

Tools for Small part machining

New
Grade
Addition

PVD Coated Cemented Carbide Grade
for Carbon Steel

MS6015



Grooving System

GY Series



Vibration Control End Mills
for Machining Difficult-to-Cut Materials

SMART MIRACLE[®]
VQXL



PVD Coated Cemented Carbide Grade for Carbon Steel

MS6015

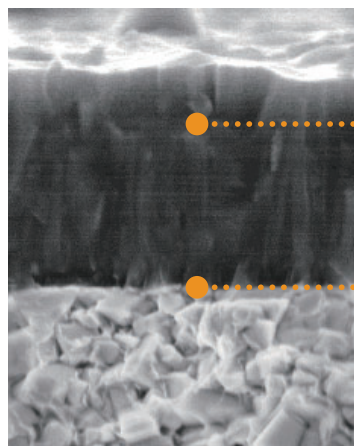
Skilled at pure iron, carbon steel and free cutting steel turning and achieving implemented stable finished surfaces and excellent dimensional accuracy.

Features 1

A fine compatible collaboration of a special carbide substrate and a new PVD coating that greatly improves wear resistance.

	MS6015	Conventional
Coating	TiCN multilayer	TiAlN
Hardness (HV)	3,000	2,800
Wear Coefficient (Carbon Steel)	Low	High
Base Material Hardness (HRA)	92.0	92.0
T.R.S (GPa)	2.0	2.0

Ti-C-N Multilayer Coating



Superior wear and welding resistance and demonstrating the best possible results for carbon steel.

Minute multilayers remarkably improve welding.

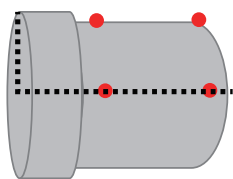
Excellent chip discharge with a reduced coefficient of friction creates a stabilized turning surface.

Cutting Performance

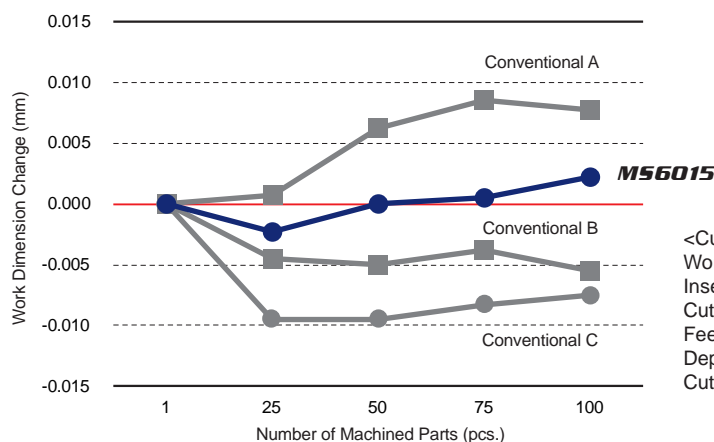
MS6015 has superior chip discharge welding of cutting edges compared with conventional products as well as minimal changes in exterior diameter dimensions.

Diagram

Average measurement of 4 positions





Processing the above and the work diameter measuring of each prescribed number of items.




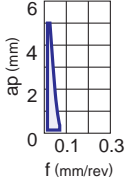
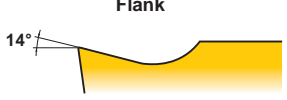

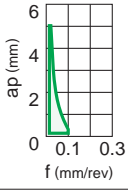


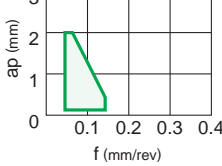
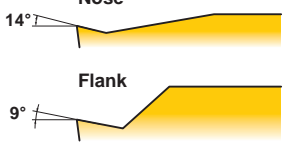
<Cutting Conditions>
 Work Material : S20C
 Insert : DCGT11T302
 Cutting Speed : 100 m/min
 Feed : 0.05 mm/rev
 Depth of Cut : 1 mm
 Cutting Mode : Wet

Features 2

Set the corner radius to a minus tolerance.

Order Number **DCGT11T302 M R-SN**  **02M R0.18mm (R0.15 – R0.20mm)**
DCGT11T304 M -SMG  **04M R0.38mm (R0.35 – R0.40mm)**

Breaker System

Application	Tolerance	Breaker Name and Picture	Features	Cross Section Geometry
Light Cutting	G	R-SS 	Light cutting of automatic lathe machining A parallel chipbreaker. Excellent chip control at low feed rates.	Carbon Steel • Alloy Steel  
		R-SN 	Medium cutting of automatic lathe machining A parallel chipbreaker. Excellent chip control at low to medium feed rates.	Carbon Steel • Alloy Steel  
Medium Cutting	G	SMG 	Medium cutting of automatic lathe machining 3D moulded chipbreaker provides good chip control. G class insert gives sharp cutting action, allowing high precision machining. Breaker geometry appropriate for copying and back turning.	Carbon Steel • Alloy Steel  

Recommended Cutting Conditions

	Work Material	Grade	Cutting Speed (m/min)	Feed (mm/rev)
P	Carbon Steel · Alloy Steel	MS6015	100 (50–150)	0.08 (0.01–0.15)
	Pure Iron · Free Cutting Steel		150 (50–250)	0.08 (0.01–0.15)
M	Stainless Steel	MS6015	80 (50–120)	0.06 (0.02–0.1)

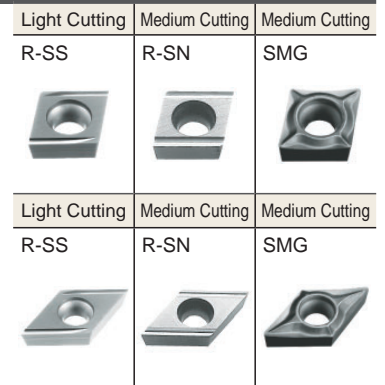
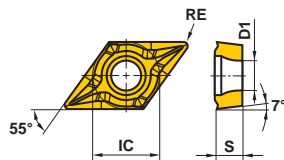
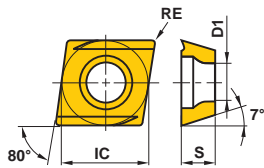
MS6015

7° Positive Inserts (With Hole)

G Class

CCGT
(SS Breaker)

DCGT
(SMG Breaker)



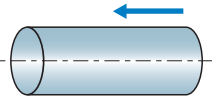
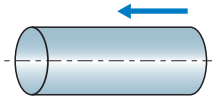
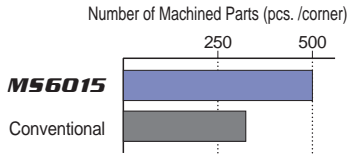
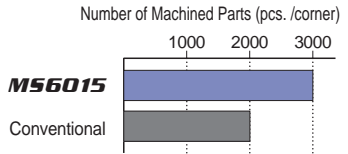
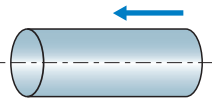
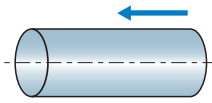
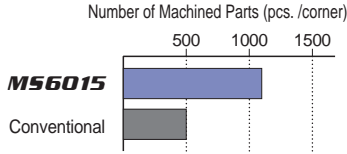
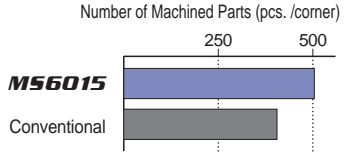
Order Number	Cutting Area	Stock	Dimensions (mm)			
			IC	S	*1	D1
NEW CCGT060201MR-SS	L	●	6.35	2.38	0.1	2.8
NEW CCGT060202MR-SS	L	●	6.35	2.38	0.2	2.8
NEW CCGT09T301MR-SS	L	●	9.525	3.97	0.1	4.4
NEW CCGT09T302MR-SS	L	●	9.525	3.97	0.2	4.4
NEW CCGT09T304MR-SS	L	●	9.525	3.97	0.4	4.4
NEW CCGT060201MR-SN	M	●	6.35	2.38	0.1	2.8
NEW CCGT060202MR-SN	M	●	6.35	2.38	0.2	2.8
NEW CCGT09T301MR-SN	M	●	9.525	3.97	0.1	4.4
NEW CCGT09T302MR-SN	M	●	9.525	3.97	0.2	4.4
NEW CCGT09T304MR-SN	M	●	9.525	3.97	0.4	4.4
NEW CCGT060201M-SMG	M	●	6.35	2.38	0.1	2.8
CCGT060202M-SMG	M	●	6.35	2.38	0.2	2.8
CCGT060204M-SMG	M	●	6.35	2.38	0.4	2.8
NEW CCGT09T301M-SMG	M	●	9.525	3.97	0.1	4.4
NEW CCGT09T302M-SMG	M	●	9.525	3.97	0.2	4.4
NEW CCGT09T304M-SMG	M	●	9.525	3.97	0.4	4.4

Order Number	Cutting Area	Stock	Dimensions (mm)			
			IC	S	*1	D1
NEW DCGT070201MR-SS	L	●	6.35	2.38	0.1	2.8
NEW DCGT070202MR-SS	L	●	6.35	2.38	0.2	2.8
NEW DCGT11T301MR-SS	L	●	9.525	3.97	0.1	4.4
NEW DCGT11T302MR-SS	L	●	9.525	3.97	0.2	4.4
NEW DCGT11T304MR-SS	L	●	9.525	3.97	0.4	4.4
NEW DCGT070201MR-SN	M	●	6.35	2.38	0.1	2.8
NEW DCGT070202MR-SN	M	●	6.35	2.38	0.2	2.8
NEW DCGT11T301MR-SN	M	●	9.525	3.97	0.1	4.4
NEW DCGT11T302MR-SN	M	●	9.525	3.97	0.2	4.4
NEW DCGT11T304MR-SN	M	●	9.525	3.97	0.4	4.4
NEW DCGT070201M-SMG	M	●	6.35	2.38	0.1	2.8
DCGT070202M-SMG	M	●	6.35	2.38	0.2	2.8
DCGT070204M-SMG	M	●	6.35	2.38	0.4	2.8
NEW DCGT11T301M-SMG	M	●	9.525	3.97	0.1	4.4
DCGT11T302M-SMG	M	●	9.525	3.97	0.2	4.4
DCGT11T304M-SMG	M	●	9.525	3.97	0.4	4.4

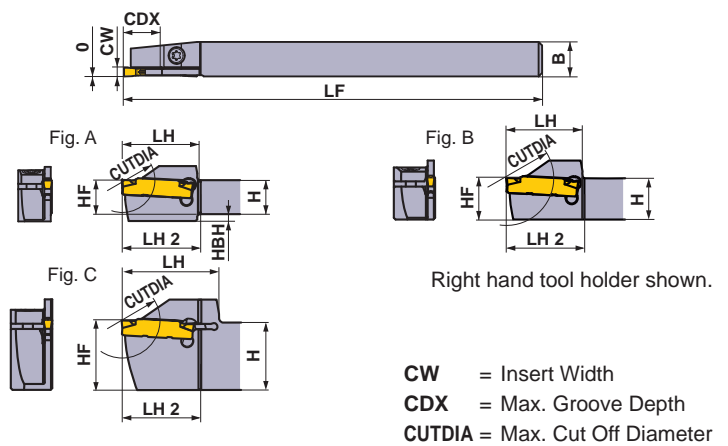
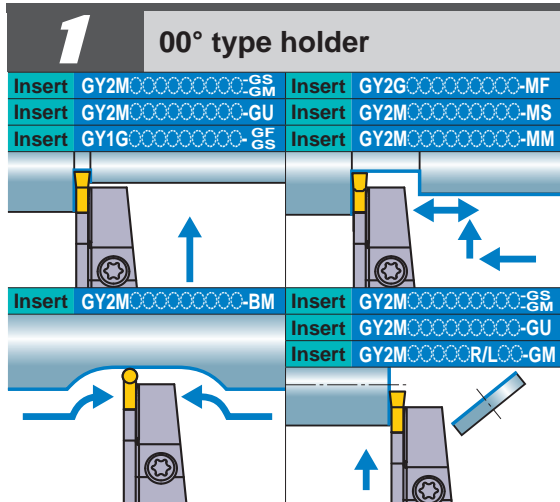
*1 RE = Dimension tolerance of minus type.

● : Inventory maintained in Japan.

Examples of Usage

Insert		DCGT11T302M-SMG (MS6015)	DCGT11T301MR-SN (MS6015)
Workpiece	Insert	Pure Iron (ECLH2)	Free Cutting Steels (SUM24L)
	Workpiece		
Cutting Conditions	Cutting Speed (m/min)	197 (4,500min ⁻¹)	125 (5,000min ⁻¹)
	Feed (mm/rev)	0.1	0.05
	Depth of Cut (mm)	0.1	0.3
Cutting Mode		Wet (oil)	Wet (oil)
Machine		CNC Automatic Lathes	CNC Automatic Lathes
Results	Number of Machined Parts (pcs. /corner)		
	Results	An excellent finished surface and 1.4x longer life compared with conventional products. Stable SMG breaker and chip discharge management.	MS6015 has minimal welding and maintains secure dimensional accuracy.
Insert		DCGT11T302MR-SN (MS6015)	DCGT11T302M-SMG (MS6015)
Workpiece	Insert	Carbon Steel (S45C)	Mild Steel (S15C)
	Workpiece		
Cutting Conditions	Cutting Speed (m/min)	113 (3,000min ⁻¹)	100 (1,300min ⁻¹)
	Feed (mm/rev)	0.03	0.12
	Depth of Cut (mm)	1.0	1.3
Cutting Mode		Wet (oil)	Wet (oil)
Machine		CNC Automatic Lathes	CNC Automatic Lathes
Results	Number of Machined Parts (pcs. /corner)		
	Results	MS6015 has superior wear resistance and achieves 2x longer life compared with conventional products.	MS6015 has superior welding resistance and achieves 1.3x longer life compared with conventional products.



GY SERIES (External grooving for Swiss style lathes)

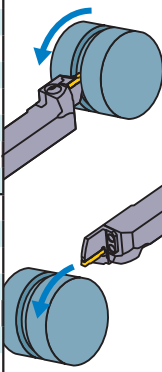
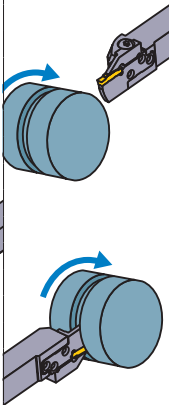


Seat Size	CW (mm)	CDX (mm) *4	CUTDIA (mm)	Type	Hand (R/L)	Order Number		Fig.
						Holder	Stock	
C	1.50	11	22	Mono block	R	GYSR1010JX00-C11	●	A
					L	GYSL1010JX00-C11	●	A
		13	26		R	GYSR1212JX00-C13	●	B
					L	GYSL1212JX00-C13	●	B
		17 *1	34 *2		R	GYSR1616JX00-C17	●	B
					L	GYSL1616JX00-C17	●	B
18 *1	36 *2	R	GYSR2012JX00-C18		●	C		
		L	GYSL2012JX00-C18		●	C		
D	2.00 2.24	11	22		R	GYSR1010JX00-D11	●	A
					L	GYSL1010JX00-D11	●	A
		13	26		R	GYSR1212JX00-D13	●	B
					L	GYSL1212JX00-D13	●	B
		17	34		R	GYSR1616JX00-D17	●	B
					L	GYSL1616JX00-D17	●	B
18	36	R	GYSR2012JX00-D18		●	C		
		L	GYSL2012JX00-D18		●	C		
E	2.39 2.50 2.74	11	22		R	GYSR1010JX00-E11	●	A
					L	GYSL1010JX00-E11	●	A
		13	26	R	GYSR1212JX00-E13	●	B	
				L	GYSL1212JX00-E13	●	B	
		17	34	R	GYSR1616JX00-E17	●	B	
				L	GYSL1616JX00-E17	●	B	
18	36	R	GYSR2012JX00-E18	●	C			
		L	GYSL2012JX00-E18	●	C			
F	3.00 3.18 3.24	11	22	R	GYSR1010JX00-F11	●	A	
				L	GYSL1010JX00-F11	●	A	
		13	26	R	GYSR1212JX00-F13	●	B	
				L	GYSL1212JX00-F13	●	B	
		17	34	R	GYSR1616JX00-F17	●	B	
				L	GYSL1616JX00-F17	●	B	
18	36	R	GYSR2012JX00-F18	●	C			
		L	GYSL2012JX00-F18	●	C			

*1 The maximum groove depth varies according to the insert used. Please refer to the maximum groove depth of inserts on pages 7 to 8.
 *2 The maximum cut off diameter **CUTDIA** varies according to the insert used. The cut off diameter is double the maximum groove depth (**CDX**) of inserts on pages 7 to 8.
 *3 Dimensions shown are when the gauge insert is used. If other insert geometries are used then **LF**, **LH** and **LH 2** values may vary.
 *4 The maximum groove depth is limited by the workpiece diameter. For details, please refer to Page 9.

SPARE PARTS

Holder Number		
	Clamp Screw	Wrench
GYSR/L1010JX00-11	CS350990T (Clamp Torque : 2.5N·m)	TKY10R
GYSR/L1212JX00-13		
GYSR/L2012JX00-18		
GYSR/L1616JX00-17	TS4SBL (Clamp Torque : 3.5N·m)	TKY15R

	Dimensions (mm) *3							Cutting Mode	
	H	B	LF	LH	LH 2	HF	HBH	Clockwise	Anticlockwise
	10	10	120	22	16	10	2		
	10	10	120	22	16	10	2		
	12	12	120	22	16	12	—		
	12	12	120	22	16	12	—		
	16	16	120	27	17	16	—		
	16	16	120	27	17	16	—		
	20	12	120	28	16	20	—		
	20	12	120	28	16	20	—		
	10	10	120	22	23	10	2		
	10	10	120	22	23	10	2		
	12	12	120	22	23	12	—		
	12	12	120	22	23	12	—		
	16	16	120	27	24	16	—		
	16	16	120	27	24	16	—		
	20	12	120	28	23	20	—		
	20	12	120	28	23	20	—		
	10	10	120	22	23	10	2		
	10	10	120	22	23	10	2		
	12	12	120	22	23	12	—		
	12	12	120	22	23	12	—		
	16	16	120	27	24	16	—		
	16	16	120	27	24	16	—		
	20	12	120	28	23	20	—		
	20	12	120	28	23	20	—		

Select an Insert

Seat Size	Insert Number
C	GY00150C0000-Breaker
D	GY00200/0224D0000-Breaker
E	GY00239/0250/0274E0000-Breaker
F	GY00300/0318/0324F0000-Breaker

For Grooving/Cutting Off > P7						
Seat Size	Breaker	GU	GS	GM	05-GM	GFGS
		Neutral	Neutral	Neutral	Hand	Neutral
C	1.50mm		●	●		
D	2.00mm	●	●	●	●	●
E	2.39mm	●	●	●		●
	2.50mm	●	●	●	●	●
F	3.00mm	●	●	●	●	●
	3.18mm	●	●	●	●	●

For Multifunctional Grooving > P8					
Seat Size	Breaker	MF	MS	MM	BM
					Ball nose
D	2.00mm	●	●	●	●
	2.24mm	●			
E	2.39mm	●			
	2.50mm	●	●	●	●
F	3.00mm				●
	RE 0.2	●	●	●	
	RE 0.4	●	●	●	
	RE 0.8			●	
	3.18mm				●
	RE 0.2	●			
	RE 0.4	●			
	3.24mm	●			

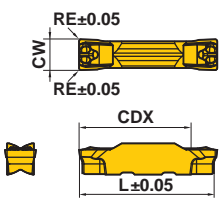
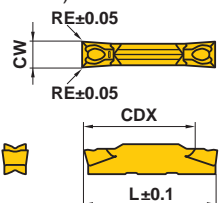
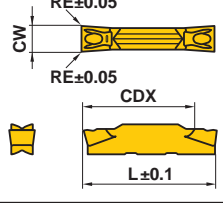
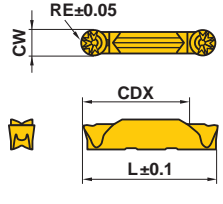
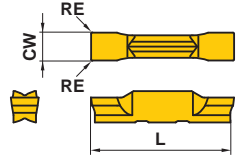
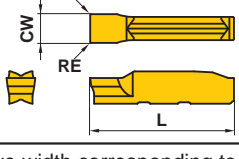
● : Gauge insert shown dimensions

GY INSERTS

Inserts

Applications	Geometry	Order Number	Stock						Seat Size	Dimensions (mm)							
			Coated		Cermet		Carbide			CBN		CW		RE	CDX	L	
			VP10RT	VP20RT	MY5015	NX2525	RT9010	RT9020		MB8025	Grooving Width	Tolerance					
For Grooving / Cutting Off	GU Breaker (For gummy steel) 	GY2M0200D020N-GU	●	●	●					D	2.00	±0.03	0.2	19.7	20.70		
		GY2M0239E020N-GU	●	●	●					E	2.39	±0.03	0.2	19.8	20.70		
		GY2M0250E020N-GU	●	●	●					E	2.50	±0.03	0.2	19.5	20.70		
		GY2M0300F030N-GU	●	●	●					F	3.00	±0.03	0.3	19.3	20.70		
		GY2M0318F030N-GU	●	●	●					F	3.18	±0.03	0.3	19.3	20.70		
	GS Breaker (Low feeds) 	NEW GY2M0150C010N-GS	●	●	●					C	1.50	±0.03	0.1	13.4	14.70		
		GY2M0200D020N-GS	●	●	●					D	2.00	±0.03	0.2	18.7	20.70		
		GY2M0239E020N-GS	●	●	●					E	2.39	±0.03	0.2	18.5	20.70		
		GY2M0250E020N-GS	●	●	●					E	2.50	±0.03	0.2	18.5	20.70		
		GY2M0300F020N-GS	●	●	●					F	3.00	±0.03	0.2	18.5	20.70		
	GM Breaker (Medium feeds) 	NEW GY2M0150C020N-GM	●	●	●					C	1.50	±0.03	0.2	13.9	14.70		
		GY2M0200D020N-GM	●	●	●					D	2.00	±0.03	0.2	19.4	20.70		
		GY2M0239E020N-GM	●	●	●					E	2.39	±0.03	0.2	19.4	20.70		
		GY2M0250E020N-GM	●	●	●					E	2.50	±0.03	0.2	19.4	20.70		
		GY2M0300F030N-GM	●	●	●					F	3.00	±0.03	0.3	19.4	20.70		
For Cutting Off	R/L05-GM Breaker Right hand insert shown.	GY2M0200D020R05-GM	●	●						D	2.00	±0.03	0.2	19.5	20.80		
		GY2M0200D020L05-GM	●	●						D	2.00	±0.03	0.2	19.5	20.80		
		GY2M0250E020R05-GM	●	●							E	2.50	±0.03	0.2	19.5	20.825	
		GY2M0250E020L05-GM	●	●							E	2.50	±0.03	0.2	19.5	20.825	
		GY2M0300F030R05-GM	●	●							F	3.00	±0.03	0.3	19.5	20.85	
		GY2M0300F030L05-GM	●	●							F	3.00	±0.03	0.3	19.5	20.85	
For Grooving	Flat Top (For Hardened material) 	GY1G0200D020N-GFGS							●	D	2.00	±0.03	0.2	—	20.70		
		GY1G0239E020N-GFGS								●	E	2.39	±0.03	0.2	—	20.70	
		GY1G0250E020N-GFGS									●	E	2.50	±0.03	0.2	—	20.70
		GY1G0300F020N-GFGS									●	F	3.00	±0.03	0.2	—	20.70
		GY1G0318F020N-GFGS									●	F	3.18	±0.03	0.2	—	20.70

● : Inventory maintained in Japan.
(10 inserts in one case) (CBN inserts are available in 1 piece in one case.)

Applications	Geometry	Order Number	Stock						Seat Size	Dimensions (mm)					
			Coated		Cermet		Carbide CBN			CW		RE	CDX	L	
			VP10RT	VP20RT	MY5015	NX2525	RT9010	RT9020		MB8025	Grooving Width				Tolerance
For Multifunctional Grooving	MF Breaker (Finishing) 	GY2G0200D020N-MF	●	●	●	●			D	2.00	±0.02	0.2	19.5	21.05	
		*1 GY2G0224D015N-MF	●	●	●	●	●			D	2.24	±0.02	0.15	19.8	21.05
		GY2G0239E020N-MF	●	●	●	●	●			E	2.39	±0.02	0.2	19.2	21.05
		GY2G0250E020N-MF	●	●	●	●	●			E	2.50	±0.02	0.2	19.4	21.05
		*1 GY2G0274E020N-MF	●	●	●	●	●			E	2.74	±0.02	0.2	19.7	21.05
		GY2G0300F020N-MF	●	●	●	●	●			F	3.00	±0.02	0.2	19.5	21.05
		GY2G0300F040N-MF	●	●	●	●	●			F	3.00	±0.02	0.4	19.3	21.05
		GY2G0318F020N-MF	●	●	●	●	●			F	3.18	±0.02	0.2	19.5	21.05
		GY2G0318F040N-MF	●	●	●	●	●			F	3.18	±0.02	0.4	19.3	21.05
		*1 GY2G0324F020N-MF	●	●	●	●	●			F	3.24	±0.02	0.2	19.5	21.05
	MS Breaker (Low feeds) 	GY2M0200D020N-MS	●	●	●	●			D	2.00	±0.03	0.2	19.1	20.70	
		GY2M0250E020N-MS	●	●	●	●			E	2.50	±0.03	0.2	19.1	20.70	
		GY2M0300F020N-MS	●	●	●	●			F	3.00	±0.03	0.2	19.2	20.70	
		GY2M0300F040N-MS	●	●	●	●			F	3.00	±0.03	0.4	18.9	20.70	
MM Breaker (Medium feeds) 	GY2M0200D020N-MM	●	●	●	●			D	2.00	±0.03	0.2	19.1	20.70		
	GY2M0250E020N-MM	●	●	●	●			E	2.50	±0.03	0.2	19.1	20.70		
	GY2M0300F020N-MM	●	●	●	●			F	3.00	±0.03	0.2	19.1	20.70		
	GY2M0300F040N-MM	●	●	●	●			F	3.00	±0.03	0.4	18.9	20.70		
	GY2M0300F080N-MM	●	●	●	●			F	3.00	±0.03	0.8	18.5	20.70		
For Copying / Receiving	BM Breaker 	GY2M0200D100N-BM	●	●	●	●			D	2.00	±0.03	1.00	19.5	20.90	
		GY2M0250E125N-BM	●	●	●	●			E	2.50	±0.03	1.25	19.3	20.90	
		GY2M0300F150N-BM	●	●	●	●			F	3.00	±0.03	1.50	19.0	20.90	
		GY2M0318F159N-BM	●	●	●	●			F	3.18	±0.03	1.59	18.9	20.90	
Blank	2 Edge Type 	*2 GY2B0220D020N			●	●	●		D	2.20	±0.10	0.2	—	21.05	
		*2 GY2E0270E020N			●	●	●		E	2.70	±0.10	0.2	—	21.05	
		*2 GY2E0340F020N			●	●	●		F	3.40	±0.10	0.2	—	21.05	
	1 Edge Type 	*2 GY1B0220D020N			●	●	●		D	2.20	±0.10	0.2	—	21.07	
		*2 GY1E0270E020N			●	●	●		E	2.70	±0.10	0.2	—	21.10	
		*2 GY1E0340F020N			●	●	●		F	3.40	±0.10	0.2	—	21.00	

*1 Groove width corresponding to the circlip.

*2 Blank inserts to be ground by customers.

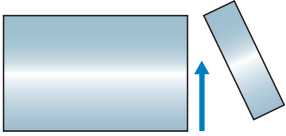
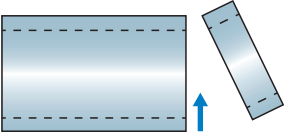
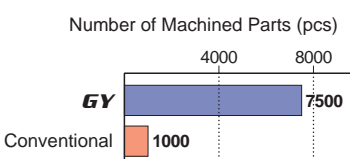
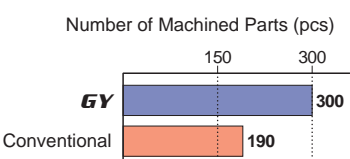
Recommended Cutting Speed (m/min)

Work Material	Hardness	Grade	Cutting Speed (m/min)						
			50	100	150	200	250	300	
P Mild Steel	≤160HB	VP20RT		100		220			
		VP10RT		110		230			
		NX2525		90		210			
	Carbon Steel Alloy Steel	160–280HB	VP20RT		80		180		
			VP10RT		90		190		
			MY5015		110		250		
		280HB≤	VP20RT		60		140		
			VP10RT		70		150		
		MY5015		90		210			
		NX2525		55		135			
M Stainless Steel	≤270HB	VP20RT		60		140			
		VP10RT		70		150			
K Gray Cast Iron	Tensile Strength ≤300MPa	VP20RT		80		180			
		VP10RT		90		190			
		MY5015		140		300			
	Ductile Cast Iron	Tensile Strength ≤800MPa	VP20RT		60		140		
			VP10RT		70		150		
			MY5015		90		210		
S Heat Resistant Alloy Titanium Alloy	—	VP20RT	30	60					
		VP10RT	40	70					
		RT9010	40	70					
H Hardened Steel	50HRC≤	MB8025		80		120			

(Note 1) VP20RT is the first recommended grade for materials other than hardened steel.

(Note 2) For VP10RT, VP20RT and MY5015, wet cutting is recommended.

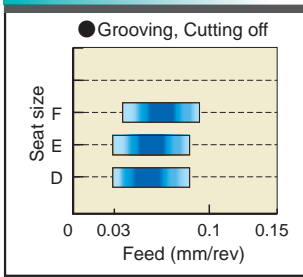
Application Examples

Tool	GYSL1212JX00-D13	GYSR1212JX-C13
Insert	GY2M0200D020N-GM (VP20RT)	GY2M0150C010N-GS (VP20RT)
Workpiece	SUS316 Cutting Off 	Inconel® 625 Cutting Off 
Component	Medical Component	Washer (Pipe Material)
Cutting Speed (m/min)	61	30.5
Feed (mm/rev)	0.031 → 0.038	0.025
Results	<p>Number of Machined Parts (pcs)</p> <p>GY: 7500</p> <p>Conventional: 1000</p>  <p>During a surface finishing test, GY achieved 7 times longer tool life and a high degree of efficiency due to high feed rate.</p>	<p>Number of Machined Parts (pcs)</p> <p>GY: 300</p> <p>Conventional: 190</p>  <p>Extended tool life was achieved because GY displayed only normal wear, but conventional products suffered from fracturing.</p>

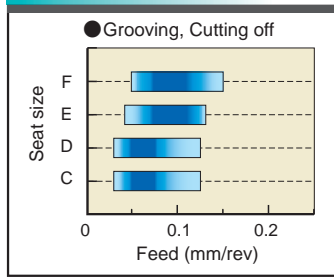
Recommended Cutting Conditions [For External Grooving]

Recommended feed rate and depth of cut

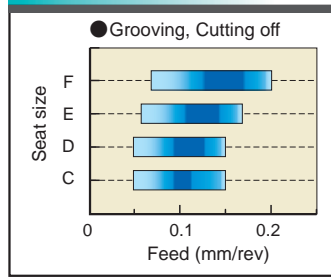
GU BREAKER



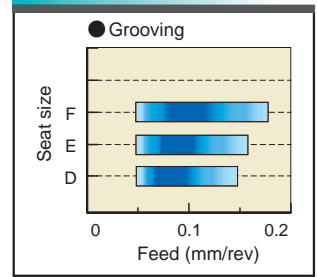
GS BREAKER



GM BREAKER

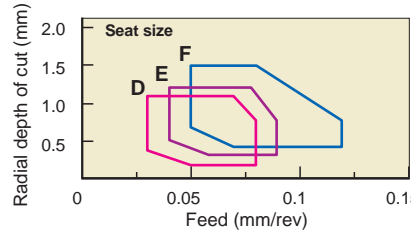


FLAT TOP GFGS (CBN)



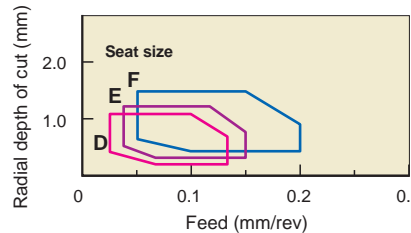
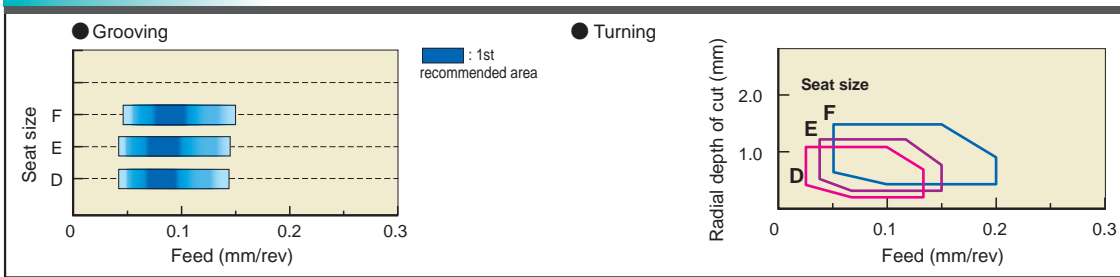
■ : 1st recommended area

MF BREAKER

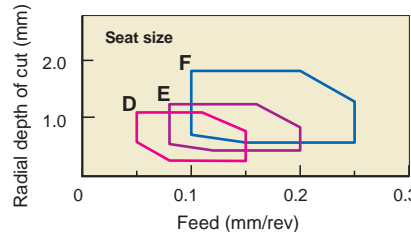
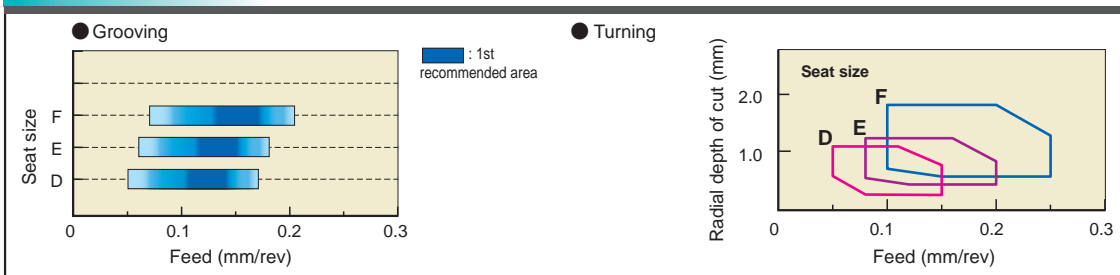


Seat Size	
Insert Width (mm)	
C	1.50
D	2.00 2.24
E	2.39 2.50 2.74
F	3.00 3.18 3.24

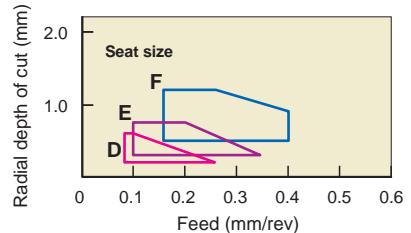
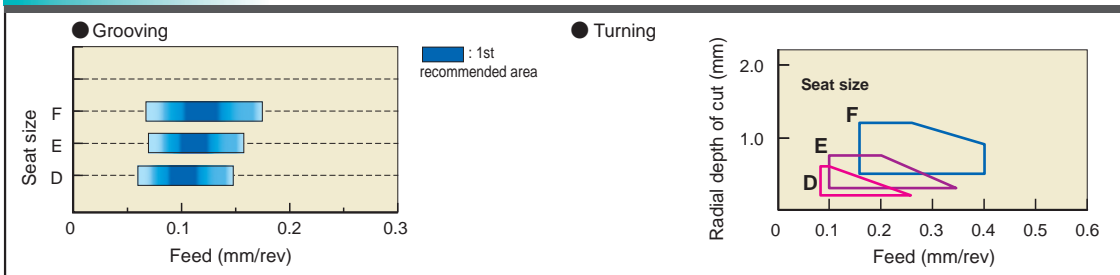
MS BREAKER



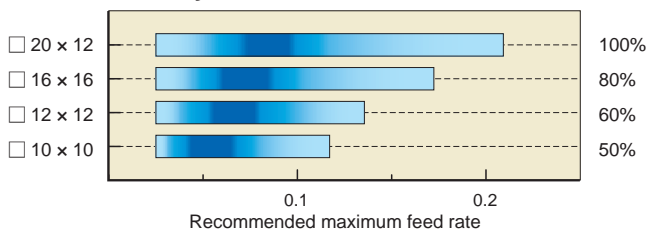
MM BREAKER



BM BREAKER



For Swiss style lathes mono block holder

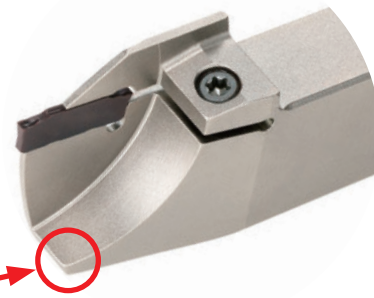
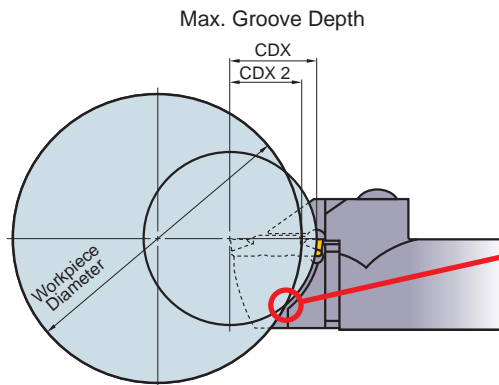


Please refer to the tables above of recommended cutting conditions for external grooving. Apply the percentage ratio shown of each shank size to the values in those tables.

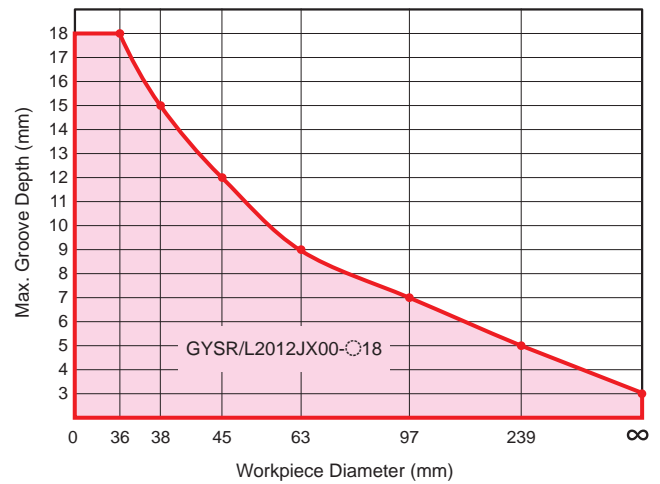
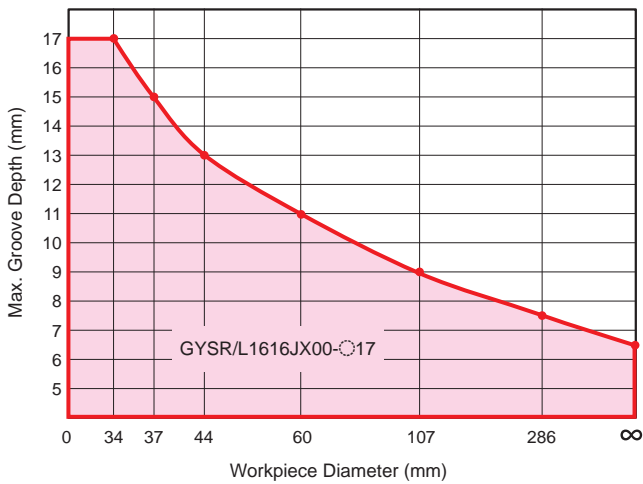
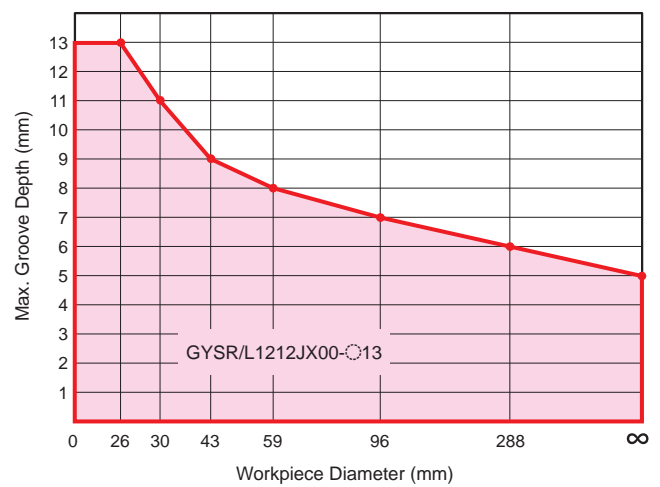
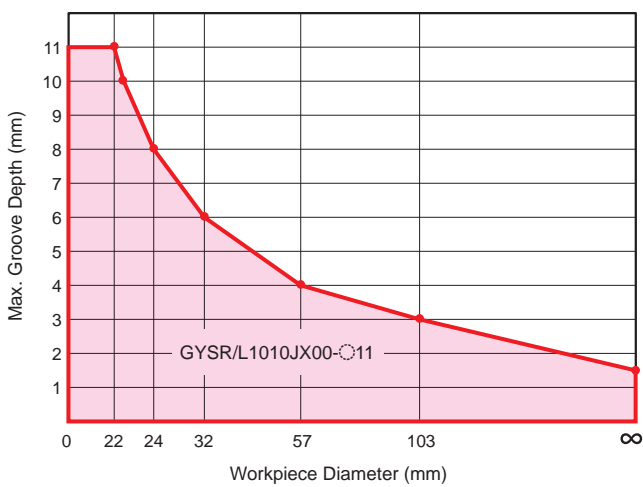
Limitation of the Maximum Groove Depth

•For Swiss style lathes mono block holder

The maximum groove depth is limited by the workpiece diameter.

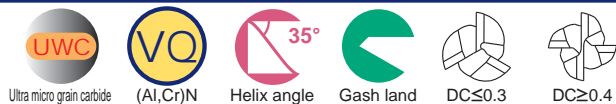


Due to interference, the maximum groove depth is limited by the workpiece diameter.

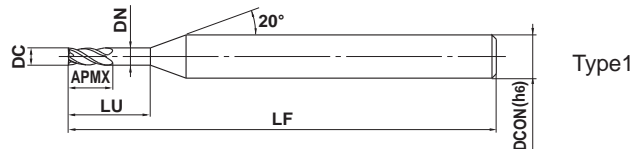


VQXL

End mill, Short cut length, 4 flute, Long neck



Carbon Steel, Alloy Steel (<30HRC)	Pre-Hardened Steel (≤45HRC)	Hardened Steel (≤55HRC)	Hardened Steel (>55HRC)	Austenitic Stainless Steel	Titanium Alloy, Heat Resistant Alloy	Copper Alloy	Aluminium Alloy
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DC ≤ 1	0			
	-0.010			
DCON=4	0			
	-0.005			

- Enhancing a high efficiency due to an improved chip disposal by adopting the SMART MIRACLE coating.
- Providing high efficiency and a long tool life by increasing the number of flutes.

Unit : mm

Order Number	DC	APMX	LU	DN	LF	DCON	N	Stock	Type
VQXLD0020N006	0.2	0.3	0.6	0.18	40	4	3	●	1
VQXLD0030N009	0.3	0.5	0.9	0.28	40	4	3	●	1
VQXLD0030N015	0.3	0.5	1.5	0.28	40	4	3	●	1
VQXLD0040N010	0.4	0.6	1	0.37	40	4	4	●	1
VQXLD0040N018	0.4	0.6	1.8	0.37	40	4	4	●	1
VQXLD0050N015	0.5	0.7	1.5	0.47	40	4	4	●	1
VQXLD0050N025	0.5	0.7	2.5	0.47	40	4	4	●	1
VQXLD0050N030	0.5	0.7	3	0.47	40	4	4	●	1
VQXLD0060N030	0.6	0.9	3	0.57	40	4	4	●	1
VQXLD0070N035	0.7	1	3.5	0.67	40	4	4	●	1
VQXLD0080N024	0.8	1.2	2.4	0.77	40	4	4	●	1
VQXLD0080N030	0.8	1.2	3	0.77	40	4	4	●	1
VQXLD0080N040	0.8	1.2	4	0.77	40	4	4	●	1
VQXLD0100N050	1	1.5	5	0.96	40	4	4	●	1

Note) SMART MIRACLE coating has reduced electric conductivity; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.

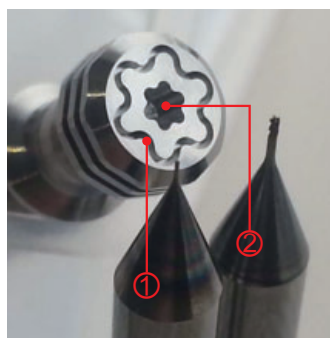
DC = Dia. LU = Neck Length LF = Overall Length N = No. of Flutes
 APMX = Cut Length DN = Neck Dia. DCON = Shank Dia.

TORX Chart

Order Number	ISO 10664
	TORX Type
VQXLD0020N006	T4
VQXLD0030N009	T6
VQXLD0030N015	T6
VQXLD0040N010	T8
VQXLD0040N018	T8
VQXLD0050N015	T15
VQXLD0050N025	T15
VQXLD0050N030	T15
VQXLD0080N024	TS25
VQXLD0080N040	TS25
VQXLD0100N050	T40

Application Example

Work Material : Ti-6Al-4V ELV
 Coolant : Emulsion
 Machining Centre: CNC automatic lathe

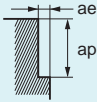


- ①
 Tool Size : $\phi 0.2$ 3 flutes
 Revolution : 17,000min⁻¹
 Table Feed : 50-80mm/min
 Depth of Cut : ap=0.025mm
- ②
 Tool Size : $\phi 0.4$ 4 flutes
 Revolution : 17,000min⁻¹
 Table Feed : 100mm/min
 Depth of Cut : ap=0.05mm
 Machining of TORX (Pre-machined pilot hole)

Recommended Cutting Conditions

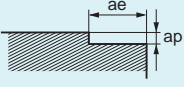
Shoulder milling

Work material		Carbon steel, Alloy steel, Mild steel, Alloy tool steel, Austenitic stainless steels, Titanium alloys, Cobalt chromium alloy, Copper, Copper alloy					Heat resistant alloys, Pre-hardened steel, Hardened steel				
Work material		S45C, SCM440, SNCM439, SUS304, SUS316, SUS304LN, SUS316LN, Ti-6Al-4V					Inconel718, NAK, PX5, SKD61, SKT4, SUS431, SUS420J2				
DC (mm)	LU (mm)	vc (m/min)	n (min ⁻¹)	vf (mm/min)	ap (mm)	ae (mm)	vc (m/min)	n (min ⁻¹)	vf (mm/min)	ap (mm)	ae (mm)
0.2	0.6	25	40000	360	0.03	0.01	20	32000	290	0.03	0.01
0.3	0.9	40	40000	480	0.045	0.015	20	21000	250	0.045	0.015
0.3	1.5	40	40000	360	0.045	0.015	20	21000	190	0.045	0.015
0.4	1.2	50	40000	800	0.06	0.02	20	16000	320	0.06	0.02
0.4	2	50	40000	560	0.06	0.02	20	16000	220	0.06	0.025
0.5	1.5	60	38000	910	0.075	0.025	20	13000	310	0.075	0.025
0.5	2.5	60	38000	610	0.075	0.025	20	13000	210	0.075	0.025
0.5	3	60	38000	550	0.075	0.025	20	13000	180	0.075	0.025
0.6	3	60	32000	640	0.09	0.03	20	10500	210	0.09	0.03
0.7	3.5	60	27000	650	0.11	0.035	20	9100	200	0.11	0.035
0.8	2.4	60	24000	960	0.12	0.04	20	8000	260	0.12	0.04
0.8	3	60	24000	860	0.12	0.04	20	8000	230	0.12	0.04
0.8	4	60	24000	670	0.12	0.04	20	8000	190	0.12	0.04
1	5	60	20000	800	0.15	0.05	20	6500	210	0.15	0.05



Face milling

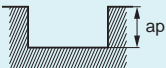
Work material		Carbon steel, Alloy steel, Mild steel, Alloy tool steel, Austenitic stainless steels, Titanium alloys, Cobalt chromium alloy, Copper, Copper alloy					Heat resistant alloys, Pre-hardened steel, Hardened steel				
Work material		S45C, SCM440, SNCM439, SUS304, SUS316, SUS304LN, SUS316LN, Ti-6Al-4V					Inconel718, NAK, PX5, SKD61, SKT4, SUS431, SUS420J2				
DC (mm)	LU (mm)	vc (m/min)	n (min ⁻¹)	vf (mm/min)	ap (mm)	ae (mm)	vc (m/min)	n (min ⁻¹)	vf (mm/min)	ap (mm)	ae (mm)
0.2	0.6	25	40000	360	0.015	≤0.2	20	32000	290	0.015	≤0.1
0.3	0.9	40	40000	480	0.025	≤0.3	20	21000	250	0.025	≤0.15
0.3	1.5	40	40000	360	0.02	≤0.3	20	21000	190	0.02	≤0.15
0.4	1.2	50	40000	800	0.03	≤0.4	20	16000	320	0.03	≤0.2
0.4	2	50	40000	560	0.02	≤0.4	20	16000	220	0.02	≤0.2
0.5	1.5	60	38000	910	0.04	≤0.5	20	13000	310	0.04	≤0.25
0.5	2.5	60	38000	610	0.03	≤0.5	20	13000	210	0.03	≤0.25
0.5	3	60	38000	550	0.03	≤0.5	20	13000	180	0.03	≤0.25
0.6	3	60	32000	640	0.035	≤0.6	20	10500	210	0.035	≤0.3
0.7	3.5	60	27000	640	0.035	≤0.7	20	9100	190	0.035	≤0.35
0.8	2.4	60	24000	960	0.06	≤0.8	20	8000	260	0.06	≤0.4
0.8	3	60	24000	840	0.05	≤0.8	20	8000	230	0.05	≤0.4
0.8	4	60	24000	670	0.04	≤0.8	20	8000	190	0.04	≤0.4
1	5	60	20000	800	0.05	≤1	20	6500	210	0.05	≤0.5



- 1) SMART MIRACLE coating is less electro conductive; therefore an external contact type (electric transmitted) tool setter may not work. When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
- 2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
- 3) When the depth of cut is smaller than shown the revolution and feed rate can be increased.

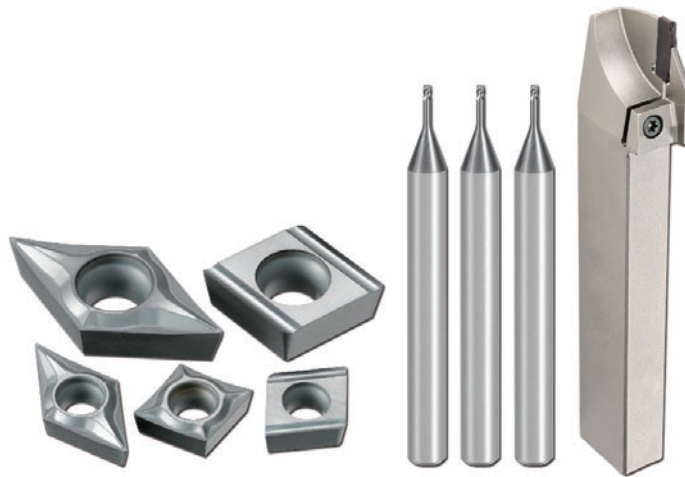
Slotting

Work material		Carbon steel, Alloy steel, Mild steel, Alloy tool steel, Austenitic stainless steels, Titanium alloys Cobalt chromium alloy, Copper, Copper alloy S45C, SCM440, SNCM439, SUS304, SUS316, SUS304LN, SUS316LN, Ti-6Al-4V				Heat resistant alloys, Pre-hardened steel, Hardened steel Inconel718, NAK, PX5, SKD61, SKT4, SUS431, SUS420J2			
DC (mm)	LU (mm)	vc (m/min)	n (min ⁻¹)	vf (mm/min)	ap (mm)	vc (m/min)	n (min ⁻¹)	vf (mm/min)	ap (mm)
0.2	0.6	20	30000	270	0.03	15	24000	220	0.03
0.3	0.9	30	30000	360	0.045	14	15000	180	0.045
0.3	1.5	30	30000	270	0.045	14	15000	140	0.045
0.4	1.2	40	30000	600	0.06	15	12000	240	0.06
0.4	2	40	30000	420	0.06	15	12000	170	0.06
0.5	1.5	45	28000	670	0.075	15	9500	230	0.075
0.5	2.5	45	28000	450	0.075	15	9500	150	0.075
0.5	3	45	28000	390	0.075	15	9500	130	0.075
0.6	3	45	24000	480	0.09	15	7800	160	0.09
0.7	3.5	45	20000	480	0.11	15	6800	140	0.11
0.8	2.4	45	18000	720	0.12	15	6000	190	0.12
0.8	3	45	18000	650	0.12	15	6000	170	0.12
0.8	4	45	18000	500	0.12	15	6000	140	0.12
1	5	45	15000	600	0.15	15	4800	150	0.15

Depth of cut	
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- 1) SMART MIRACLE coating is less electro conductive; therefore an external contact type (electric transmitted) tool setter may not work.
When measuring the tool length, please use an internal contact type (non-electricity type) tool setter or a laser type tool setter.
- 2) Effective cutting of stainless steel, titanium alloys and heat-resistant alloys etc. can be achieved with the use of emulsion.
- 3) When the depth of cut is smaller than shown the feed rate can be increased.

DC = Dia.
LU = Neck length
vc = Cutting speed
n = Revolution
vf = Feed rate
ap = Depth of cut
ae = Width of cut



Tools for Small part machining

For Your Safety

●Cutting flutes and chips have sharp edges. Never touch these with your bare hands. ●Use these products within their recommended range of conditions, and make sure to replace tools before excessive wear occurs. ●Lathes may scatter hot chips or eject long chips. Make sure to use protective equipment such as safety cover and protective eye wear to prevent injury. ●Always take appropriate fire protection measures if non-water-soluble cutting fluid is used. ●If the tool is to be rotated for use, always make sure to perform a test run to check for shaking, vibrations, and unusual sounds.

MITSUBISHI MATERIALS CORPORATION

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(Tools specifications subject to change without notice.)

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