

## 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, HAKU...		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

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Q	MAGIC CUT	Magic cutting series	18
S	SUPER MILL	HSC & HHC series	45
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COM	COM.pro	CFRP machining series	154
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V70B NEW

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i-plus

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

Q

## MAGIC CUT

p. 18



QBM

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0.2~1.8

Aldura

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

QB

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ALTIN

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

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Aldura

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

QBN

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nAcoB

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

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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

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nAcoB

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

QBHX

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i8

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

QBLS/M/L

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ALTIN

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

QBLSX/MX/LX

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i8

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

QBP

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ALTIN

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

QEM

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0.2~1.8

Aldura

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

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ALTIN

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

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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

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nAcoB

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

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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

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ALTIN

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

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ALTIN

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

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Aldura

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

QRHN

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nAcoB

HRC 45-55

HRC 55-60

HRC 60-65

Hardened Steels  
HRC 65-70

Cast Iron

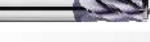
Titanium Alloy

Stainless Steels

Aluminum Alloy

Copper Alloy

Graphite

Superalloy,  
Heat-resistant Steels

QRHX

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i8

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

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ALTIN



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 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	☉				○				○		
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 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									☉			

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	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
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 DEL	p. 131	2~20									☉			
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<b>G.pro</b>														
 SGBB	p. 139	4~12	Diamond										☉	
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 SGRB	p. 143	4~12	Diamond										☉	
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 SGES	p. 145	1.0~4.0	Diamond										☉	
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<b>DEN.pro</b>														
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 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											
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 TWBF	p. 153	0.8~3.0												
<b>COM.pro</b>														
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 CFRA	p. 156	6~12	Diamond											
<b>MAGIC SHANK</b>														
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 EX2SB	p. 158	10~20	i8	☉	☉			○				○		
 EX2SRD	p. 159	10~20	i8	☉	☉			○				○		
 EX2SEB	p. 159	10~20	i8	☉	☉			○				○		

G

DT

COM

EX



















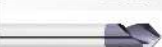










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C

CD

CR

		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.pro</b>	p. 162													
	 EMT	p. 163	P0.5-P2.5	G100	◎				○	○	○	○	○	○	○
	 EMTW	p. 164	P0.5-P2.5	G100	◎				○	○	○	○	○	○	○
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	 EMTF	p. 167	P0.5-P1.75	G100	◎				○	○	○	○	○	○	○
	<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>	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>	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	SLOTTING	RADIUS	PROFILING
<p>HRC45 ↓</p> <p>D1 6mm ↓    ap=1.5D    ae=0.02D D1 6mm ↑    ap=1.5D    ae=0.05D</p>	<p>HRC45 ↓</p> <p>ap 0.2D    ae=D1</p>	<p>HRC45 ↓</p> <p>ap 0.04R    ae 0.06R</p>	<p>HRC45 ↓</p> <p>ap 0.02R    ae 0.02R</p>

## SOLID CARBIDE

QMG	SMG	MG
ISO-Classification	ISO-Classification	ISO-Classification
K10-K30	K40-K50	K40-K50
Diameter (mm)	Diameter (mm)	Diameter (mm)
1.2-32.2	1.2-42.2	1.2-42.2
Co (%)	Co (%)	Co (%)
9.0	12.0	10.0
W/C+cr <sub>3</sub> c <sub>2</sub> +vc (%)	W/C+cr <sub>3</sub> c <sub>2</sub> +vc (%)	W/C+cr <sub>3</sub> c <sub>2</sub> +vc (%)
91.0	88.0	90.0
Density (g/cm <sup>3</sup> )	Density (g/cm <sup>3</sup> )	Density (g/cm <sup>3</sup> )
14.40	14.05	14.5
HV <sub>30</sub> (kg/mm <sup>2</sup> )	HV <sub>30</sub> (kg/mm <sup>2</sup> )	HV <sub>30</sub> (kg/mm <sup>2</sup> )
1920	1680	1610
HRA (ISO3738)	HRA (ISO3738)	HRA (ISO3738)
93.9	92.5	92.3
K <sub>IC</sub> (MNm <sup>-3/2</sup> )	K <sub>IC</sub> (MNm <sup>-3/2</sup> )	K <sub>IC</sub> (MNm <sup>-3/2</sup> )
9.3	10.0	10.5
TRS (N/mm <sup>2</sup> )	TRS (N/mm <sup>2</sup> )	TRS (N/mm <sup>2</sup> )
> 4000	> 4000	> 4000
A	A	A
02	02	02
Porosity	Porosity	Porosity
B	B	B
00	00	00
C	C	C
00	00	00
WC-grain size (μm)	WC-grain size (μm)	WC-grain size (μm)
0.2-0.5	0.5	0.6
Co %	Co %	Co %
9	12	10
WC incl. Doping (%)	WC incl. Doping (%)	WC incl. Doping (%)
89.83	88	90
Tungsten Carbide α	Tungsten Carbide α	Tungsten Carbide α
ø0.2μm	ø0.4μm	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)

