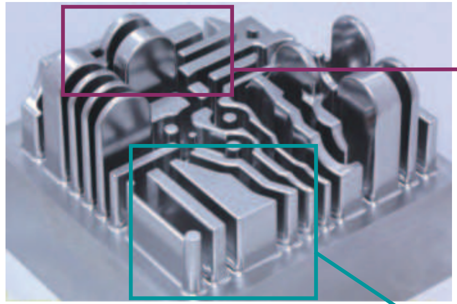
Work Material DAC-S
Hardness 44HRC

MUGEN COATING PREMIUM
3-Flute Long Taper Neck Ball End Mill

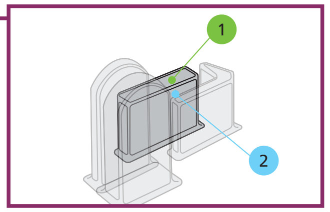
Page ➡ F-070

MRBTNH345 R 0.5 × Neck Taper Angle 30′ ～ R 2 × Neck Taper Angle 1° Total 69 sizes

The tapered neck shape with high rigidity enables highly accurate and stable machining even in deep milling

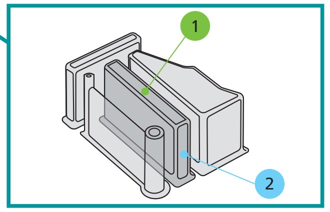


At the beginning of machining



Surface roughness [μ m]	
1 Top	Ra : 0.340 Rz : 2.015
2 Side	Ra : 0.168 Rz : 1.271

At the end of machining



Surface roughness [μ m]	
1 Top	Ra : 0.343 Rz : 2.081
2 Side	Ra : 0.194 Rz : 1.375

Work size	80 × 80 mm (Machining depth 30mm)
Work material	DAC-S(44HRC)
Coolant	Oil mist
Total machining time	35 hr 37 min

Process	Roughing ①	Roughin ②-1		Roughing ②-2		Roughin ②-3		Finishing	
Tool	MRBTNH345 R1.5×1°×30	MRBTNH345 R1×1°×20		MRBTNH345 R1×1°×25		MRBTNH345 R1×1°×30		MRBTNH345 R1×1°×30	
Spindle speed [min^{-1}]	10,000					8,000			
Feed [mm/min]	1,600	1,000	2,000	800	1,600	600	1,200	800	
Depth of cut apxae [mm]	0.1 × 0.2	ap 0.04	ap 0.08	ap 0.04	ap 0.08	ap 0.035	ap 0.07	ap 0.15	ae 0.1
Stock	Side:0.2 Bottom:0.1	0.05						-	
Machining time	1 hr 38 min	7 hr 45 min		6 hr		9 hr 20 min		6 hr 26 min	

Sealed mold

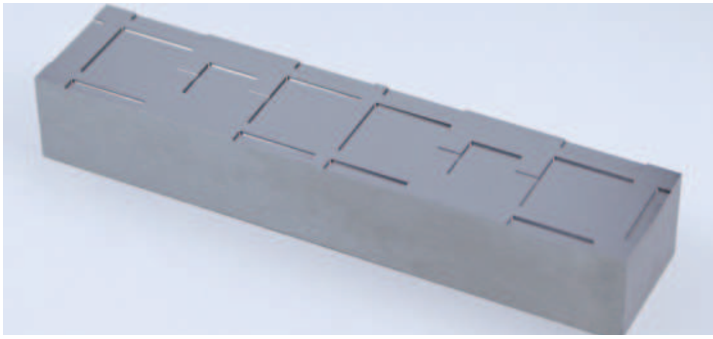
Work Material HPM31
Hardness 60HRC

MUGEN COATING PREMIUM
4-flute Long Neck Radius End Mill for Hardend Steel

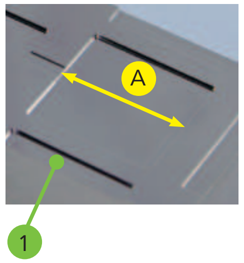
Page ➡ F-078

MHRH430R ϕ 0.1 × R 0.01 ～ ϕ 6 × R 1 Total 336 sizes

High-precision milling with minimal tool wear even after long hours of machining on high-hardened steel of 60 HRC or higher



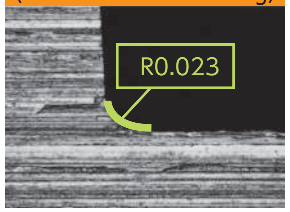
Work size	90 × 20 mm (Machining depth 0.35mm)
Work material	HPM31(60HRC)
Coolant	Oil mist
Total machining time	3 hr 59 min



	Target	Actual
A Width	12.000 mm	11.998 mm

1 Surface roughness	Ra 0.046 μ m Rz 0.247 μ m

R accuracy
(At the end of machining)



Cutting Part	Roughing	Semi-finishing	Finishing (Side • Corner)	Finishing(Bottom)
Tool	MHRH430R ϕ 1×R0.05×2	MHRH430R ϕ 0.8×R0.02×2	MHRH430R ϕ 0.8×R0.02×2	MHRH430R ϕ 0.8×R0.1×2
Spindle speed [min^{-1}]	21,000	21,000	31,000	31,000
Feed [mm/min]	2,000	1,800	1,200	1,200
Depth of cut apxae [mm]	0.04 × 0.25	0.015 × 0.1	ap 0.01	ae 0.01
Stock	0.02	0.01	-	-
Machining time	1 hr 16 min	25 min	39 min	1hr 39min

Machining Case
Regular Line
MUGEN PREMIUM
Long Neck Type

High efficient machining

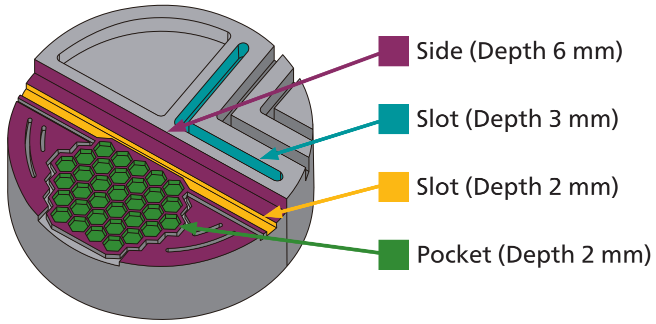
Work Material Titanium Alloy Ti-6Al-4

MUGEN COATING PREMIUM
4-Flute High Efficient "Z" End Mill for Stainless Steels

Page ➡ I-006

MSUSZ440 φ 1～φ 6 Total 62 sizes

Unequal flute spacing / unequal helix angle to minimize chatter
Specializing in high-efficiency machining of titanium alloy



Work size	φ 80
Work material	Titanium alloy Ti-6Al-4V
Coolant	Water-soluble fluid
Machining time	φ 1 : 27 min φ 3 : 9 min 30 sec

Cutting Part	Side (Depth 6 mm)		Slot (Depth 3 mm)			Slot (Depth 2 mm)		Pocket (Depth 2 mm)		
Process	Roughing	Finishing	Plunging	Slotting	Finishing	Trochoidal	Finishing	Plunging& Contouring	Roughing	Finishing
Tool	MSUSZ440 φ 3 × 6					MSUSZ440 φ 1 × 2				
Spindle speed [min^{-1}]	6,700		6,200			16,800		13,500		
Feed [mm/min]	1,100	800	50	300	800	600	400	50 & 200	600	400
Depth of cut apxae [mm]	6×0.6	6×0.1	ap 0.75		3×0.1	2×0.2	2×0.05	0.25×0.5	1.97×0.12	2×0.05 (Side) 0.03×0.5 (Bottom)
Machining time	4 min 30 sec		1 min			4 min 30 sec		18 min 30 sec		

Machining Case High Efficient Milling

High efficient machining

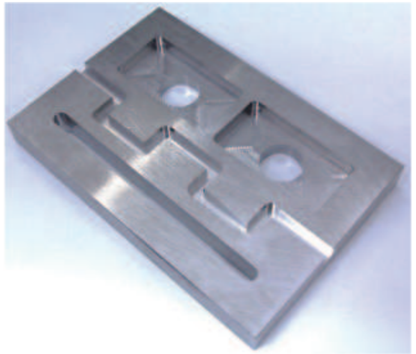
Work Material SCM415

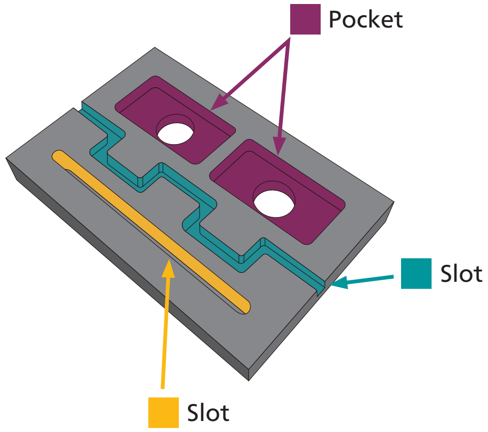
MUGEN COATING
4-Flute High Efficient "Z" End Mill for Carbon Steels

Page ➡ I-008

MSCZ440 φ 1～φ 6 Total 62 sizes

Unequal flute spacing / unequal helix angle to minimize chatter
For carbon steel to pre-hardened steel, possible continuous machining from plunging to grooving





Work size	150×100mm (Machining depth 15 mm)
Work material	SCM415
Coolant	Air blow
Total machining time	8 min 30 sec

Cutting Part	Pocket			Slot		Slot	
Process	Roughing	Roughing	Finishing	Roughing	Finishing	Roughing	Finishing
Tool	MSCZ440 φ 5×10					MSCZ440 φ 6×18	
Spindle speed [min^{-1}]	4,200					3,500	
Feed [mm/min]	Plunging:200 Slot:880	1,600	800	880	800	Plunging:150 Slot:650	780
Depth of cut apxae [mm]	ap 2.5	7.5×1	7.5×0.2	ap 5	ap 5	ap 3	ap 15
Stock	-	0.2	-	0.4	-	0.3	-
Machining time	1 min 30 sec	3 min	1 min	30 sec	30 sec	1 min 30 sec	30 sec

Machining Case High Efficient Milling

Honeycomb pocket shape

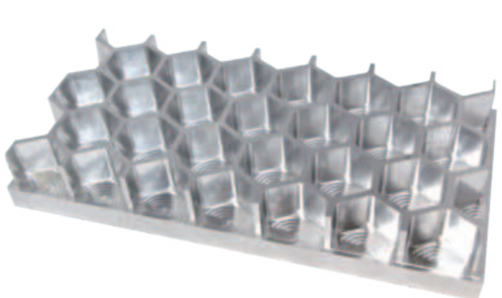
Work Material A6061

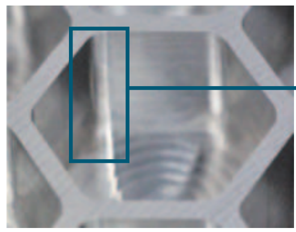
High Efficient 3-Flute End Mill for Aluminium L/D=3

Page ➡ I-014 J-022

AL3D-345 ϕ 1～ϕ 12 Total 9 sizes

3-flute strong twist type for aluminium processing
Continuous machining from plunge to grooving is possible

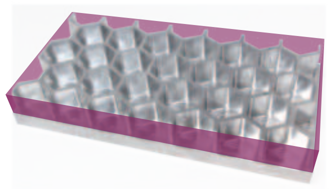


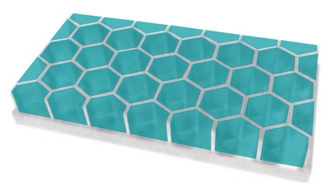


Pocket size : 25mm

In-corner surface after finishing

Work size	200 × 100 mm (Machining depth 18 mm)
Work material	A6061
Coolant	Water-soluble fluid
Total machining time	18 min





Cutting Part	Peripheral part		Honeycomb pocket		
Process	Roughing	Finishing	Helical approach	Roughing	Finishing
Tool	AL3D-345 ϕ 6				
Spindle speed [min^{-1}]	17,500				
Feed [mm/min]	3,000		1,000	3,000	
Depth of cut apxae [mm]	18 × 1.8	18 × 0.1	ap 0.14 (1circle) (Helical R = 2.0 mm Angle = 4°)	18 × 1.8	18 × 0.1

Bevel gear electrode

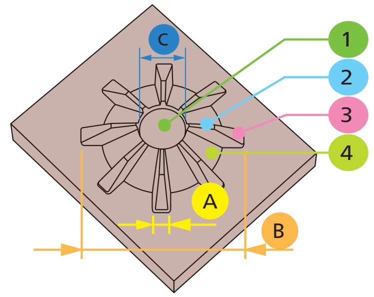
Work Material Cupper Tungsten (W70% - Cu30%)

Long Neck Ball End Mill for Copper Electrode

Page ➡ K-010

DRB230 R 0.05 ～ R 3 Total 94 sizes

Realizes long time machining and achieves stable high precision machining surface even on tough material of copper tungsten



	Surface Roughness
1 Flat surface	Ra : 0.129 Rz : 1.224
2 Inclined angle 12°	Ra : 0.174 Rz : 1.709
3 Inclined angle 34.07°	Ra : 0.199 Rz : 1.471
4 Inclined angle 35°	Ra : 0.296 Rz : 2.050

Work size	30 × 36 mm (Machining depth 5 mm)
Work material	Copper tungsten (W70% - Cu30%)
Coolant	Water-insoluble fluid
Total machining time	4 hr 20 min

	Width	
	Target	Actual
A	2.500	2.504
B	25.000	25.002
C	8.203	8.202

Process	Roughing	Semi-finishing		Stock removal	Finishing		
		Side · Curved	Top · Flat		Side · Curved	Top	Flat · Contour
Tool	DRB230 R0.4×3	DRB230 R0.4×3		DRB230 R0.2×1			
Spindle speed [min^{-1}]	30,000						
Feed [mm/min]	1,400			500			
Depth of cut apxae [mm]	0.15 × 0.3	0.05 × 0.01	0.01 × 0.05	0.01 × 0.02	0.03 × 0.01	0.01 × 0.03	ap 0.01 ae 0.03・0.02
Stock	0.02	0.01		0.01	-		
Machining time	1 hr 20 min	25 min	23 min	47 min	1 hr 25 min		

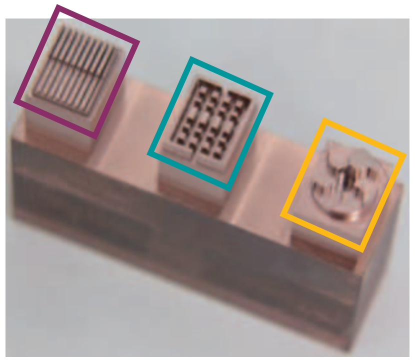
Work Material Cupper Tungsten
(W70% - Cu30%)

Long Neck Square End Mill for Copper Electrode

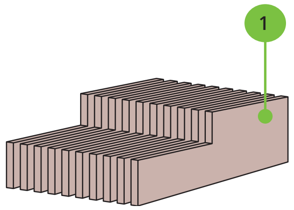
Page ➡K-006

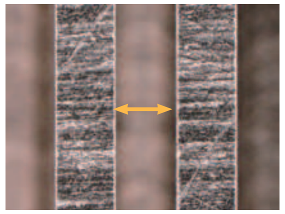
DHR237 ϕ0.1 ~ ϕ6 Total 74 sizes

Realizes long time machining and achieves stable high precision machining surface even on tough material of copper tungsten



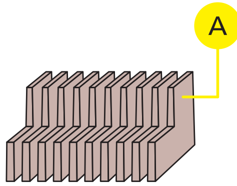
Work size	10 × 30 mm (Machining depth 3 mm)
Work material	Copper tungsten (W70% - Cu30%)
Coolant	Water-insoluble fluid
Total machining time	1 hr 40 min





Slot width [mm]	Target	Actual
B	0.310	0.307

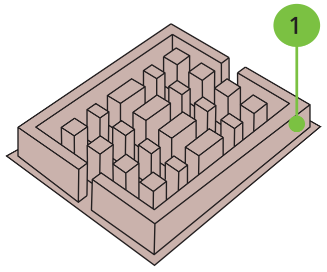
Side surface roughness [μm]
1 Ra : 0.101

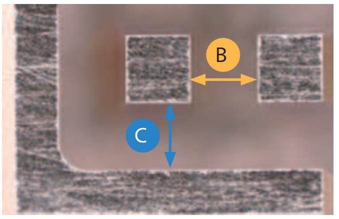


Deflection A [mm]
0.001

Shape	Micro slit shape	
Process	Roughing (Slotting)	Finishing (Side milling)
Tool	DHR237 ϕ0.3×1	DHR237 ϕ0.3×2
Spindle speed [min^{-1}]	25,000	
Feed [mm/min]	200 100 ※	150
Depth of cut apxae [mm]	ap 0.01 ap 0.005 ※	0.1×0.005
Stock	0.005	-
Machining time	42 min	12 min

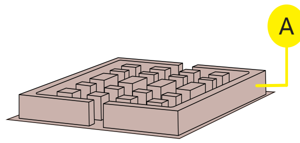
※Guide part machining from the upper surface to -0.05mm.





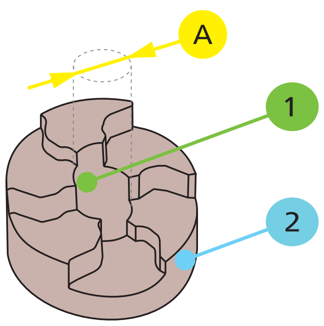
Slot width [mm]	Target	Actual
B	0.600	0.601
C	0.600	0.599

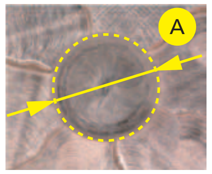
Side surface roughness [μm]
1 Ra : 0.197



Deflection A [mm]
0.001

Shape	Fine prism profile		
Process	Roughing (Slotting)	Finishing (Side milling)	Finishing (Side milling)
Tool	DHR237 ϕ0.5×1.5		
Spindle speed [min^{-1}]	26,000		
Feed [mm/min]	500	550	
Depth of cut apxae [mm]	ap 0.07	0.3 × 0.02	0.3 × 0.005
Stock	0.05	0.005	-
Machining time	13 min		





Width [mm]	Target	Actual
A	1.800	1.797

Surface roughness [μm]	
1	Ra 0.182
2	Ra 0.176

Shape	Cylindrical stage profile		
Process	Roughing (Helical milling)	Finishing (Side milling)	Finishing (Side milling)
Tool	DHR237 ϕ0.8×3		
Spindle speed [min^{-1}]	12,000		
Feed [mm/min]	500		
Depth of cut apxae [mm]	ap 0.02 (Helical R = 0.25)	0.5 × 0.02	0.5 × 0.005
Stock	0.25	0.005	-
Machining time	33 min		

Machining Case Copper Electrode Milling

Electrode for press mold

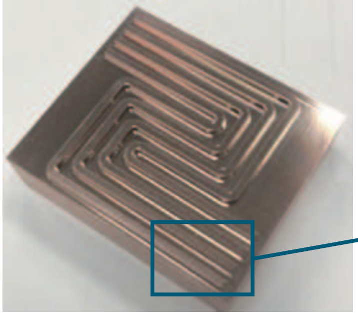
Work Material Cupper Tungsten (W70% - Cu30%)

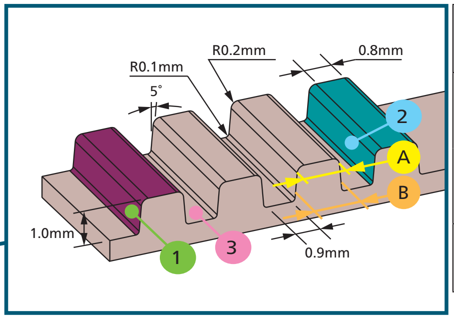
Long Neck Radius End Mill for Copper Electrode

Page ➡ K-016

DHR237R ϕ0.2 × R0.02 ～ ϕ6 × R1 Total 153 sizes

Realizes long time machining and achieves stable high precision machining surface even on tough material of copper tungsten





Surface roughness [μm]		
Side	1	Ra : 0.159 Rz : 1.403
	2	Ra : 0.139 Rz : 1.018
Bottom	3	Ra : 0.055 Rz : 0.516

Work size	30 × 35 mm (Machining depth 1.0 mm)
Work material	Copper tungsten (W70% - Cu30%)
Coolant	Water-soluble fluid
Total machining time	2 hr 5 min

Width	A Depth from top 0.2 mm	B Depth from top 0.8 mm
Target	1.202 mm	1.307 mm
■ Shape (purple)	1.203 mm	1.311 mm
■ Shape (teal)	1.207 mm	1.314 mm

Process	Roughing		Semi-finishing		Finishing	
	Contour	Slot	Flat surface	Side	Flat surface	Side
Tool	DHR237R ϕ 1×R0.1×3				DHR237R ϕ 1×R0.1×3	
Spindle speed [min^{-1}]	23,000					
Feed [mm/min]	2,200	1,000	2,200		1,100	
Depth of cut apxae [mm]	0.054 × 0.55	ap 0.027	ae 0.05	ap 0.03	ae 0.05	ap 0.02
Stock	0.05		0.03		-	
Machining time	23 min		30 min		1 hr 12 min	

Machining Case
Copper Electrode Milling

Heat-resistant glass machining

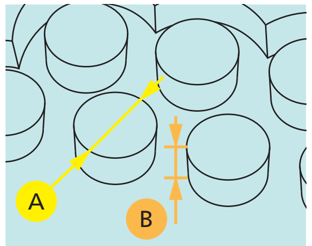
Work Material Heat-resistant glass

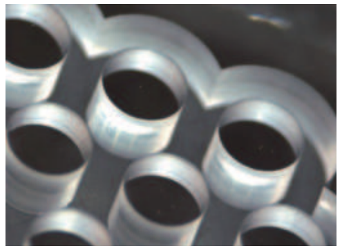
End Mill for Hard Brittle Materials

Page ➡ N-006

DCMS ϕ0.3 ～ ϕ2 Total 14 sizes

Machinable on hard brittle materials such as glass and cemented carbide
High adhered DIAMOND COATING makes tool life longer





Work size	20 × 20 mm (Machining depth 1 mm)
Work material	Heat-resistant glass
Coolant	Water-soluble fluid
Total machining time	20 hr 30 min

	A Cylinder diameter	B Cutting Depth
Target	1.260	1.000
Actual	1.259	0.999

Process	Contour
Tool	DCMS ϕ 0.5×1
Spindle speed [min^{-1}]	20,000
Feed [mm/min]	120
Depth of cut apxae [mm]	0.002 × 0.3
Machining time	20 hr 30 min

Machining Case
Hard Brittle Material Milling

Propeller shape

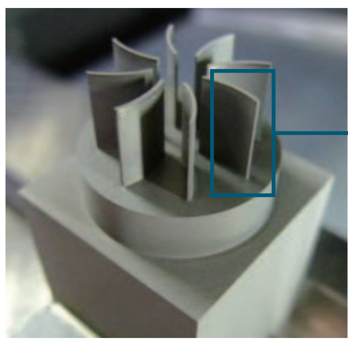
Work Material Graphite (TTK-5)

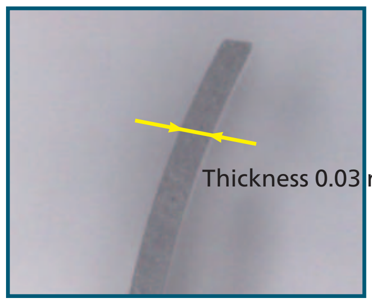
DIAMOND COATING 2-Flute Long Neck End Mill

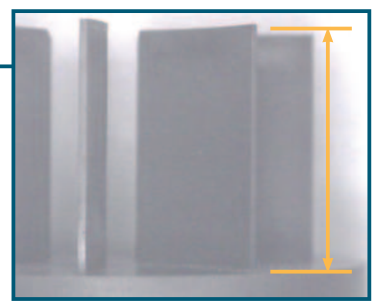
Page ➡ M-008

DCHR230 ϕ 0.5 ~ ϕ 6 Total 19 sizes

Original DIAMOND COATING realized a tool long life for the machining of graphite







Work size	ϕ 14 mm (Height of blade 6 mm)
Work material	Graphite (TTK-5)
Coolant	Air blow
Total machining time	1 hr 20 min

Machining Case Graphite Milling

Process	Cylindrical roughing	Roughing	Semi-finishing	Finishing
Tool	DCSE235 ϕ 6	DCHR230 ϕ 1×10		
Spindle speed [min^{-1}]	8,000	20,000		
Feed [mm/min]	600	2,000	1,000	800
Depth of cut apxae [mm]	8×0.5	0.2×0.6	0.05×0.2	
Machining time	5 min	1 hr 5 min		10 min

Slope drilling

Work Material SUS304

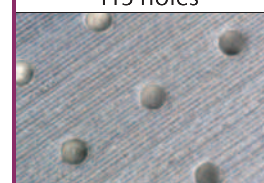
MUGEN COATING Flat Drill

Page ➡ O-006

MFD ϕ 0.1 ~ ϕ 6 Total 69 sizes

Possible for high-precision drilling on slopes of various angles with less burr

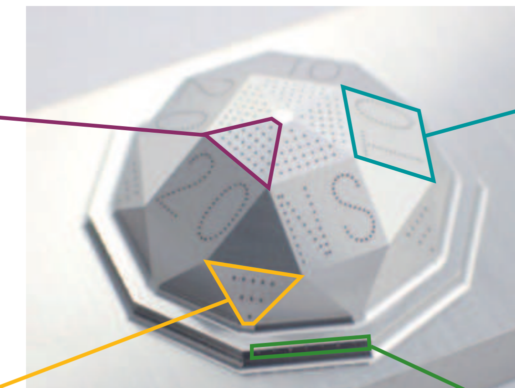
Inclined angle 15°(Blind hole) 115 holes



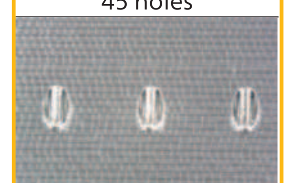
Hole diameter ϕ 0.101

Inclined angle 30°(Blind hole) 256 holes

Hole diameter ϕ 0.104



Inclined angle 70°(Blind hole) 45 holes



Hole diameter ϕ 0.100

Semicircular hole (Blind hole) 35 holes

Hole diamete ϕ 0.100

Work size	20 × 30 mm
Work material	SUS304
Coolant	Water-soluble fluid
Total machining time	1 hr 10 min

Machining Case Drill

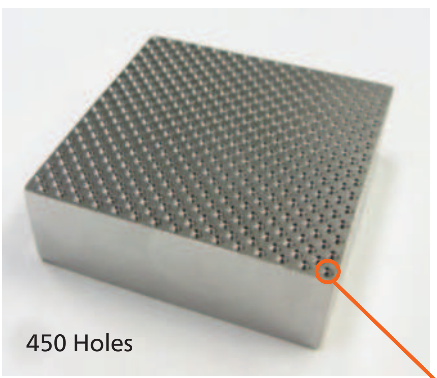
Process	Inclined angle 15° (Blind hole)	Inclined angle 30° (Blind hole)	Inclined angle 70° (Blind hole)	Semicircular hole (Blind hole)
Tool	MFD ϕ 0.1	MFD ϕ 0.1	MFD ϕ 0.1	
Spindle speed [min^{-1}]	25,000	25,000	25,000	
Feed [mm/min]	3	3	2	
Machining depth [mm]	0.2 (Non-Step)	0.2 (Non-Step)	0.2 (Non-Step)	
Machining time	15 min (8 sec / hole)	40 min (8 sec / hole)	10 min (10 sec / hole)	5 min (10 sec / hole)

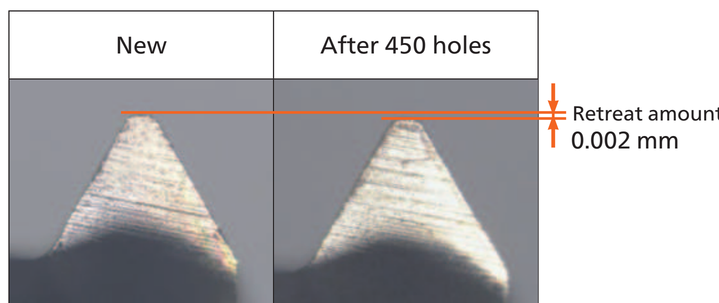
MUGEN COATING M-Thread Mill (for Internal Thread)

Page ➡ P-006

MMTM M1 ~ M6 Total 11 sizes

Thread mill used for threading instead of a tap. Cutting resistance can significantly be reduced in comparison with a tap, and tool life and accuracy can be improved in processing heat resistant alloy





Work size	35 × 35 mm
Work material	SUS316L
Coolant	Water-soluble fluid
Total machining time	3 hr 20 min

Process	Center hole milling	Pilot hole milling	Thread milling
Tool	MDR-PD ϕ 0.7	MDR-R ϕ 0.76	MMTM M1
Spindle speed [min^{-1}]	6,000		17,500
Feed [mm/min]	30	90	300
Depth of cut apxae [mm]	Step amount 0.05	Step amount 0.1	ae 0.088×2 Final helical R 0.155
Machining time	1 hr 21 min 5 sec	1 hr 24 min 35 sec	34 min 20 sec

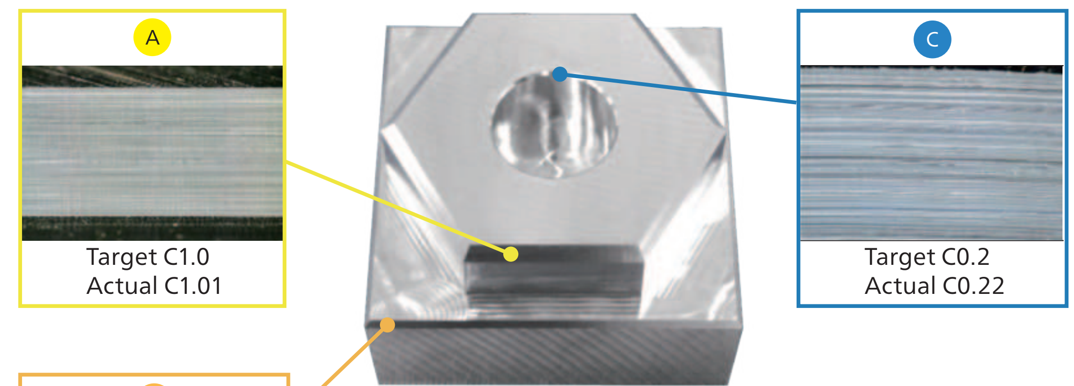
Thread milling : Up-cut

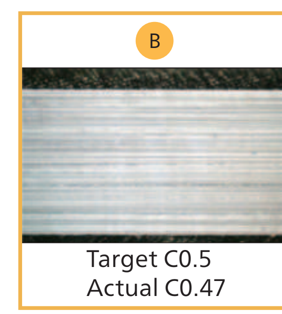
MUGEN COATING Chamfer Cutter

Page ➡ Q-010

NSCV-M ϕ 4・ϕ 6 Total 2 sizes

Specialized for cutting at chamfering.
Sharp edge with high rake angle realizes good surface quality and reduces burr. For steels





Work size	30 × 30 × 30 mm
Work material	SUS304
Coolant	Water-soluble fluid
Total machining time	63 sec

Process	A Chamfer	B Chamfer	C Chamfer
Tool	NSCV-M ϕ 6		
Spindle speed [min^{-1}]	4,000		
Feed [mm/min]	360		
Depth of cut [mm]	C 1.0	C 0.5	C 0.2
Machining time	19 sec	38 sec	6 sec

5

Technical Guidance

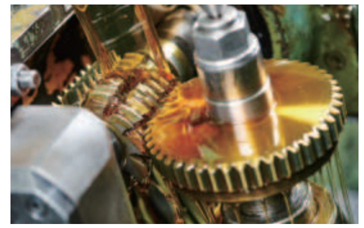
What is End mill ?

What is Cutting tool?

Cutting tools generally include milling tools, end mills, cutters and drills, turning tools, drilling tools, gear hob cutters and etc.

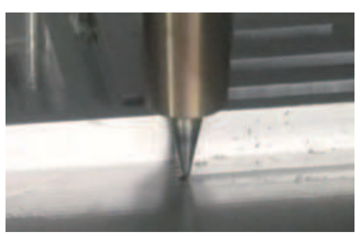

Drilling

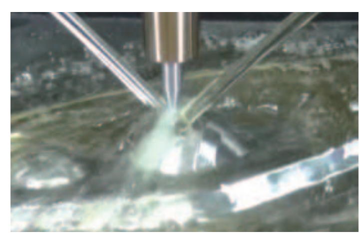

Turning processing

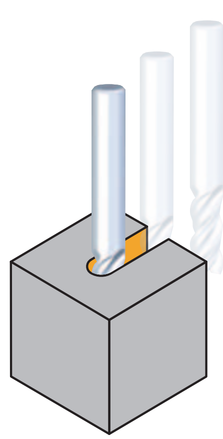

Gear processing

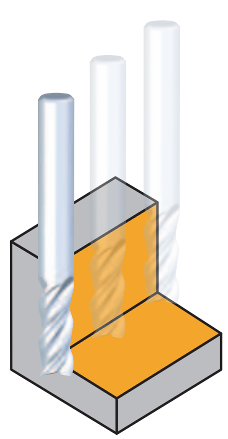
What is end mill?

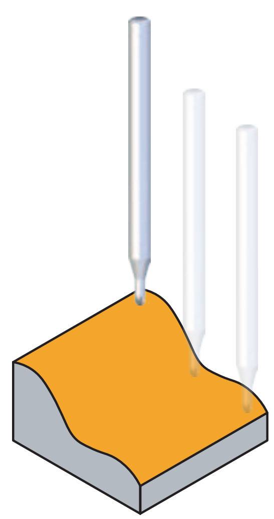
End mill is similar to drill that supports variety of cutting processes, and is used to produce many industrial products. The biggest dimension is up to about ϕ30mm. Recently, with the development of Japanese industrial products, the small diameter end mill that under ϕ6mm is becoming popular. Furthermore, the materials of end mill are getting various from high speed steel to cemented carbide, ceramics, and even CBN, PCD brazed on cemented carbide.






Slotting by square end mill

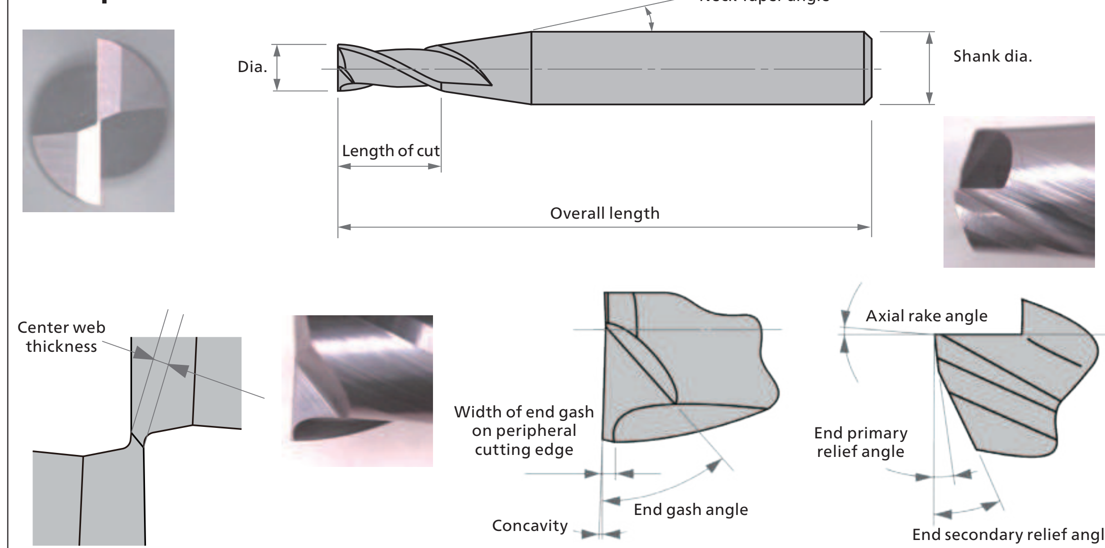

Side milling by square end mill


3D milling by ball end mill

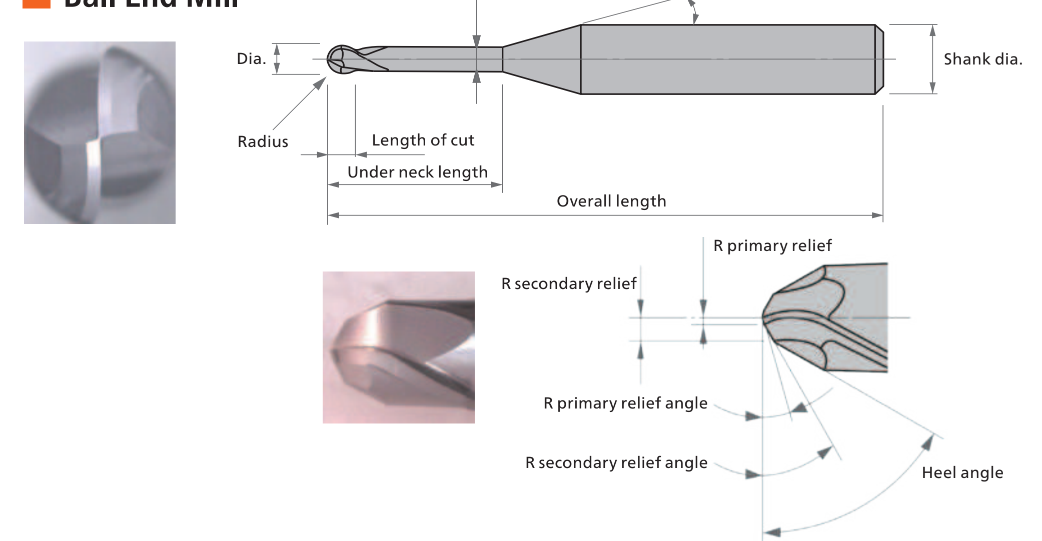
Technical Guidance

Name of parts for End mill

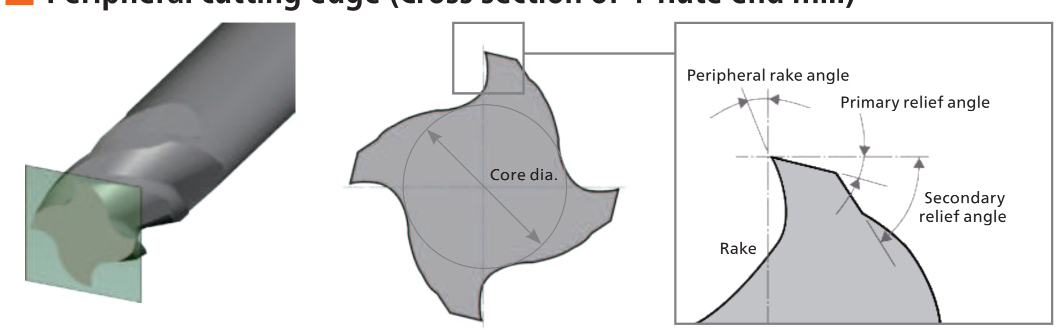
Square End Mill



Ball End Mill



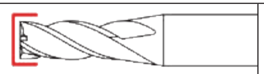
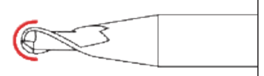
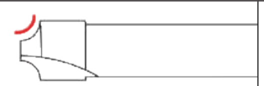
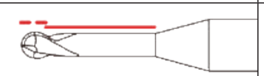
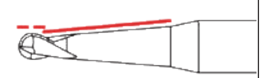
Peripheral cutting edge (Cross section of 4-flute end mill)



Technical Guidance

Type of End mill

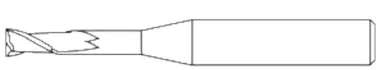
Type of peripheral and end cutting edge

Type of End cutting edge	Square		Square end cutting edge
	Ball		Ball end cutting edge
	Corner Radius		Square end cutting edge
	Formed		Generic name for special types
Type of Peripheral cutting edge	Straight		Cylindrical peripheral cutting edge
	Taper		Tapered peripheral cutting edge
	Long Neck		Thinner neck diameter than end diameter
	Taper Neck		Thinner neck diameter than end diameter but taper shape

Shapes of NS TOOL's end mill

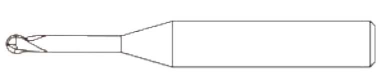
Square End Mill

Long Neck square End Mill

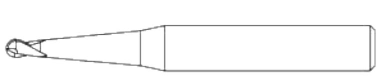


Ball End Mill

Long Neck Ball End Mill

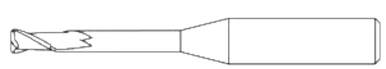


Long Neck Tapered Ball End Mill

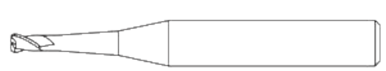


Corner Radius End Mill

Long Neck Corner Radius End Mill

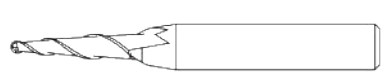


Long Neck Tapered Corner Radius End Mill

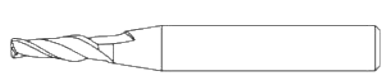


Tapered Square End Mill

Tapered Ball End Mill



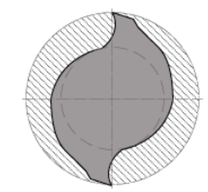
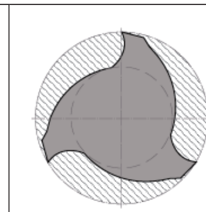
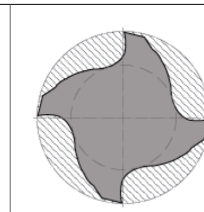
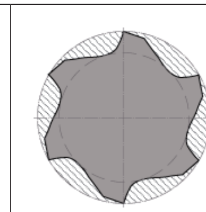
Tapered Corner Radius End Mill



Differences on number of flute

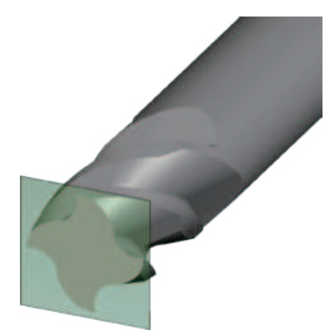
Number of flute

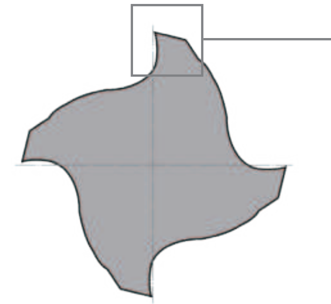
It is important to choose the number of flute of the end mill according to the usage. Introduction of the advantages, disadvantages, and usage of each number of flute are as below.

					
		2-flute	3-flute	4-flute	6-flute
Features	Advantage	Well chip removal	Well chip removal	High tool rigidity	High tool rigidity
	Disadvantage	Low tool rigidity	Difficult to measure dia.	Low chip removal	Low chip removal
Usage		For General use	Slotting & Side milling	Side milling	Side milling

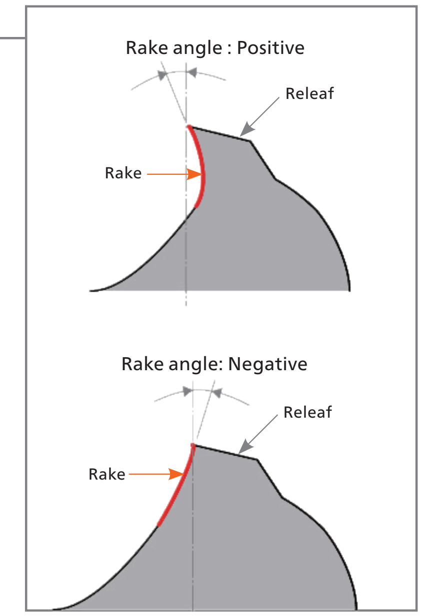
Rake angle at peripheral cutting edge

Variety of rake angles to support different cutting materials.





Cross section of end mill



End mill with positive rake angle has a sharp flute that generally compatible with nonferrous metals and low hard materials. On the other hand, the negative rake angle has strong cutting edge to support high hard materials machining.

Calculation for Cutting Speed, Spindle Speed and Feed

Cutting Speed	vc (m/min)	$= \dfrac{\pi \text{ (Circle ratio 3.14)} \times D \text{ (End mill diameter mm)} \times n \text{ (Spindle Speed min}^{-1}\text{)}}{1{,}000}$	
Spindle Speed	n (min^{-1})	$= vc \div \pi \div D \times 1{,}000$	
Feed	vf (mm/min)	$= n \times fz \times Z$ (number of flute)	
Feed per Tooth	fz (mm/tooth)	$= \dfrac{vf}{n \times Z \text{ (number of flute)}}$	
Metal Removal Rate	Q (cm^3/min)	$= \dfrac{ap \times ae \times vf}{1{,}000}$	ap : Axial depth of cut (mm) ae : Radial depth of cut (mm) vf : Feed (mm/min)
Theoretical Surface Finish ※Plane	h (μm)	$= ae^2 \times 1{,}000 \div 8R$	ae : Radial depth of cut (mm) R : Ball radius (mm)

When maximum speed of the machine spindle less than value of recommended milling conditions,
adjust conditions by calculation as follows.

Example **MSE430 Machining S50C with MSE430 φ1**

Recommended milling condition

Spindle Speed n; 20,700 min^{-1}
Feed vf ; 330 mm/min

In case Maximum Spindle Speed of the machine is 12,000min^{-1}...

Spindle Speed n; 10,000 min^{-1}
Feed **vf ; 159 mm/min**

Cutting Speed (vc) (m/min)

Appropriate Cutting Speed should be decided by parameters such as tool material, diameter, length of cut, work material, cutting machine, rigidity of tool holder, machining configuration, accuracy, cutting fluid, and etc.
Generally tool material and work material are main factors to determine the Cutting Speed.

Table 1. Cutting Speed

Work Material	Cutting Speed (m/min)	
	Solid Carbide Tool	Coated Carbide Tool
Carbon Steels e.g.)S50C	30 ～ 60	60 ～ 150
Alloy Steels e.g.)SCM, SKD	30 ～ 40	60 ～ 100
Prehardened Steels e.g.)NAK, HPM	30 ～ 40	60 ～ 100
Stainless Steels e.g.)SUS304	20 ～ 30	40 ～ 80
Hardened Steels(45 ～ 60HRC) e.g.)SKD61, STAVAX	–	20 ～ 100

Feed per Tooth (fz) (mm/tooth)

Feed per Tooth is an important element for efficient machining which should be determined by parameters such as tool diameter, type, work material, cutting machine, rigidity of tool holder, machining configuration, accuracy and cutting depth.
Table 2 is a guideline of Feed per Tooth for short flute end mills.

Table 2. Feed per Tooth

Dia. (mm)	Feed per Tooth (mm/tooth)	
	2-Flutes	4-Flutes
1	0.001 ～ 0.005	
6	0.02 ～ 0.04	0.01 ～ 0.03
10	0.04 ～ 0.08	0.03 ～ 0.06
20	0.08 ～ 0.12	0.06 ～ 0.1

※ Note: Feed per Tooth for standard flute size end mills should be adjusted to 80% or less from table 2.

Referring above parameters of Cutting Speed and Feed per Tooth, both Spindle Speed and Feed are calculated considering all other related factors as well.

Technical Guidance

Technical Guidance

Metal Removal Rate (cm^3/min)

Metal removal rate (the volume of metal removed in cubic mm per minute) is calculated by the following formula.

$$Q_{(cm^3/min)} = \frac{ap \times ae \times vf}{1{,}000}$$

ap : Axial depth of cut (mm)
ae : Radial depth of cut (mm)
vf : Feed (mm/min)

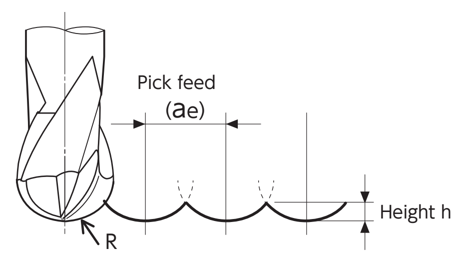
Q : Metal removal rate (cm^3/min)

all end mill and pick feed (ae) (theoretical surface finish)

In ball end mill milling, height h of the unmachined part like mountain shape below be formed by ball radius and pick feed, which are called cusp height or scallop height and which is considered theoretical surface finish. Since pick feed is the same ae radial depth of cut at the milling in flat part, it is calculated by the following formula.

$$h_{(\mu m)} = \left(R - \sqrt{R^2 - \left(\frac{ae}{2}\right)^2}\right) \times 1000 \fallingdotseq ae^2 \times 1000 \div 8R$$

R : Radius (mm)
ae : Radial depth of cut (mm)



Cusp Height Quick Reference Matrix

Unit : μm

Radius	Radial depth of cut ae [mm]										
	0.005	0.01	0.02	0.03	0.04	0.05	0.08	0.1	0.15	0.2	0.3
0.05	0.06	0.25	1.01	2.30	–	–	–	–	–	–	–
0.1	0.03	0.13	0.50	1.13	2.02	3.18	–	–	–	–	–
0.3	0.01	0.04	0.17	0.38	0.67	1.04	2.68	4.20	–	–	–
0.5	~ 0.01	0.03	0.10	0.23	0.40	0.63	1.60	2.51	5.66	–	–
0.75	–	0.02	0.07	0.15	0.27	0.42	1.07	1.67	3.76	6.70	–
1	–	0.01	0.05	0.11	0.20	0.31	0.80	1.25	2.82	5.01	–
1.5	–	~ 0.01	0.03	0.08	0.13	0.21	0.53	0.83	1.88	3.34	7.52
2	–	–	0.03	0.06	0.10	0.16	0.40	0.63	1.41	2.50	5.63
2.5	–	–	0.02	0.05	0.08	0.13	0.32	0.50	1.13	2.00	4.50
3	–	–	0.02	0.04	0.07	0.10	0.27	0.42	0.94	1.67	3.75

※In finishing in flat part, the above values in the table are theoretical values by the radial depth of cut (ae).

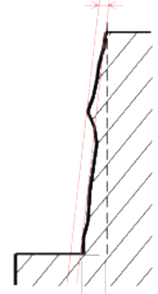
Selection of Number of Flute

	2-Flutes	3-Flutes	4-Flutes	6-Flutes
Slotting	◎	◎	○	×
Side Milling	○	◎	◎	◎

Generally 2-flutes and 3-flutes are selected for slotting because of the larger chip pocket.
4-flutes and 6-flutes are recommended for side milling as no problem of chip disposal.

Selection of Helix Angle

		Helix 25°	Helix 30°	Helix 35°	Helix 40°	Helix 45°
Shearing ability		○	○	◎	◎	⦾
Chatter resistance		○	○	◎	◎	⦾
Surface roughness		○	○	◎	◎	⦾
Inclination		⦾	◎	◎	○	○
Wave		⦾	◎	◎	○	○
Application	Slotting	⦾	◎	○	○	△
	Side milling	○	◎	◎	◎	⦾
	Hardened steels	△	△	○	◎	⦾

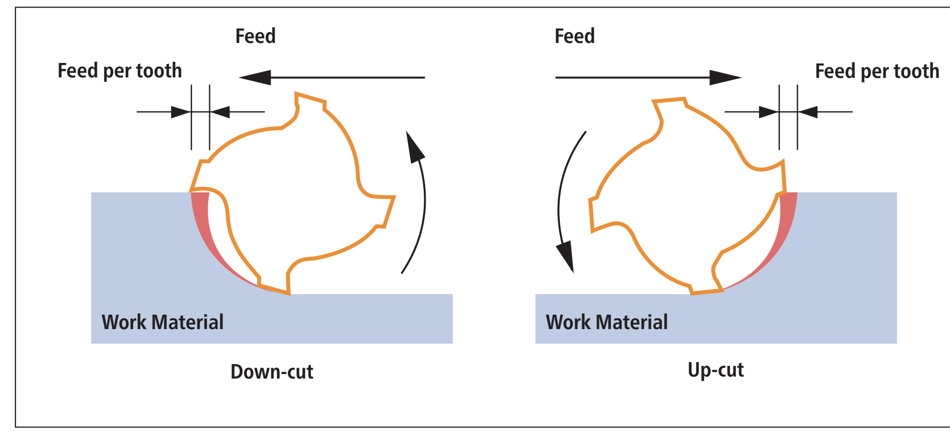


※ Remarks

- **Helix 25°**
  Suitable for slotting.
- **Helix 30°**
  Recommendable for both slotting and side milling.
- **Helix 35°, Helix 40°, Helix 45°**
  Selectable within the required tolerance.
  As larger angle gives higher shearing ability and reduce chattering, it is possible to relatively prolong the length of cut.
- **Helix 45°**
  Suitable for machining for hardened steels and tough materials.

Cutting Direction (Up-cut and Down-cut)

Cutting structure of Up-cut and Down-cut



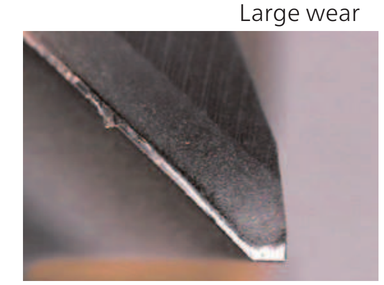
Difference of edge wear by cutting directions

(After cutting of 50m, S50C)

Small wear

Down-cut

Large wear



Up-cut

Down-cut tooth first cuts thicker then progressively thinner, while Up-cut goes the opposite.
As shown by above photos, Down-cut is recommended since the wear of cutting edge is comparatively small and tool life is eventually longer.

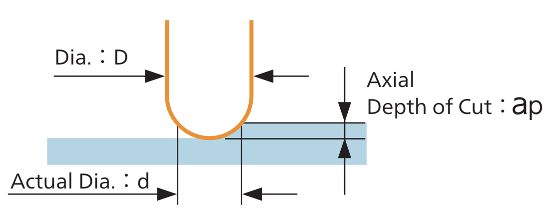
Technical Guidance

Summary of diameter of cutting point of Ball End Mill

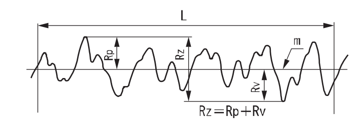
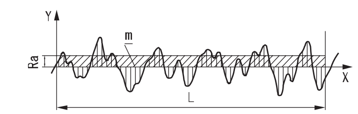
(R)	(D)	Axial Depth of Cut (ap)【mm】														
Radius	Dia.	0.01	0.02	0.03	0.04	0.05	0.08	0.1	0.15	0.2	0.3	0.5	0.8	1	2	3
0.1	0.2	0.087	0.12	0.143	0.16	0.173	0.196	0.2								
0.2	0.4	0.125	0.174	0.211	0.24	0.265	0.32	0.35	0.39	0.4						
0.3	0.6	0.154	0.215	0.262	0.299	0.332	0.41	0.45	0.52	0.57	0.6					
0.4	0.8	0.178	0.25	0.304	0.349	0.387	0.48	0.53	0.62	0.69	0.77					
0.5	1	0.199	0.28	0.341	0.392	0.436	0.54	0.6	0.71	0.8	0.92	1				
1	2	0.282	0.398	0.486	0.56	0.624	0.78	0.87	1.05	1.2	1.43	1.73	1.96	2		
1.5	3	0.346	0.488	0.597	0.688	0.768	0.97	1.08	1.31	1.5	1.8	2.24	2.65	2.83		
2	4	0.399	0.564	0.69	0.796	0.889	1.12	1.25	1.52	1.74	2.11	2.65	3.2	3.46	4	
2.5	5	0.447	0.631	0.722	0.891	0.995	1.25	1.4	1.71	1.96	2.37	3	3.67	4	4.9	
3	6	0.489	0.692	0.846	0.977	1.091	1.38	1.54	1.87	2.15	2.62	3.32	4.08	4.47	5.66	6
4	8	0.565	0.799	0.978	1.129	1.261	1.59	1.78	2.17	2.5	3.04	3.87	4.8	5.29	6.93	7.75
5	10	0.632	0.894	1.094	1.262	1.411	1.78	1.99	2.43	2.8	3.41	4.36	5.43	6	8	9.17
6	12	0.693	0.979	1.198	1.383	1.546	1.95	2.18	2.67	3.07	3.75	4.8	5.99	6.63	8.94	10.39
7	14	0.748	1.058	1.295	1.495	1.67	2.11	2.36	2.88	3.32	4.05	5.2	6.5	7.21	9.8	11.49
8	16	0.8	1.131	1.384	1.598	1.786	2.26	2.52	3.08	3.56	4.34	5.57	6.97	7.75	10.58	12.49
9	18	0.848	1.199	1.468	1.695	1.895	2.39	2.68	3.27	3.77	4.61	5.92	7.42	8.25	11.31	13.42
10	20	0.894	1.264	1.548	1.787	1.997	2.52	2.82	3.45	3.98	4.86	6.24	7.84	8.72	12	14.28

Calculation of Actual Dia.

$$d = 2\sqrt{ap\,(D-ap)}$$



Measurement and Symbol of Surface Roughness (Extracted from JIS B 0601-2001)

Type	Symbol	Description	Reference chart
Maximum Height of the Profile	Rz	The maximum height of the profile is the distance between the maximum peak height and the maximum valley depth from the mean line in each sampling length. Rz(ISO/JIS)is the mean value of the maximum peak-to-valley heights in the evaluation length.	
Arithmetic Mean Deviation of the Profile	Ra	The arithmetic mean deviation of the profile is the arithmetic mean of the absolute values of distances from the mean line to the profile.	 $Ra = \frac{1}{L}\int_0^L \lvert f(x)\rvert dx$ L = Evaluation Length

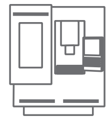
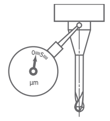
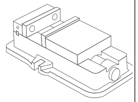
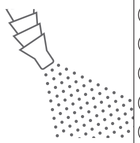
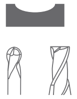
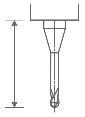
Value of Maximum Height of the Profile	Value of Arithmetic Mean Deviation of the Profile	Finishing Symbol	Indication of surface texture in technical product documentation
0.05S 0.1S 0.2S 0.4S 0.8S	0.012a 0.025a 0.05a 0.1a 0.2a	▽▽▽▽	$\sqrt{Ra\ 0.012}$ ～ $\sqrt{Ra\ 0.2}$
1.6S 3.2S 6.3S	0.4a 0.8a 1.6a	▽▽▽	$\sqrt{Ra\ 0.4}$ ～ $\sqrt{Ra\ 1.6}$
12.5S 25S	3.2a 6.3a	▽▽	$\sqrt{Ra\ 3.2}$ ～ $\sqrt{Ra\ 6.3}$
50S 100S	12.5a 25a	▽	$\sqrt{Ra\ 12.5}$ ～ $\sqrt{Ra\ 25}$

※ Note: Triangle Finishing Symbol Mark presents approximate surface roughness specified by Ra and Rz.

Comparison Table of Hardness

Rockwell Hardness C Scale150kg Brale (HRC)	Diamond Pyramid Hardness Number, Vickers (HV)	Brinell Hardness Standard10mm Ball 29.42kN (HB)	Rockwell Hardness A Scale 60kg Brale (HRA)	Shore Scleroscope Hardness Number (HS)	Approx Tensile Strength N/mm^2
68	940	–	85.6	97	–
67	900	–	85.5	95	–
66	865	–	84.5	92	–
65	832	–	83.9	91	–
64	800	–	83.4	88	–
63	772	–	82.8	87	–
62	746	–	82.3	85	–
61	720	–	81.8	83	–
60	697	–	81.2	81	–
59	674	–	80.7	80	–
58	653	–	80.1	78	–
57	633	–	79.6	76	–
56	613	–	79.0	75	–
55	595	–	78.5	74	2079
54	577	–	78.0	72	2010
53	560	–	77.4	71	1952
52	544	500	76.8	69	1883
51	528	487	76.3	68	1824
50	513	475	75.9	67	1755
49	498	464	75.2	66	1687
48	484	451	74.7	64	1639
47	471	442	74.1	63	1578
46	458	432	73.6	62	1530
45	446	421	73.1	60	1481
44	434	409	72.5	58	1432
43	423	400	72.0	57	1383
42	412	390	71.5	56	1334
41	402	381	70.9	55	1294
40	392	371	70.4	54	1245
39	382	362	69.9	52	1216
38	372	353	69.4	51	1177
37	363	344	68.9	50	1157
36	354	336	68.4	49	1118
35	345	327	67.9	48	1079
34	336	319	67.4	47	1059
33	327	311	66.8	46	1030
32	318	301	66.3	44	1000
31	310	294	65.8	43	981
30	302	286	65.3	42	952
29	294	279	64.7	41	932
28	285	271	64.3	41	912
27	279	264	63.8	40	883
26	272	258	63.3	38	863
25	266	253	62.8	38	843
24	260	247	62.4	37	824
23	254	243	62.0	36	804
22	248	237	61.5	35	785
21	243	231	61.0	35	775
20	238	226	60.5	34	755
(18)	230	219	–	33	736
(16)	222	212	–	32	706
(14)	213	203	–	31	677
(12)	204	194	–	29	647
(10)	196	187	–	28	618
(8)	188	179	–	27	598
(6)	180	171	–	26	579
(4)	173	165	–	25	549
(2)	166	158	–	24	530
(0)	160	152	–	24	520

Factors for End Mill Operation

Factor	Instruction and Advice
Rigidity of Machine 	① Use a rigid machine. ② Adjust cutting conditions according to the rigidity of machine.
Collet Chuck and Run out of End Mill 	① Use a rigid and precise collet chuck. ② Minimize the run out of end mill.
Work Clamp 	① Work piece must be firmly clamped. ② In case work piece cannot be firmly clamped, relieve cutting condition.
Cutting Fluid and Chips 	① Give a sufficient cutting fluid. ② Recommend water soluble fluid for heavy cutting. ③ Some end mills apply dry cutting only. ④ Use air blow for dry cutting. ⑤ Remove chips from working area.
Selection of End Mill 	① Select most suitable end mills according to work material and dimension. ② Refer to the index table on front page.
Cutting Conditions **vc vf ap ae**	① Refer to recommended milling condition table. ② It is necessary to adjust conditions according to the machine rigidity and clamping condition of work material.
Overhang of End Mill from Tool Holder 	① Overhang of end mill must be as short as possible from tool holder. ② In case overhang cannot be shorten, relieve cutting condition.

Troubleshooting for End Mill Operation

Symptoms of troubles	Cause	Solution
Chattering	· Excessive spindle speed · Excessive feed · Excessive long of effective length or overhang of end mill · Work material is not firmly clamped · Wear of cutting edge progressed · Excessive chucking runout	· Reduce spindle speed · Reduce feed · Adjust effective length and overhang as short as possible · Clamp work material firmly · Use new end mill or regrind · Adjust chucking runout
Breakage of End Mill	· Excessive depth of cut · Chips clogged · Excessive feed per tooth · Wear of cutting edge progressed	· Reduce depth of cut · Adjust coolant nozzle to right direction to dispose chips · Reduce feed per tooth · Use new end mill or regrind
Chipping of Cutting Edge	· Excessive depth of cut · Excessive feed · Work material is not firmly clamped · Excessive spindle speed · Excessive long of effective length or overhang of end mill · Wear of cutting edge progressed · Built up edge · Excessive cooling	· Reduce depth of cut · Reduce feed · Clamp work material firmly · Reduce spindle speed · Adjust effective length and overhang as short as possible · Use new end mill or regrind · Choose appropriate coating · Use air blow or oil mist
Abnormal Wear	· Excessive spindle speed · Too low feed	· Reduce spindle speed · Increase feed
Clogging and Depositing	· Chips are not well disposed · Excessive feed · Excessive depth of cut · Inappropriate number of flute · Wear of cutting edge progressed	· Adjust coolant nozzle to right direction to dispose chips · Reduce feed · Reduce depth of cut · Use fewer flutes end mill · Use new end mill or regrind
Deflection of End Mill	· Excessive feed · Excessive depth of cut · Excessive long of effective length or overhang of end mill · Large helix angle of flutes	· Reduce feed · Reduce depth of cut · Adjust effective length and overhang as short as possible · Use smaller helix angle
Burr on Finished Surface	· Wear of cutting edge progressed · Small helix angle of flutes · Excessive depth of cut	· Use new end mill or regrind · Use larger helix angle · Reduce depth of cut
Poor Surface Roughness	· Wear of cutting edge progressed · Chips bite · Excessive feed · Excessive long of effective length or overhang of end mill · Too low spindle speed · Stock removals vary for finishing · Excessive chucking runout	· Use new end mill or regrind · Use coolant to remove chips · Reduce feed · Adjust effective length and overhang as short as possible · Increase spindle speed · Improve semi-finishing process · Adjust chucking runout
Poor Machining Accuracy (Error)	· Inconsistent thermal extension of spindle · Stock removals vary for finishing · Excessive feed · Excessive chucking runout	· Warm up spindle by idling before starting operation · Improve semi-finishing process · Reduce feed · Adjust chucking runout

Technical Guidance

Comparison Table of Die and Mold Materials

For Cold Work Die Steels

Classification	JIS	AISI	Hardness (HRC)	AICHI STEEL	SANYO SPECIAL STEEL	DAIDO STEEL	NIHON KOSHUHA STEEL	HITACHI METALS	NACHI FUJIKOSHI	UDDEHOLM	BOHLER
Carbon Tool Steels	SK105 (SK3)	W1-10			QK3	YK3					K990
Alloy steels	SKS93		55-60	SK301	QK3M	YK30	K3M	YCS3			
	SKS3	-	55-62	SKS3	QKS3	GOA	KS3	SGT		ARNE	K460
	SKD1	D3	55-62			DC1	KD1	CRD		SVERKER3	K100 K107
	SKD11	D2	55-62	SKD11	QC11	DC11	KD11	SLD SLD-i	CDS11	SVERKER21	K105 K110
	SKD11		55-62				KD11S KD11MAX				
	8%Cr type			AUD11 AUD15	QCM7 QCM8	DC53	KD21	SLD8 SLD10	MDS9	SLEPNER	K340
	Die steel Matrix type			SXACE		DCMX	NOGA	ARK1		CALDIE UNIMAX	W360
	SKD12	A2	55-62			DC12	KD12			RIGOR	K305
	Pre-hardened Steels		40			G040F	KAP65	HPM-MAGIC		IMPAX HH	
	Flame Hardening Steels		55-62	SX105V	QF3	G05	KRCX	HMD5		FERMO	
	Low Temperature Air Quenched Steel		58-62			G04	KSM	ACD37			
	Steels for Impact Resistance		55-60		QF1	GS5	KTV5	YSM			
	Other		-					SLD-MAGIC	ICS22	CALMAX ELMAX VANCRON40 VANADIS4E VANADIS10	K390 K490 K890
High-Speed steels	SKH51	M2	55-65		QH51	MH51	H51	YXM1	SKH9		S600
	SKH51 type		57-66						SKH9D		
	SKH55 type		57-66				HM35	YXM4	HM35 HS53M		S705
	SKH57 type						MV10	XVC5	HS93R DURO-SP		S700
	Matrix type		55-64		QHZ	DRM1 DRM2 DRM3 MH85	KMX1 KMX2 KMX3	YXR3 YXR7 YXR33	DURO-FZ DURO-F1 DURO-F3 DURO-F7 DURO-V2 DURO-V5		
Powder Metal High Speed Tool Steels	SKH40		58-70		SPM30	DEX40		HAP40	FAX38	VANADIS30	S590
	Matrix type		58-70			DEX-M1 DEX-M3		HAP5R			
	Other		58-70		SPM23 SPM60 SPMR8 SPMV6 SPMX4N	DEX20 DEX60		HAP10 HAP50 HAP72	FAX31 FAX40 FAX55 FAXG2	VANADIS23 VANADIS60	S290 S390 S690 S790

Technical Guidance

Comparison Table of Die and Mold Materials

Hot Die Steels

Classification	JIS	AISI	Hardness (HRC)	AICHI STEEL	SANYO SPECIAL STEEL	DAIDO STEEL	NIHON KOSHUHA STEEL	HITACHI METALS	NACHI FUJIKOSHI	MITSUBISHI SEIKO	UDDEHOLM	BOHLER
Alloy steels	SKD4		40-50			DH4	KD4					
	SKD5	H21	45-50			DH5	KD5					
	SKD6	H11	40-52			DH62	KD6				VIDAR	W300 W400
	SKD61	H13	40-52	SKD61	QD61	DHA DHA1	KDA	DAC			ORVAR 2M	W302
	SKD61		40-52	AUD61 AUD60A	QDA61 QDN QDX-HARMOTEX QDN1-R	DHA2 DH21 DHA-WORLD DH31-S DH31-EX	KDA1 KDA1S KDAMAX	DAC-S DAC3 DAC10 DAC55 DAC-MAGIC			ORVAR-S DIEVAR FORMVAR	W303 W403
	SKD61 (Free-cutting)					DH2F	KAP90F	FDAC				
	SKD62	H12	40-52		QD62	DH62	KDB					
	SKD7	H10	40-50			DH72	KDH1					W320
	SKD7		40-50	AUD72	QDH	DH32 DH71 DH73		DAC40 YEM-K	DURO-N1			
	SKD8	H19	40-50			DH41	KDF					
	SKD8		40-50			DH42	KDF4	MDC-K				
	SKT4	L6	38-45	SKT4A	QT41-HARMOTEX	GFA	KTV	DM			ALVAR14	W500
	SKT4		38-45		QDT	GF78	TD3					
	Precipitation Steel			AUD91 MPH-K		DH76				HD22B		
	Other				QF5	DHA-Thermo					BURE BALDER	
High-Speed steels	Matrix type		53-65		QHZ	DRM1 DRM2	KMX1	YXR33	DURO-FZ DURO-F1			W360

Comparison Table of Die and Mold Materials

From the book end appendix of the Special Steel Guide First Edition (Revised edition)
Author: Special Steel Association of JAPAN
Since March, 2017

Plastic Mold Steels

Classification	JIS	AISI	Hardness (HRC)	AICHI STEEL	JFE STEEL	SANYO SPECIAL STEEL	DAIDO STEEL	NIHON KOSHUHA STEEL	HITACHI METALS	NACHI FUJIKOSHI	UDDEHOLM	BOHLER
Pre-hardened Steels	SC type	1055	13		JFE-MD1	PC55		KPM1 KPMAX				
	SCM type	4140	28		JFE-MD3 JFE-MD5		PDS3					
	SCM	P20	33			PCM30	PX5 PXA30	KPM30	HPM7			M200 M201 M238
	SUS type	S420 type					S-STAR D-STAR	GHX	HPM38	PROVA-400 PROVA-450	STAVAX	M303 M310
	SUS type (Free-cutting)						G-STAR		HPM77		RoyAlloy	M315
	SUS type	S17400	35			QSH6	NAK101	U630	PSL		CORRAX	N700
	SCM	P20	36					JHX			IMPAXHH	
	SUS type		40								EDRO400	M303HH
	SKD61	H13					DH2F	KAP90F	FDAC			
		P21				PCM40S	NAK80	KAP88	HPM-PRO			M461
		P21 (Free-cutting)				PCM40	NAK55	KAP65	HPM1			M261
		P21 (Rust resistant)							CENA1 CENA-V			
									HPM-MAGIC		NIMAX	
Quenching and Tempering	SKD11	D2	60	AUD11		QCM8 SPMR8	PD613	NOGA	HPM31 ZCD-M		RIGOR SLEIPNER CALDIE CALMAX	K105 K110 K340
	SUS type 440C	S44004	57			QPD5 SPC5	SUS440C	SUS440C	SUS440C	440C PROVA-500	ELMAX	M340 M390 N685 N690 N695
	SUS type 420	S420 type	52				S-STAR D-STAR G-STAR	GHX	HPM38 HPM38S HPM77	PROVA-400 PROVA-450	STAVAX POLMAX MIRRAX	M310 M333
Age Hardening	Maraging Steels		50～			QM300	MAS1C	KMS	YAG	EXEO-M21		V720 V721
	Other										CORRAX	
	Non-magnetic steels		40					NMS1	HPM75			

Comparison Table of Die and Mold Materials

● For High Speed Steels

Classification	JIS	AISI	Hardness (HRC)	SANYO SPECIAL STEEL	DAIDO STEEL	NIHON KOSHUHA STEEL	HITACHI METALS	NACHI FUJIKOSHI	UDDEHOLM	BOHLER
Tungsten type	SKH2	T1	63～			H2	YHX2	SKH2		S200
	SKH3	T4	64～			H3		SKH3		S305
	SKH4	T5	64～			H4		SKH4		
	SKH10	T15	64～			HV5				
Molybdenum type	SKH51	M2	55-65	QH51	MH51	H51	YXM1	SKH9		S600 S614 S401
	SKH52	M3-1	57-66			H52		HM31		
	SKH53	M3-2	64～			HV1				S607
	SKH54	M4	64～			HV2		HM4		
	SKH55		60-66			HM35	YXM4	HM35		S705
	SKH56	M36	60-66			HM36		HM36		
	SKH57		62-67			HV10	XVC5	HS93R		S700
	SKH58	M7	64～			HM3		HM7NN		S400
	SKH59	M42	62-67			HM42	YXM42	HM42		S500
	Other					S70	YXM27 YXM60	HS53M HS97R HM1 HMT12 HM33 SKH9D DURO-SP		
Matrix type	Matrix type		45-65	QHZ	DRM1 DRM2 DRM3 MH85	KMX1 KMX2 KMX3	YXR3 YXR33 YXR7	DURO-FZ DURO-F1 DURO-F3 DURO-F7 DURO-V2 DURO-V5		W360
Powdered type	SKH40		58-70	SPM30	DEX40		HAP40	FAX38	VANADIS30	S590
	Other		58-70	SPM23 SPM60 SPMR8 SPMV6 SPMX4N	DEX20 DEX60 DEX-M1 DEX-M3		HAP10 HAP50 HAP72 HAP5R	FAX31 FAX40 FAX55 FAXG2	VANADIS23 VANADIS60	S290 S390 S690 S790

Read Following Precautions for Safe Use ⚠ CAUTION

Attention on Safety

- When removing tools from cases, be careful of getting-out of tools and don't touch directly the cutting edges.
- Never touch the cutting edges directly with bare hand.
- Use safety covers and eye protection, as tools may be broken.
- Use holders, etc. that match the tools and nature of the machining operations.
  The tool should be firmly attached to the holder to prevent shaking.
- The work materials clamp firmly.
- Make sure of dimensions of tools and work pieces before starting operation.
- It is necessary to adjust conditions according to the dimensions of work materials and the machine.
- Select a cutting fluid appropriate to the particular usage. Using water-insoluble fluid could lead to fires due to sparks generated during machining or heat caused by breakage. Ensure that you take proper fire-prevention measures.
- If abnormal sound, etc. occurs during machining, stop the machine immediately.
- Don't modify tools.

Attention on Regriding

- When the tool is reground, grinding dust is generated which is dangerous to your health.
  Be sure to wear protective glasses and a dust proof mask.
- Regrind tools at proper period.

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※ Specifications may change without notice for improvement.

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