

## ITEM PAGE STRUCTURE

Product Name 1

Item Code 2

### Working Material 3

Icons 4

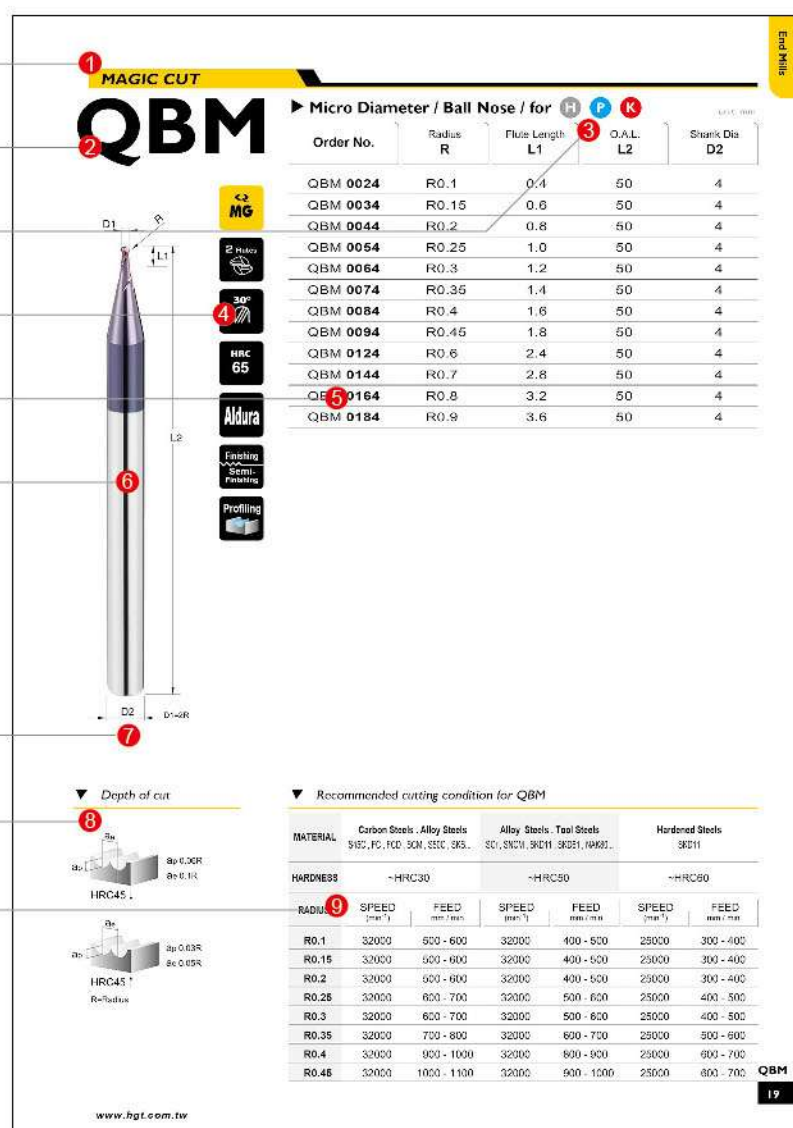
## Product specification 5

Product Image 6







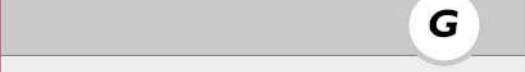







Product diagram 7

Depth of cut 8

Recommended cutting condition **9**



## THE SYSTEM CODE INTRODUCES

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

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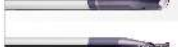















V

## V70

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
p. 14													
 V70B NEW p. 15	3~12	i-plus	○	○	○	○							
 V70R NEW p. 16	6~12	i-plus	○	○	○	○							
 V70E NEW p. 17	6~16	i-plus	○	○	○	○							

Q

## MAGIC CUT


























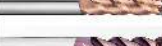










Page	Mill Dia.	Coating	HRC 45-55	HRC 55-60	HRC 60-65	Hardened Steels HRC 65-70	Cast Iron	Titanium Alloy	Stainless Steels	Aluminum Alloy	Copper Alloy	Graphite	Superalloy, Heat-resistant Steels
p. 18													
 QBM p. 19	0.2~1.8	Aldura	○	○	○								
 QB p. 20	1~16	ALTIN	○	○	○								
 QBG p. 21	4~12	Aldura	○	○	○								
 QBN p. 22	1~16	nAcoB	○	○	○								
 QBX p. 23	1~16	i8	○	○	○								
 QBHN p. 24	1~12	nAcoB	○	○	○								
 QBHX p. 25	1~12	i8	○	○	○								
 QBL5/M/L p. 26	2~20	ALTIN	○	○	○								
 QBL5X/MX/LX p. 27	2~20	i8	○	○	○								
 QBP p. 28	1~12	ALTIN	○	○	○								
 QEM p. 29	0.2~1.8	Aldura	○	○	○								
 QEB p. 30	1~20	ALTIN	○	○	○								
 QEBG p. 31	4~12	Aldura	○	○	○								
 QEBN p. 32	3~20	nAcoB	○	○	○								
 QEX p. 33	3~20	i8	○	○	○								
 QELB p. 34	6~12	ALTIN	○	○	○								
 QRD p. 35	1~12	ALTIN	○	○	○								
 QRDG p. 36	4~12	Aldura	○	○	○								
 QRHN p. 37	3~12	nAcoB	○	○	○								
 QRHX p. 38	3~12	i8	○	○	○								
 QERC p. 39	6~12	ALTIN	○	○	○								
 QRHLX p. 40	6~12	i8	○	○	○								
 QBF p. 41	0.5~4	ALTIN	○	○	○								
 QEFA p. 42	0.5~3	Aldura	○	○	○								
 QRFA p. 43	1~3	Aldura	○	○	○								
 QRFB p. 44	1~3	Aldura	○	○	○								

S

## SUPER MILL

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
p. 45													
 SBM p. 46	0.2~1.8	ALTIN	○	○			○				○		
 SBMX p. 47	0.2~1.8	i8	○	○			○				○		
 SB p. 48	1~16	ALTIN	○	○			○				○		
 SBK p. 49	1~16	G100	○	○			○				○		
 SBX p. 50	1~16	i8	○	○			○				○		



## 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
p. 51	1~16	ALTIN	○	○			○				○		
 SBB p. 51													
 SBL5/M/L p. 52	1~20	ALTIN	○	○			○				○		
 SBL5X/MX/LX p. 53	2~12	i8	○	○			○				○		
 SBC p. 54	2~6	ALTIN	○	○			○				○		
 SBCX p. 55	2~6	i8	○	○			○				○		
 SEM p. 56	0.2~1.8	ALTIN	○	○			○				○		
 SEMX p. 57	0.2~1.8	i8	○	○			○				○		
 SEA p. 58	1~20	ALTIN	○	○			○				○		
 SEB p. 59	1~20	ALTIN	○	○			○				○		
 SEK p. 60	1~20	G100	○	○			○				○		
 SEX p. 61	3~20	i8	○	○			○				○		
 SEP p. 62	3~20	HELICA	○	○			○				○		
 SEW p. 63	3~20	G300	○	○			○				○		
 SEPC NEW p. 64	2~12	i8	○	○			○	○	○	○	○		○
 SELA p. 65	6~12	ALTIN	○	○			○				○		
 SELB p. 66	3~16	ALTIN	○	○			○				○		
 SELD p. 67	4~12	ALTIN	○	○			○				○		
 SHA p. 68	6~16	ALTIN	○	○			○				○		
 SEZ p. 69	4~12	ALTIN	○	○			○				○		
 SRA p. 70	4~16	ALTIN	○	○			○				○		
 SRB p. 71	4~16	ALTIN	○	○			○				○		
 SRC p. 72	3~12	ALTIN	○	○			○				○		
 SRD p. 73	1.5~12	ALTIN	○	○			○				○		
 SRDX p. 74	3~12	i8	○	○			○				○		
 SRK p. 75	3~12	G100	○	○			○				○		
 SERC p. 76	6~12	ALTIN	○	○			○				○		
 SERCX p. 77	6~12	i8	○	○			○				○		
 SRP p. 78	6~12	ALTIN	○	○			○				○		
 SBF p. 79	0.5~4	ALTIN	○	○			○				○		
 SBFX p. 80	0.5~4	i8	○	○			○				○		
 SEFA p. 81	1~3	ALTIN	○	○			○				○		
 SEFAX p. 82	1~3	i8	○	○			○				○		
 SEF p. 83	1~3	ALTIN	○	○			○				○		
 SEFX p. 84	1~3	i8	○	○			○				○		
<b>EFFICIENCY MILLS</b>													
 BM p. 86	0.4~1.8	TiaLN	○				○				○		
 BS p. 87	1~4	TiaLN	○				○				○		

E







## 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	☉				○				○		
 I.pro	p. 113													
 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 NEW	p. 122	3~20	G-plus	○					☉	☉				☉
 SIRW NEW	p. 123	3~12	G-plus	○					☉	☉				☉
 D MILL	p. 124													
 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									☉			
 DED	p. 129	2~20									☉			
 DEDP	p. 130	2~20	DLC								☉			
 DEL	p. 131	2~20									☉			
 DEPW NEW	p. 132	3~20									☉			
 DEG	p. 133	6~16									☉			
 DFR	p. 134	6~20									☉			
 DRC	p. 135	3~16									☉			
 DBX	p. 136	1~12	CRN								☉	☉		
 DEDX	p. 137	2~20	CRN								☉	☉		
 G.pro	p. 138													
 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										☉	
 DEN.pro	p. 147													
 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												
 COM.pro	p. 154													
 CFPA	p. 155	6~12	Diamond											
 CFRA	p. 156	6~12	Diamond											
 MAGIC SHANK	p. 157													
 EX2CS NEW	p. 158	10~20												
 EX2SB NEW	p. 158	10~20	i8	☉	☉				○			○		
 EX2SRD NEW	p. 159	10~20	i8	☉	☉				○			○		
 EX2SEB NEW	p. 159	10~20	i8	☉	☉				○			○		

G

















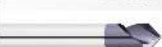










DT

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	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)

