

## ITEM PAGE STRUCTURE

Product Name ①

Item Code ②

Working Material ③

Icons ④

Product specification ⑤

Product Image ⑥

Product diagram ⑦

Depth of cut ⑧

Recommended cutting condition ⑨

**Micro Diameter / Ball Nose / for**

Order No.	Radius R	Flute Length L1	O.A.L. L2	Shank Dia D2
QBM 0024	R0.1	0.4	50	4
QBM 0034	R0.15	0.6	50	4
QBM 0044	R0.2	0.8	50	4
QBM 0054	R0.25	1.0	50	4
QBM 0064	R0.3	1.2	50	4
QBM 0074	R0.35	1.4	50	4
QBM 0084	R0.4	1.6	50	4
QBM 0094	R0.45	1.8	50	4
QBM 0124	R0.6	2.4	50	4
QBM 0144	R0.7	2.8	50	4
QBM 0164	R0.8	3.2	50	4
QBM 0184	R0.9	3.6	50	4

**Recommended cutting condition for QBM**

MATERIAL	Carbon Steels - Alloy Steels S45C, FC, PCD, SCM, S50C, S65C...		Alloy Steels - Tool Steels SC1, SNCM, SKD11, SKD11, HAKK...		Hardened Steels SKH11	
	HARDNESS ~HRC30		HARDNESS ~HRC50		HARDNESS ~HRC60	
RADIUS	SPEED (m/min)	FEED (mm/min)	SPEED (m/min)	FEED (mm/min)	SPEED (m/min)	FEED (mm/min)
R0.1	32000	500 - 600	32000	100 - 500	25000	300 - 400
R0.15	32000	500 - 600	32000	400 - 500	25000	300 - 400
R0.2	32000	500 - 600	32000	400 - 500	25000	300 - 400
R0.25	32000	600 - 700	32000	500 - 600	25000	400 - 500
R0.3	32000	600 - 700	32000	500 - 600	25000	400 - 500
R0.35	32000	700 - 800	32000	600 - 700	25000	500 - 600
R0.4	32000	900 - 1000	32000	800 - 900	25000	600 - 700
R0.45	32000	1000 - 1100	32000	900 - 1000	25000	600 - 700

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## THE SYSTEM CODE INTRODUCES

V	V70	Hardened Steels HRC70 series	14
Q	MAGIC CUT	Magic cutting series	18
S	SUPER MILL	HSC & HHC series	45
E	EFFICIENCY MILLS	Efficiency end mills series	85
I	I.pro	Titanium & Stainless cutting series	113
D	D MILL	Aluminum & Copper cutting series	124
G	G.pro	Graphite cutting series	138
DT	DEN.pro	Dental end mills	147
COM	COM.pro	CFRP machining series	154
EX	MAGIC SHANK	Magic shank series	157
T	T.pro	Thread milling series	162
C	C.pro	Chamfering series	168
CD	CD	Carbide drills series	173
CR	CR	Carbide reamers series	185

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V70B NEW

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Q

## MAGIC CUT

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QBM

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0.2~1.8

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QB

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QBG

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QBX

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QBLS/M/L

p. 26

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QBLSX/MX/LX

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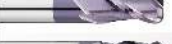

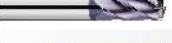













QBP

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## CONTENTS

	Page	Mill Dia.	Coating	HRC 45-55	HRC 55-60	HRC 60-65	Hardened Steels HRC 65-70	Cast Iron	Titanium Alloy	Stainless Steels	Aluminum Alloy	Copper Alloy	Graphite	Superalloy, Heat-resistant Steels
 BA	p. 88	1~20	TiaLN	☉				○				○		
 BB	p. 89	1~12	TiaLN	☉				○				○		
 BLS/M/L	p. 90	1~20	TiaLN	☉				○				○		
 EM	p. 91	0.4~1.8	TiaLN	☉				○				○		
 ES	p. 92	1~4	TiaLN	☉				○				○		
 EA	p. 93	1~20	TiaLN	☉				○				○		
 EB	p. 94	1~20	TiaLN	☉				○				○		
 EC/EP	p. 95	3~20	TiaLN	☉				○				○		
 ED	p. 96	3~16	TiaLN	☉				○	○	○		○		
 ELA	p. 97	6~12	TiaLN	☉				○				○		
 ELB	p. 98	3~16	TiaLN	☉				○				○		
 ELC	p. 99	2~12	TiaLN	☉				○				○		
 ELD	p. 100	2~20	TiaLN	☉				○				○		
 EH	p. 101	6~20	TiaLN	☉				○				○		
 EHL	p. 102	6~20	TiaLN	☉				○				○		
 EG	p. 103	6~20	TiaLN	☉				○				○		
 EGA	p. 104	6~20	TiaLN	☉				○				○		
 ETL	p. 105	1~4	TiaLN	☉				○				○		
 ET	p. 106	0.5~10	TiaLN	☉				○				○		
 ERA	p. 108	3~12	TiaLN	☉				○				○		
 ERB	p. 109	3~12	TiaLN	☉				○				○		
 ERC	p. 110	6~12	TiaLN	☉				○				○		
 BF	p. 111	1~4	TiaLN	☉				○				○		
 EFA	p. 112	1~3	TiaLN	☉				○				○		
<b>I.pro</b>														
 SBBI	p. 114	3~12	G300	○					☉	☉				☉
 SEI	p. 115	3~20	G300	○					☉	☉				☉
 SEPS	p. 116	3~20	HELICA	○					☉	☉				☉
 SEPI	p. 117	3~20	G300	○					☉	☉				☉
 SIB	p. 118	3~20	G300	○					☉	☉				☉
 SHAI	p. 119	6~16	G300	○					☉	☉				☉
 SEGI	p. 120	6~20	G300	○					☉	☉				☉
 SRIP	p. 121	3~12	G300	○					☉	☉				☉
 SIW	p. 122	3~20	G-plus	○					☉	☉				☉
 SIRW	p. 123	3~12	G-plus	○					☉	☉				☉
<b>D MILL</b>														
 DB	p. 125	1~12									☉			

I

D

## CONTENTS

	Page	Mill Dia.	Coating	HRC 45-55	HRC 55-60	HRC 60-65	Hardened Steels HRC 65-70	Cast Iron	Titanium Alloy	Stainless Steels	Aluminum Alloy	Copper Alloy	Graphite	Superalloy, Heat-resistant Steels
 DEA	p. 126	1~16									☉			
 DEB	p. 127	1~16									☉			
 DEC	p. 128	2~20									☉			
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 DBX	p. 136	1~12	CRN								☉	☉		
 DEDX	p. 137	2~20	CRN								☉	☉		
<b>G.pro</b>														
 SGBB	p. 139	4~12	Diamond										☉	
 SGBF	p. 140	4~12	Diamond										☉	
 SGEB	p. 141	4~12	Diamond										☉	
 SGRD	p. 142	4~12	Diamond										☉	
 SGRB	p. 143	4~12	Diamond										☉	
 SGBS	p. 144	1.0~4.0	Diamond										☉	
 SGES	p. 145	1.0~4.0	Diamond										☉	
 SGRS	p. 146	1.0~4.0	Diamond										☉	
<b>DEN.pro</b>														
 TOBF	p. 148	0.6~3.0	Diamond											
 TTBF	p. 149	0.8~3.0	G300											
 TTFA	p. 150	0.5~2.5	G300											
 TTRA	p. 151	1.0~2.5	G300											
 TTRB	p. 151	2.0~4.0	G300											
 TCBF	p. 152	0.8~3.0	Diamond											
 TWBF	p. 153	0.8~3.0												
<b>COM.pro</b>														
 CFPA	p. 155	6~12	Diamond											
 CFRA	p. 156	6~12	Diamond											
<b>MAGIC SHANK</b>														
 EX2CS	p. 158	10~20												
 EX2SB	p. 158	10~20	i8	☉	☉			○				○		
 EX2SRD	p. 159	10~20	i8	☉	☉			○				○		
 EX2SEB	p. 159	10~20	i8	☉	☉			○				○		

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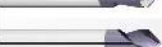


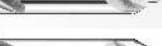








DT

COM

EX



## CONTENTS

		Page	Mill Dia.	Coating	HRC 45-55	HRC 55-60	HRC 60-65	Hardened Steels HRC 65-70	Cast Iron	Titanium Alloy	Stainless Steels	Aluminum Alloy	Copper Alloy	Graphite	Superalloy. Heat-resistant Steels
	 EX2DPW NEW	p. 160	10~20									◎			
	 EX2SIW NEW	p. 160	10~20	G-plus						◎	◎				◎
<b>T</b>	<b>T.pro</b>	p. 162													
	 EMT	p. 163	P0.5-P2.5	G100	◎				○	○	○	○	○	○	○
	 EMTW	p. 164	P0.5-P2.5	G100	◎				○	○	○	○	○	○	○
	 EMTH	p. 165	P0.7-P2.5	G100	◎				○	○	○	○	○	○	○
	 EMTS	p. 166	P0.5-P1.25	i8	◎				○	○	○	○	○	○	○
	 EMTF	p. 167	P0.5-P1.75	G100	◎				○	○	○	○	○	○	○
<b>C</b>	<b>C.pro</b>	p. 168													
	 ECM	p. 169	4~12	TiAlN	◎				○	○	○	○	○	○	○
	 ECMP NEW	p. 170	4~12	i8	◎				○	○	○	○	○	○	○
	 ECMV NEW	p. 171	4~12	i8	◎				○	○	○	○	○	○	○
	 ECR/EMCR	p. 172	1~12		◎				○	○	○	○	○	○	○
<b>CD</b>	<b>CD</b>	p. 173													
	 ESD	p. 174	3~20		◎				◎	○	○	○	◎	○	○
	 ESD2	p. 174	3~20		◎				◎	○	○	○	◎	○	○
	 ESDC	p. 175	3~20	TiAlN	◎				◎	○	○	○	◎	○	○
	 ESDA	p. 175	3~20	TiAlN	◎				◎	○	○	○	◎	○	○
	 ESDS	p. 176	6~20	TiAlN	◎				◎	○	○	○	◎	○	○
	 ESDL	p. 176	6~20	TiAlN	◎				◎	○	○	○	◎	○	○
	 CCD	p. 177	0.5~5		◎				◎	○	○	○	◎	○	○
	 CCDA	p. 177	0.5~5		◎				◎	○	○	○	◎	○	○
	 CD	p. 178	2~13	TiAlN	◎				◎				◎		
	 CDA	p. 179	3~20	TiAlN	◎				◎				◎		
	 CDB	p. 180	3~20	TiAlN	◎				◎				◎		
	 CDC	p. 181	3~12	TiAlN	◎				◎				◎		
	 CDAC	p. 182	3~20	i8	◎				◎				◎		
	 CDBC	p. 183	3~20	i8	◎				◎				◎		
	 CDCC	p. 184	3~10	i8	◎				◎				◎		
<b>CR</b>	<b>CR</b>	p. 185													
	 CRA	p. 186	2~12		◎				◎				◎		

## TOLERANCE

## Square End Mills (mm)

Flute Dia.	Dia. Tolerance
1.0	0~-0.015
1.5	0~-0.015
2.0	0~-0.015
2.5	0~-0.015
3.0	0~-0.015
4.0	0~-0.015
5.0	0~-0.015
6.0	0~-0.015
8.0	0~-0.020
10.0	0~-0.020
12.0	0~-0.020
16.0	0~-0.020
20.0	0~-0.020

## Ball Nose End Mills (mm)

Flute Dia.	R Tolerance
R0.5	±0.01
R1	±0.01
R1.5	±0.01
R2	±0.01
R2.5	±0.01
R3	±0.01
R4	±0.01
R5	±0.01
R6	±0.01
R8	±0.02
R10	±0.02

## Corner Radius End Mills (mm)

Flute Dia.	R Tolerance
1.0	±0.01
2.0	±0.01
3.0	±0.01
4.0	±0.01
6.0	±0.01
8.0	±0.01
10.0	±0.01
12.0	±0.01
16.0	±0.015

## Shank (mm)

Shank Dia. (h6)	Shank Tolerance
ø 3	0~-0.008
ø 4	0~-0.008
ø 6	0~-0.008
ø 8	0~-0.009
ø 10	0~-0.009
ø 12	0~-0.011
ø 16	0~-0.011
ø 20	0~-0.013

## Recommended Cutting Instructions

1. In order to enhance processing efficiency and extend life of cutters, please use the balanced chucks with high rigidity and high accuracy.
2. Make overhang enough for processing. If it's necessary to extend the milling cutter, please be sure to reduce spindle speed and feed speed.
3. If there's abnormal sound or vibration during processing, please adjust cutting data to prevent cutters from being influenced or broken.
4. Please choose correct cutting oil to maximize efficiency.
5. The result of cutting data depends on working materials, machines, work clips, programming and etc. Cutting data are for reference. You may increase cutting data starting from 50%.

## ICONS

### Flutes



### Helix Angle (0°, 5°, 7°, 25°, 30°, 35°, 45°, 55°, 40°/43°)



### Work Material Hardness (40, 55, 60, 65, 70)



### Coating



### Roughing Pitch



### Corner Radius (0.1, 0.2, 0.3, 0.5, 1, 1.5, 2)



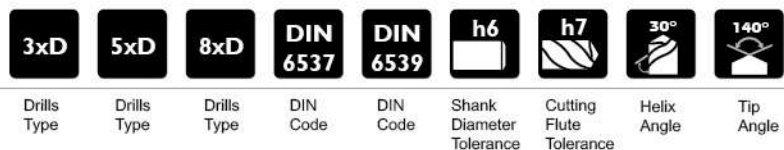
### Tip Angle (60°, 90°, 120°)



### Applications



### Statistics For Drills



Drills Type   Drills Type   Drills Type   DIN Code   DIN Code   Shank Diameter Tolerance   Cutting Flute Tolerance   Helix Angle   Tip Angle

## DEPTH OF CUT

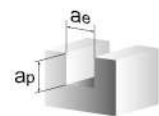
### SIDE MILLING



HRC45 ↓

D1 6mm ↓   ap=1.5D   ae=0.02D  
D1 6mm ↑   ap=1.5D   ae=0.05D

### SLOTING



HRC45 ↓

ap 0.2D  
ae=D1

### RADIUS



HRC45 ↓

ap 0.04R  
ae 0.06R

### PROFILING



HRC45 ↓

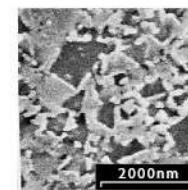
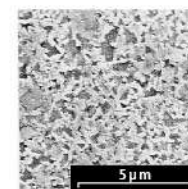
ap 0.02R  
ae 0.02R

## SOLID CARBIDE

# QMG



ISO-Classification		K10-K30
Diameter	(mm)	1.2-32.2
Co	(%)	9.0
W/C+cr <sub>3</sub> c <sub>2</sub> +vc	(%)	91.0
Density	(g/cm <sup>3</sup> )	14.40
HV <sub>30</sub>	(kg/mm <sup>2</sup> )	1920
HRA	(ISO3738)	93.9
K <sub>IC</sub>	(MNm <sup>-3/2</sup> )	9.3
TRS	(N/mm <sup>2</sup> )	> 4000
	A	02
Porosity	B	00
	C	00
WC-grain size	(μm)	0.2-0.5

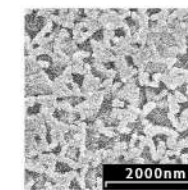
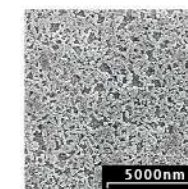


Co %	9
WC incl. Doping (%)	89.83
Tungsten Carbide α	ø0.2μm

# SMG



ISO-Classification		K40-K50
Diameter	(mm)	1.2-42.2
Co	(%)	12.0
W/C+cr <sub>3</sub> c <sub>2</sub> +vc	(%)	88.0
Density	(g/cm <sup>3</sup> )	14.05
HV <sub>30</sub>	(kg/mm <sup>2</sup> )	1680
HRA	(ISO3738)	92.5
K <sub>IC</sub>	(MNm <sup>-3/2</sup> )	10.0
TRS	(N/mm <sup>2</sup> )	> 4000
	A	02
Porosity	B	00
	C	00
WC-grain size	(μm)	0.5

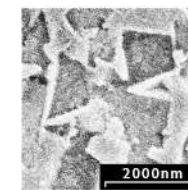
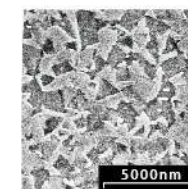


Co %	12
WC incl. Doping (%)	88
Tungsten Carbide α	ø0.4μm

# MG



ISO-Classification		K40-K50
Diameter	(mm)	1.2-42.2
Co	(%)	10.0
W/C+cr <sub>3</sub> c <sub>2</sub> +vc	(%)	90.0
Density	(g/cm <sup>3</sup> )	14.5
HV <sub>30</sub>	(kg/mm <sup>2</sup> )	1610
HRA	(ISO3738)	92.3
K <sub>IC</sub>	(MNm <sup>-3/2</sup> )	10.5
TRS	(N/mm <sup>2</sup> )	> 4000
	A	02
Porosity	B	00
	C	00
WC-grain size	(μm)	0.6



Co %	10
WC incl. Doping (%)	90
Tungsten Carbide α	ø0.6μm

## WORK MATERIAL

ISO	(H)	(P)	(K)	(M)	(S)	(N)
MATERIAL	Hardened steel	Low alloy steel	Cast iron	Stainless steel	High temp. alloys	Aluminum alloy
		High alloy steel, cast steel, tool steel			Titanium and Ti alloys	Copper alloys
						Non-metallic



## HARD COATING PROPERTIES

Coating Type	Symbol Color	Nanohardness(GPa)	Thickness (μm)	Friction Coefficient	Max usage Temp(°C)	Coating Temp(°C)
TIALN	BLACK	30	1 - 4	0.4	800	450 ↑
AlTiN	BLACK	38	1 - 4	0.6	900	450 ↑
nACoB	BLUE	45	1 - 4	0.45	1200	400 ↑
HELICA	COPPER	30	1 - 4	0.25	1000	480 ↑
CrN	METAL-SILVER	18	1 - 7	0.4	700	200 - 400
DLC	BLACK	20	1 - 3	0.15	400	150 - 250
G100	BURGUNDY-VIOLET	33	1 - 4	0.3	500	
G300	SOFT GOLD	35	1 - 4	0.4	800	
i8	GOLD-BRASS	47	1 - 4	0.45	900	
Aldura	BLACK	32	1 - 4	0.35	1100	
G-plus	WHITE GOLD		1 - 4	0.25	550	
i-plus	COPPER		1 - 3	0.3	1200	



## COATING APPLICATIONS

Coating Type	Symbol Color	Introduce coating on different materials
TIALN	BLACK	General steel for wet cutting (HRC35-45)
AlTiN	BLACK	High Hard steel for Dry cutting (HRC45-65)
nACoB	BLUE	High Hard steel for Dry cutting (HRC55-65)
HELICA	COPPER	General steel, Cast iron, with special flute design and work on Stainless steel(EX: SEPS)
CrN	METAL-SILVER	Copper Alloy
DLC	BLACK	Aluminum Alloy
G100	BURGUNDY-VIOLET	General steel for wet cutting (HRC35-45)
G300	SOFT GOLD	Tough material, ex: Titanium Alloy, Nickel Alloy, Stainless steel and Heat-resistant alloy
i8	GOLD-BRASS	High Hard steel for Dry and wet cutting(HRC55-65)
Aldura	BLACK	High Hard steel for Dry cutting (HRC55-65)
Diamond	BLACK GRAY	Graphite, Zirconium Oxide
G-plus	WHITE GOLD	Tough material, ex: Titanium Alloy, Nickel Alloy, Stainless steel and Heat-resistant alloy
i-plus	COPPER	High Hard steel for Dry and wet cutting(HRC70)

