MIRROR BALL — BNM Type

MIRROR BALL
High Precision Indexable Ball Nose End Mill

C-Body

- Insert radius from accuracy is **bellow ±0.010 mm** when fixed to the holder. (accuracy **below ±0.006 mm** in insert alone).

Cat.No.	Stock	Dimensions (mm)									Parts		Inserts	Fig.
		φDc	R	ℓ1	ℓ2	L	φD1	θ	θk	φDs	Screws	Wrench		
BNMS-060017S-06C	●	6	3	–	17	60	5.5	–	–	6	FSW-2005H	A-06	BNM-060/070…	1
BNMS-060030T-S10C	●			15	30	80		6°	4°14'	10				2
BNMM-060035S-06C	●			–	35	92		–	–	6				1
BNML-060017S-06C	●				17	120								
BNMS-080025S-08C	●	8	4		25	90	7.5			8	FSW-2506H	A-07	BNM-080…; RNM-080…	
BNMM-080035S-08C	●				35	92								
BNML-080075S-08C	●				75	140								
BNML-080095S-08C	●				95	160								
BNML-080075T-S12C	●			20	75	132		2°	1°37'	12				2
BNMS-100030S-10C	●	10	5	–	30	100	9.5	–	–	10	FSW-3007H	A-08	BNM-100/110…; RNM-100…	1
BNMM-100043S-10C	●				43									
BNML-100075S-10C	●				75	140								
BNML-100080S-10C	●				80	220								
BNML-100095S-10C	●				95	160								
BNML-100140S-10C	●				140	220								
BNML-100075T-S12C	●			32.1	75	132		1°30'	0°49'					2
BNMS-120028S-12C	●	12	6	–	28	84	11.5	–	–	12	FSW-3509H	A-10	BNM-120…; RNM-120…	1
BNMM-120053S-12C	●				53	110								
BNML-120095S-12C	●				95	160								
BNML-120100S-12C	●				100	220								
BNML-120085T-S16C	●			33.8	85	145		2°	1°27'	16				2
BNML-120130S-12C	●			–	130	200		–	–	12				1
BNML-120150S-12C	●				150	220								
BNMS-160033S-16C	●	16	8	–	33	93	15	–	–	16	FSW-4013H	A-15	BNM-160…; GRM-160…; RNM-160…	1
BNMM-160063T-20C	●			37.5	63	123		4°	2°5'	20				2
BNML-160070S-16C	●			–	70	140		–	–	16				1
BNML-160090S-16C	●				90	160								
BNML-160100S-16C	●			100		220								
BNML-160100T-S20C	●			44.5		166		2°	1°15'	20				2
BNML-160110S-16C	●			–	110	180		–	–	16				1
BNML-160150S-16C	●				150	220								
BNMS-200039S-20C	●	20	10		39	105	19			20	FSW-5016H	A-20W	BNM-200…; GRM-200…; RNM-200…	
BNMM-200075S-20C	●				75	141								

MIRROR BALL — BNM Type

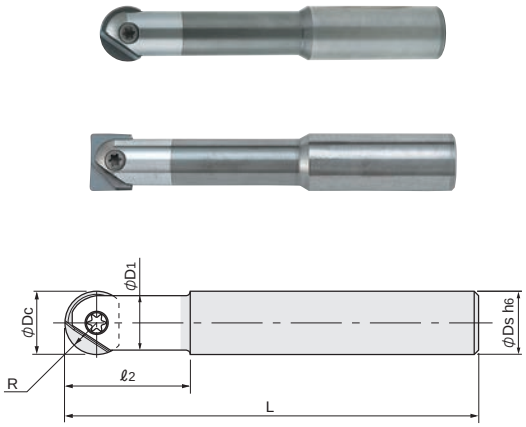


Fig 1

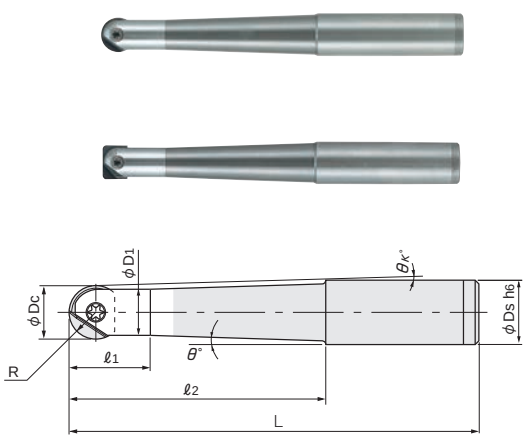


Fig 2

Cat.No.	Stock	Dimensions (mm)									Parts		Inserts	Fig.
		φDc	R	ℓ1	ℓ2	L	φD1	θ	θk	φDs	Screws	Wrench		
BNML-200100S-20C	●	20	10	–	100	220	19	–	–	20	FSW-5016H	A-20W	BNM-200...; RNM-200...	1
BNML-200105S-20C	●				105	180								
BNML-200115T-S25C	●			64.3	115	191		2°	1°22'	25				2
BNML-200125S-20C	●			–	125	200		–	–	20				1
BNML-200170S-20C	●				170	250								
BNML-200220S-20C	●				220	300								
BNMM-250090S-25C	●	25	12.5		90	166	24			25	FSW-6020	A-30	BNM-250...; RNM-250...	
BNML-250100S-25C	●				100	220								
BNML-250140S-25C	●				140									
BNML-250170S-25C	●				170	250								
BNMM-300120S-32C	●	30	15		120	200	29			32	FSW-8025S	A-30	BNM-300/320...; RNM-300...	
BNML-300100S-32C	●				100	220								
BNML-300140S-32C	●				140									
BNML-300170S-32C	●				170	250								
BNML-300220S-32C	●				220	300								

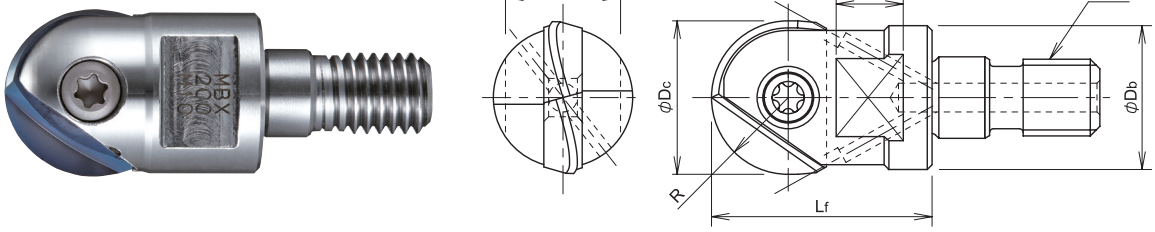
Screw	Torque(N.m)
FSW-2005H	0.5
FSW-2506H	0.9
FSW-3007H	1.2
FSW-3509H	2.0
FSW-4013H	3.0
FSW-5016H	4.0
FSW-6020	6.0
FSW-8025S	6.0

MIRROR BALL — BNM Type

■ Modular Head Type

Through coolant hole

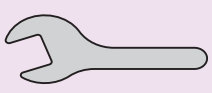
- Insert radius from accuracy is **bellow ±0.010 mm** when fixed to the holder (accuracy **below ±0.006 mm** in insert alone).
- O.D. runout is below 0.015 mm when fixed to MSN carbide shank holder.



Cat.No.	Stock	Dimensions (mm)							Parts		Inserts
		φDc	R	Lf	φDb	MD	C	W	Screws	Wrench	
MBX-100-M6	●	10	5	18	9.7	M6	6.5	8	FSW-3007H	A-08	BNM-100/110…
MBX-120-M6	●	12	6	20	11.5	M6			FSW-3509H	A-10	BNM-120…
MBX-160-M8	●	16	8	23	15	M8	8	12	FSW-4013H	A-15	BNM-160…; GRM-160…
MBX-200-M10	●	20	10	30	19	M10		14	FSW-5016H	A-20W	BNM-200…; GRM-200…
MBX-250-M12	●	25	12.5	35	24	M12	10	17	FSW-6020	A-30	BNM-250…; GRM-250…
MBX-300-M16	●	30	15	43	29	M16	12.5	22	FSW-8025S	A-30	BNM-300/320…; GRM-300…

Screw	Torque(N.m)
FSW-3007H	1.2
FSW-3509H	2.0
FSW-4013H	3.0
FSW-5016H	4.0
FSW-6020	6.0
FSW-8025S	6.0

■ Spanner

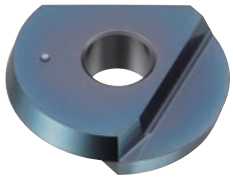


Cat.No.	MD	Torque	width across flat	Thickness	Length
DS-08	M6	8.0 N.m	8	4	85
DS-12	M8	16 N.m	12	4	93

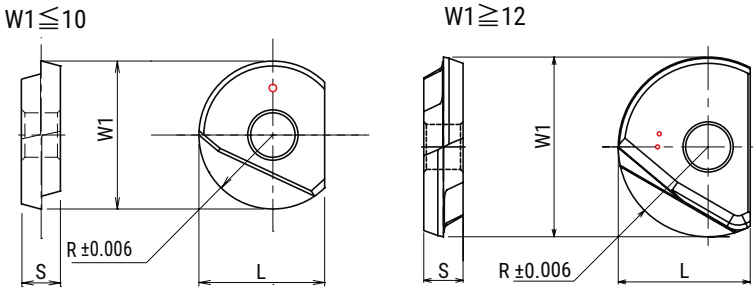
MIRROR BALL — BNM Type

■ BNM Type - Neutral style geometry (strictly for finishing applications)

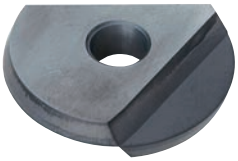
Radius accuracy ± 0.006 mm

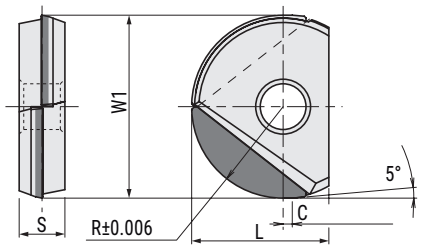


● DH111, JC10000, KT9



● CBN





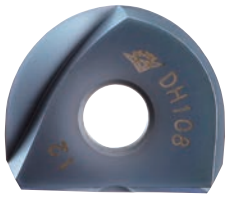
Cat.No.	PVD coating	CBN	DIAMMOND COATING	Uncoated	Dimensions (mm)				
	DH111	JBN245	JC10000	KT9	R	W1	L	C	S
BNM-060	●		●	●	3	6	5	-	2
BNM-070	●		●		3.5	7	5.5	-	2
BNM-080	●		●	●	4	8	7	-	2.4
BNM-100	●		●	●	5	10	8.5	-	2.6
BNM-110			●		5.5	11	9	-	2.6
BNM-120	●		●	●	6	12	10	-	3
BNM-160	●	●	●	●	8	16	12	0.8	4
BNM-200	●	●	●	●	10	20	15	1	5
BNM-250	●	●		●	12.5	25	18.5	1	6
BNM-300	●	●		●	15	30	22.5	1	7
BNM-320	●			●	16	32	23.5	-	7

MIRROR BALL — BNM Type

■ BNM-SS Type - Sharp helical geometry

(good for finishing and semi finishing general steel , mold steel & stainless steel)

Radius accuracy
± 0.006 mm



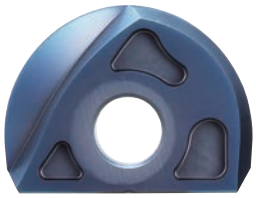


Fig 1

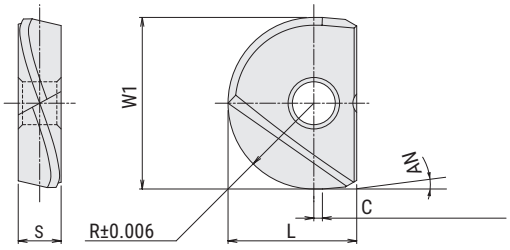
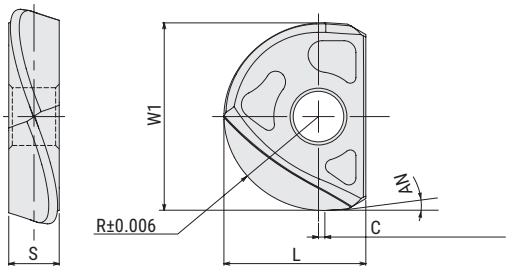


Fig 2



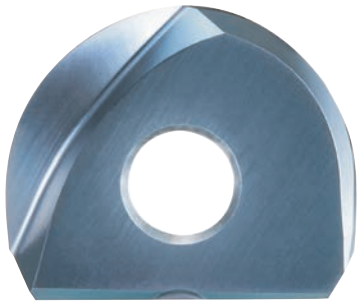
Cat.No.	PVD Coating		Dimensions(mm)						Fig.
	DH108	DS108	R	L	W1	S	C	AN	
BNM-060-SS	●	●	3	5	6	2	–	10°	1
BNM-080-SS	●	●	4	7	8	2.4	0.5	5°	
BNM-100-SS	●	●	5	8.5	10	2.6	1		
BNM-120-SS	●	●	6	10	12	3			
BNM-160-SS	●	●	8	12	16	4			
BNM-200-SS	●	●	10	15	20	5			2
BNM-250-SS	●	●	12.5	18.5	25	6			
BNM-300-SS	●	●	15	22.5	30	7			
BNM-320-SS	●	●	16	23.5	32				

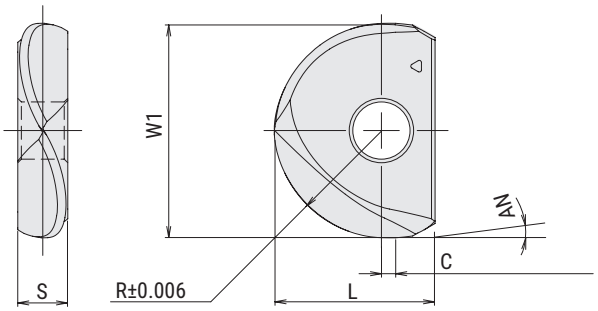
MIRROR BALL — BNM Type

■ BNM-TS Type - High Helix geometry

(good for semi-finishing & finishing hard materials up to 60HRC)

Radius accuracy
± 0.006 mm





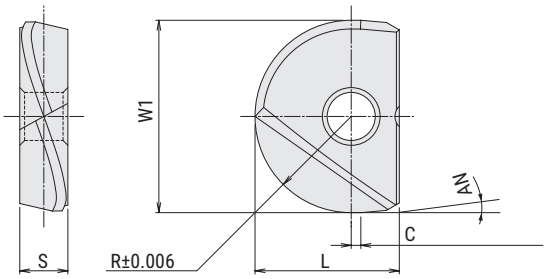
Cat.No.	PVD Coating	Dimensions(mm)					
	DH102	R	W1	L	S	C	AN
BNM-060-TS	●	3	6	5	2	–	10°
BNM-080-TS	●	4	8	7	2.4	0.5	5°
BNM-100-TS	●	5	10	8.5	2.6	1	
BNM-120-TS	●	6	12	10	3	1.5	
BNM-160-TS	●	8	16	12	4		
BNM-200-TS	●	10	20	15	5	2	
BNM-250-TS	●	12.5	25	18.5	6		
BNM-300-TS	●	15	30	22.5	7		
BNM-320-TS	●	16	32	23.5			

MIRROR BALL — BNM Type

■ BNM-S Type - Sharp helical geometry

(good for semi-finishing & finishing non-ferrous metals such as alminium, copper)

Radius accuracy ± 0.006 mm

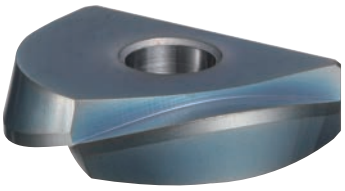


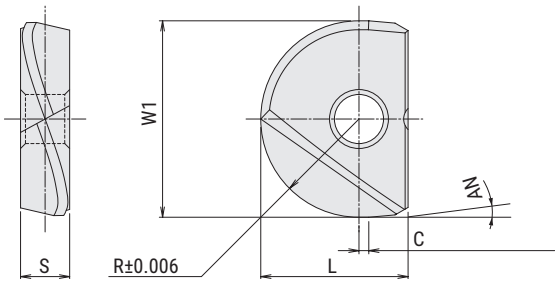
Cat.No.	Uncoated	DLC Coating	Dimensions (mm)					
	FZ05	JC20003	R	L	W1	S	C	AN
BNM-060-S	●		3	5	6	2	–	10°
		●						
BNM-080-S	●		4	7	8	2.4	0.5	5°
		●						
BNM-100-S	●		5	8.5	10	2.6	1	
		●						
BNM-120-S	●		6	10	12	3		
		●						
BNM-160-S	●		8	12	16	4		
		●						
BNM-200-S	●		10	15	20	5		
		●						
BNM-250-S	●		12.5	18.5	25	6		
		●						
BNM-300-S	●		15	22.5	30	7		
		●						

■ BNM-TG type - Helical geometry

(good for finishing hard material/weld up to 60 HRC)

Radius accuracy ± 0.006 mm





Cat.No.	PVD Coating	Dimensions(mm)					
	DH102	R	L	W1	S	C	AN
BNM-060-TG	●	3	5	6	2	–	10°
BNM-080-TG	●	4	7	8	2.4	0.5	5°
BNM-100-TG	●	5	8.5	10	2.6	1	
BNM-120-TG	●	6	10	12	3	1.5	
BNM-160-TG	●	8	12	16	4		
BNM-200-TG	●	10	15	20	5	2	
BNM-250-TG	●	12.5	18.5	25	6		
BNM-300-TG	●	15	22.5	30	7		
BNM-320-TG	●	16	32	32			

MIRROR BALL — BNM Type

■ Controlled Torque Wrenches (with replaceable blade)

Wrenches are pre-set to protect screws and bodies against damage during both the tightening and loosening process

● Controlled Torque Wrenches (with replaceable blade)

Cat. No.	Torque #	Screw torque	Replacement blade	Applicable inserts
TQC-06	T6	0.5Nm	B-06	BNM◯-06... RNM◯-06...
TQC-07	T7	0.9Nm	B-07	BNM◯-08... RNM◯-08...
TQC-08	T8	1.2Nm	B-08	BNM◯-10... RNM◯-10...
TQC-10	T10	2.0Nm	B-10	BNM◯-12... RNM◯-12...

● Replacement blade

Cat. No.	Torque #	Applicable wrench
B-06	T6	TQC-06
B-07	T7	TQC-07
B-08	T8	TQC-08
B-10	T10	TQC-10

★ Insert mounting information

1. Make sure the insert seat on body is carefully cleaned.
2. Make sure insert itself is clean, especially hole and face location.
3. Change insert screw when threads start to wear. (approximately every 10-15 inserts)
4. Do not over tighten screw, see table for torque specifications.

tool dia.(mm)	Tecommended torque
φDc	N·m
6	0.5
8	0.9
10	1.2
12	2.0
16	3.0
20	4.0
25	5.0
30	6.0
32	6.0

MIRROR BALL — BNM Type

■ Grade selection guide

Material	BNM					BNM-S		BNM -SS		BNM -TG	BNM -TS	GRM		
	DH103	DH111	JC10000	KT9	JBN245	FZ05	JC20003	DH108	DS108	DH102	DH102	JC8015	DH102	JBN245
Carbon steel (S50C, S55C) below 250HB	○	◎ ☆						◎				◎	○	
Cast steel (GM190, ICD5) below 285HB	○	◎ ☆						◎				◎	○	
Tool & die steel (SKD61, SKD11) below 255HB	○	◎ ☆						◎				◎	○	
Mold steel (HPM7, PX5, P20) 30-36 HRC	◎	○						◎				○	◎	
Mold steel (NAK80, HPM1, P21) 38-43HRC	◎	○						◎				○	◎	
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	◎	○						◎		○	○	○	◎	
Hardened die steel (SKD11, SLD, DC11) 55-62HRC								○		◎	◎		◎	
HSS (SKH, HAP) 63-70HRC										◎	◎		◎	
Grey cast iron (FC250) 160-260HB	◎	○			★			○		◎	◎	○	◎	★
Nodular cast iron (FCD700) 170-300HB	◎	○			★			○		◎	◎	○	◎	★
Austenitic stainless steel (SUS304, 316, 317) 17Cr	○	◎ ☆						◎	○			◎	○	
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	○	◎ ☆						◎	○			◎	○	
Alminium alloy (A5052) 160-260HB				◎		◎	◎							
Alminium alloy (A7075) 160-260HB				◎		◎	◎							
Alminium alloy Si below13%				◎		◎	◎							
Copper alloy (C1100)				◎		◎	◎							
Graphite			○				◎							
Titanium alloy (Ti-6Al-4V) 35-43HRC	○	◎ ☆						◎	◎			◎	○	
Heat resistant alloy (INCO718) 35-43HRC	○	◎ ☆						◎	◎			◎	○	

◎:First choice ○:Second choice ☆:Wet cutting ★:High speed cutting

MIRROR BALL — BNM Type

■ Recommended cutting conditions

Overhang length ℓ/Dc	n (min⁻¹)	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			6				8				10			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Cast steel (GM190, ICD5) below 285HB	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Tool & die steel (SKD61, SKD11) below 255HB	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Mold steel (HPM7, PX5, P20) 30-36 HRC	BNM BNM-SS	DH111 DH108	0.05	0.1	18,570	5,570	0.05	0.15	13,930	4,180	0.1	0.2	12,730	5,090
Mold steel (NAK80, HPM1, P21) 38-43HRC	BNM BNM-SS	DH111 DH108	0.05	0.1	15,920	3,180	0.05	0.15	11,940	2,390	0.1	0.2	11,140	3,340
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	BNM BNM-SS	DH103 DH108	0.05	0.1	13,260	2,650	0.05	0.15	9,950	1,990	0.1	0.2	9,550	2,870
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	BNM-TG BNM-TS	DH102	0.05	0.1	10,610	2,120	0.05	0.15	7,960	1,590	0.1	0.15	7,960	2,390
HSS (SKH, HAP) 63-70HRC	BNM-TG BNM-TS	DH102	0.05	0.05	7,960	1,590	0.05	0.1	5,970	1,190	0.05	0.1	6,370	1,270
Grey cast iron (FC250) 160-260HB	BNM BNM-TG BNM-TS	DH111 DH102	0.1	0.1	18,570	7,430	0.1	0.15	13,930	5,570	0.15	0.2	12,730	6,370
Nodular cast iron (FCD700) 170-300HB	BNM BNM-TG BNM-TS	DH111 DH102	0.1	0.1	18,570	7,430	0.1	0.15	13,930	5,570	0.15	0.2	12,730	6,370
Austenitic stainless steel (SUS304, 316, 317) 17Cr	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	BNM BNM-SS	DH111 DH108	0.1	0.1	18,570	5,570	0.1	0.15	13,930	4,180	0.15	0.2	12,730	5,090
Alminium alloy (A5052) 160-260HB	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.1	23,870	9,550	0.2	0.15	17,900	7,160	0.25	0.2	15,920	7,960
Alminium alloy (A7075) 160-260HB	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.1	23,870	9,550	0.2	0.15	17,900	7,160	0.25	0.2	15,920	7,960
Alminium alloy Si below13%	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.1	23,870	9,550	0.2	0.15	17,900	7,160	0.25	0.2	15,920	7,960
Copper alloy (C1100)	BNM BNM-S	KT9 FZ05 JC20003	0.15	0.1	23,870	9,550	0.15	0.15	17,900	7,160	0.2	0.2	15,920	7,960
Graphite	BNM BNM-S	JC10000 JC20003	0.15	0.1	23,870	9,550	0.15	0.15	17,900	7,160	0.2	0.2	15,920	7,960
Titanium alloy (Ti-6Al-4V) 35-43HRC	BNM BNM-SS	DH111 DS108	0.05	0.1	10,610	3,180	0.05	0.15	7,960	2,390	0.1	0.15	9,550	3,820
Heat resistant alloy (INCO718) 35-43HRC	BNM BNM-SS	DH111 DS108	0.05	0.1	7,960	1,590	0.05	0.1	5,970	1,190	0.1	0.1	6,370	1,910

Note
1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter ocurring, recommended to reduce ap or feed.
4. Use air blow.

MIRROR BALL — BNM Type

■ Recommended cutting conditions

Overhang length ℓ/Dc	n (min⁻¹)	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			12				16				20			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Cast steel (GM190, ICD5) below 285HB	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Tool & die steel (SKD61, SKD11) below 255HB	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Mold steel (HPM7, PX5, P20) 30-36 HRC	BNM BNM-SS	DH103 DH108	0.1	0.2	10,610	4,240	0.1	0.25	8,950	5,370	0.1	0.3	7,160	5,010
Mold steel (NAK80, HPM1, P21) 38-43HRC	BNM BNM-SS	DH103 DH108	0.1	0.2	9,280	2,780	0.1	0.25	7,960	3,980	0.1	0.3	6,370	3,820
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	BNM BNM-SS	DH103 DH108	0.1	0.2	7,960	2,390	0.1	0.25	6,960	3,480	0.1	0.3	5,570	3,340
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	BNM-TG BNM-TS	DH102	0.1	0.2	6,630	1,990	0.1	0.25	5,970	2,990	0.1	0.3	4,770	2,860
HSS (SKH, HAP) 63-70HRC	BNM-TG BNM-TS	DH102	0.05	0.1	5,310	1,060	0.05	0.1	4,970	1,490	0.05	0.15	3,980	1,190
Grey cast iron (FC250) 160-260HB	BNM BNM-TG BNM-TS	DH103 DH102	0.15	0.2	10,610	5,310	0.15	0.25	8,950	6,270	0.15	0.3	7,160	5,730
Nodular cast iron (FCD700) 170-300HB	BNM BNM-TG BNM-TS	DH103 DH102	0.15	0.2	10,610	5,310	0.15	0.25	8,950	6,270	0.15	0.3	7,160	5,730
Austenitic stainless steel (SUS304, 316, 317) 17Cr	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	BNM BNM-SS	DH111 DH108	0.15	0.2	10,610	4,240	0.15	0.25	8,950	5,370	0.15	0.3	7,160	5,010
Alminium alloy (A5052) 160-260HB	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.2	13,260	6,630	0.25	0.25	10,940	7,660	0.25	0.3	8,750	7,000
Alminium alloy (A7075) 160-260HB	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.2	13,260	6,630	0.25	0.25	10,940	7,660	0.25	0.3	8,750	7,000
Alminium alloy Si below13%	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.2	13,260	6,630	0.25	0.25	10,940	7,660	0.25	0.3	8,750	7,000
Copper alloy (C1100)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.2	13,260	6,630	0.2	0.25	10,940	7,660	0.2	0.3	8,750	7,000
Graphite	BNM BNM-S	JC10000 JC20003	0.2	0.2	13,260	6,630	0.2	0.25	10,940	7,660	0.2	0.3	8,750	7,000
Titanium alloy (Ti-6Al-4V) 35-43HRC	BNM BNM-SS	DH111 DS108	0.1	0.2	7,960	3,180	0.1	0.25	5,970	2,990	0.1	0.3	4,770	2,860
Heat resistant alloy (INCO718) 35-43HRC	BNM BNM-SS	DH111 DS108	0.1	0.1	5,310	1,590	0.1	0.1	4,970	1,990	0.1	0.15	3,980	1,590

Note
1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter ocurring, recommended to reduce ap or feed.
4. Use air blow.

MIRROR BALL — BNM Type

■ Recommended cutting conditions

Overhang length ℓ/Dc	n (min⁻¹)	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)											
			25				30				32			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Carbon steel (S50C, S55C) below 250HB	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Cast steel (GM190, ICD5) below 285HB	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Tool & die steel (SKD61, SKD11) below 255HB	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Mold steel (HPM7, PX5, P20) 30-36 HRC	BNM BNM-SS	DH103 DH108	0.1	0.4	6,370	4,460	0.1	0.5	5,310	3,720	0.1	0.5	4,970	3,480
Mold steel (NAK80, HPM1, P21) 38-43HRC	BNM BNM-SS	DH103 DH108	0.1	0.4	5,730	3,440	0.1	0.5	4,770	2,860	0.1	0.5	4,480	2,690
Hardened die steel (SKD61, DAC, DHA) 42-52HRC	BNM BNM-SS	DH103 DH108	0.1	0.4	5,090	3,050	0.1	0.5	4,240	2,540	0.1	0.5	3,980	2,390
Hardened die steel (SKD11, SLD, DC11) 55-62HRC	BNM-TG BNM-TS	DH102	0.1	0.4	4,460	2,680	0.1	0.5	3,710	2,230	0.1	0.5	3,480	2,090
HSS (SKH, HAP) 63-70HRC	BNM-TG BNM-TS	DH102	0.05	0.2	3,820	1,530	0.05	0.3	3,180	1,270	0.05	0.3	2,980	1,190
Grey cast iron (FC250) 160-260HB	BNM BNM-TG BNM-TS	DH103 DH102	0.15	0.4	6,370	5,100	0.15	0.5	5,310	4,250	0.15	0.5	4,970	3,980
Nodular cast iron (FCD700) 170-300HB	BNM BNM-TG BNM-TS	DH103 DH102	0.15	0.4	6,370	5,100	0.15	0.5	5,310	4,250	0.15	0.5	4,970	3,980
Austenitic stainless steel (SUS304, 316, 317) 17Cr	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Ferritic & martensitic stainless steel (SUS403, 420J2, 430) 13Cr	BNM BNM-SS	DH111 DH108	0.15	0.4	6,370	4,460	0.15	0.5	5,310	3,720	0.15	0.5	4,970	3,480
Alminium alloy (A5052) 160-260HB	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.4	7,640	6,110	0.25	0.5	6,370	5,100	0.25	0.5	5,970	4,780
Alminium alloy (A7075) 160-260HB	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.4	7,640	6,110	0.25	0.5	6,370	5,100	0.25	0.5	5,970	4,780
Alminium alloy Si below13%	BNM BNM-S	KT9 FZ05 JC20003	0.25	0.4	7,640	6,110	0.25	0.5	6,370	5,100	0.25	0.5	5,970	4,780
Copper alloy (C1100)	BNM BNM-S	KT9 FZ05 JC20003	0.2	0.4	7,640	6,110	0.2	0.5	6,370	5,100	0.2	0.5	5,970	4,780
Graphite	BNM BNM-S	JC10000 JC20003	0.2	0.4	7,640	6,110	0.2	0.5	6,370	5,100	0.2	0.5	5,970	4,780
Titanium alloy (Ti-6Al-4V) 35-43HRC	BNM BNM-SS	DH111 DS108	0.1	0.4	4,460	2,680	0.1	0.5	3,710	2,230	0.1	0.5	3,480	2,090
Heat resistant alloy (INCO718) 35-43HRC	BNM BNM-SS	DH111 DS108	0.1	0.2	3,820	1,530	0.1	0.3	3,180	1,270	0.1	0.3	2,980	1,190

Note
1. Please adjust cutting conditions according to machine rigidity or work rigidity.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. In case of chatter ocurring, recommended to reduce ap or feed.
4. Use air blow.

MIRROR BALL — BNM Type

■ Recommended cutting conditions

Overhang length ℓ/Dc	n (min⁻¹)	Vf (mm/min)
~3Dc	100%	100%
3Dc~5Dc	70%	70%
5Dc~10Dc	50%	50%

Material	Cat.No.	Grade	Tool dia.(mm)							
			16				20			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Grey cast iron (FC250) 160-260HB	BNM	JBN245	0.05	0.25	23,870	11,940	0.05	0.3	19,100	11,460
Nodular cast iron (FCD700) 170-300HB	BNM	JBN245	0.05	0.25	19,890	7,960	0.05	0.3	15,920	7,960

Material	Cat.No.	Grade	Tool dia.(mm)							
			25				30			
			ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)	ap (mm)	ae (mm)	n (min⁻¹)	Vf (mm/min)
Grey cast iron (FC250) 160-260HB	BNM	JBN245	0.05	0.4	15,280	9,170	0.05	0.5	12,730	8,910
Nodular cast iron (FCD700) 170-300HB	BNM	JBN245	0.05	0.4	12,730	6,370	0.05	0.5	10,610	6,370

Note
1. These cutting conditions represent on high speed machine.
2. These cutting conditions represent stable machining at length 3 x Dc. please adjust cutting conditions according to overhang length.
3. Use carbide shank holder.
4. For better surface finish , mist coolant is recommended.
5. Plunging is not recommended.
6. Please keep the stock uniform by pre-machining.