B179E

DF

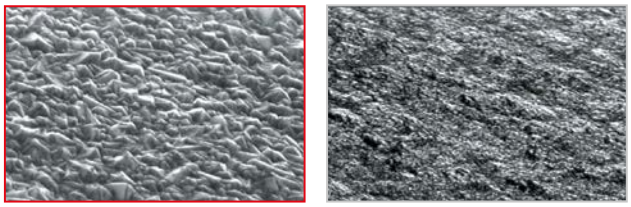
HIGH PRECISION END MILLS FOR OUTSTANDING TOOL LIFE AND EXCELLENT SURFACE FINISHES

MITSUBISHI MATERIALS

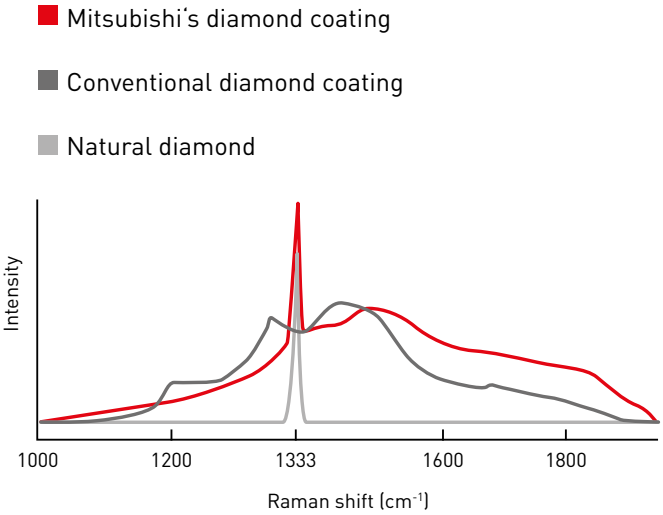
DIAMOND COATED END MILLS FOR GRAPHITE AND NON FERROUS METALS

CRYSTALLIZED DIAMOND COATING

The diamond coating is firmly bound to the substrate to ensure long tool life and prevent peeling.



RAMAN SPECTROSCOPY

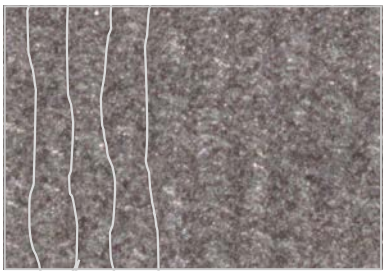


DF2XLBF	Ball nose, 2 flute, Long neck, for finishing	RE0.3×10	– RE1.5×20mm	
DF2XLB	Ball nose, 2 flute, Long neck	RE0.1×0.5	– RE3×12mm	
DF2MB	Ball nose, Medium cut length, 2 flute	RE3×100	– RE6×200mm	
DF3XB	Ball nose, 3 flute, Taper neck	RE1×0.5°×30	– RE2×0.5°×100mm	
DFPSRB	Corner radius end mill, Short cut length, 2-4 flute, High precision	Ø0.5×RE0.1×4	– Ø12×RE0.5×40mm	
DF4JC	End mill, Semi long cut length, 4 flute	Ø3	– Ø12mm	
DF4XL	End mill, Long neck, 4 flute	Ø1×6	– Ø12×30mm	

DF2XLBF

SURFACE COMPARISON (GRAPHITE ISO-63)

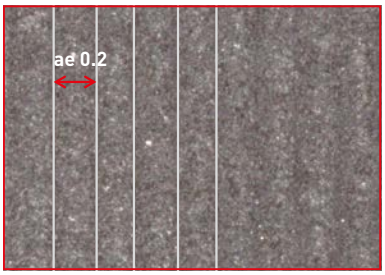
Conventional



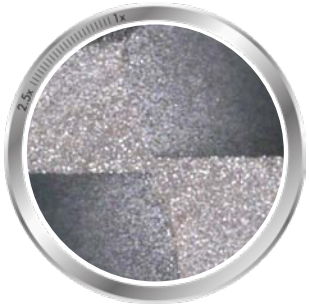
Poor sharpness can cause tool deflection and the cutter path to wander.

Feed Direction

DF2XLBF



Optimised geometry and sharp cutting edge provides superior surface finishes.



End Cutting Edge Geometry

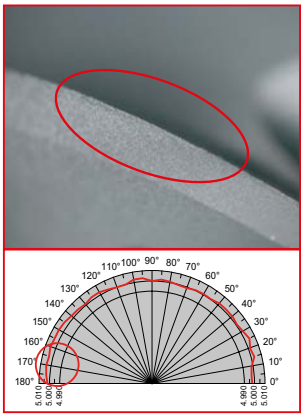
The combination of an optimised cutting edge and the diamond coating greatly enhances cutting performance. Excellent surface finishes on graphite can be achieved.

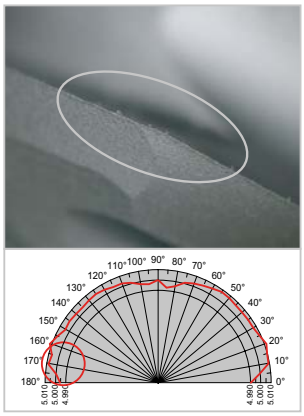
Crystallized Diamond Coating

Optimization of the coating film provides even higher sharpness.

Seamless Cutting Edge

Outstanding finishes are possible even when machining wall surfaces due to the seamless edge geometry.





DF2XLBF

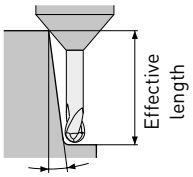
BALL NOSE, MEDIUM CUT LENGTH, 2 FLUTE, LONG NECK, FOR FINISHING

X N

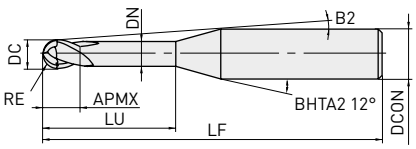
0.3<RE<1	1.5<RE
±0.005	±0.01

DCON=4

h5 0 / - 0.008



Type1



Diamond coated long-neck ball end mills are ideal for excellent surface finishes on non-ferrous materials.

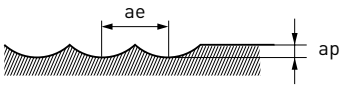
Order Number	RE	DC	APMX	LU	DN	B2	LF	DCON	Effective length for inclined angle				Flutes	Stock	Type
									30'	1°	2°	3°			
DF2XLBFR0030N100	0.3	0.6	0.45	10	0.57	5.5°	50	4	10.4	10.9	11.9	13.2	2	●	1
DF2XLBFR0050N120	0.5	1	1.5	12	0.86	4.6°	50	4	12.6	13.2	14.4	15.9	2	●	1
DF2XLBFR0050N160	0.5	1	1.5	16	0.86	3.8°	50	4	16.8	17.5	19.2	21.3	2	●	1
DF2XLBFR0050N200	0.5	1	1.5	20	0.86	3.2°	50	4	21	21.9	24	26.6	2	●	1
DF2XLBFR0100N160	1	2	3	16	1.86	2.9°	50	4	16.7	17.4	19	*	2	●	1
DF2XLBFR0100N200	1	2	3	20	1.86	2.4°	50	4	20.9	21.8	23.9	*	2	●	1
DF2XLBFR0150N160	1.5	3	4.5	16	2.86	1.7°	50	4	16.7	17.3	18.9	20.8	2	●	1
DF2XLBFR0150N200	1.5	3	4.5	20	2.86	1.4°	50	4	20.8	21.7	23.7	26.1	2	●	1

* No interference

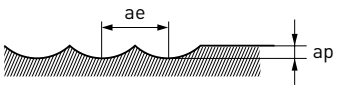
● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

		X							
Work Material		**Graphite**				**Zirconia (Before Sintering)**			
RE (mm)	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
R0.3	10	35000	1000	0.05	0.015	26000	600	0.06	0.03
R0.5	12	40000	2000	0.10	0.200	26000	600	0.10	0.05
	16	35000	1500	0.09	0.200	26000	600	0.08	0.04
	20	30000	1100	0.08	0.200	26000	600	0.08	0.04
R1	16	30000	2000	0.20	0.500	18000	1400	0.06	0.80
	20	30000	2000	0.20	0.500	18000	1200	0.50	0.60
R1.5	16	28000	3000	0.30	0.900	15000	1600	0.90	0.90
	20	25000	2500	0.20	0.900	15000	1400	0.60	0.80



		X				N			
Work Material		**Rigid Composite Resin (Composite Resin)**				**Copper, Copper Alloys**			
RE (mm)	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
R0.3	10	28000	450	0.050	0.050	30000	600	0.005	0.040
R0.5	12	25000	900	0.100	0.100	33000	1400	0.010	0.100
	16	25000	700	0.080	0.080	25000	800	0.007	0.080
	20	25000	600	0.080	0.080	20000	500	0.005	0.050
R1	16	25000	2100	0.800	0.800	30000	1800	0.050	0.200
	20	25000	1800	0.500	0.500	20000	1200	0.040	0.200
R1.5	16	25000	2400	1.000	1.000	28000	3000	0.300	0.300
	20	25000	2100	0.800	0.800	25000	2500	0.200	0.300



When high machining accuracy is needed, or the work materials becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.
When dry machining work materials that contain resin, beware build up of chips that may cause breakage.

DF2XLB

BALL NOSE, 2 FLUTE, LONG NECK, FOR GRAPHITE

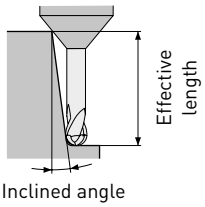
X N

0.1≤RE≤3

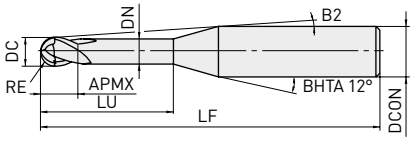
±0.01

DCON=4,6

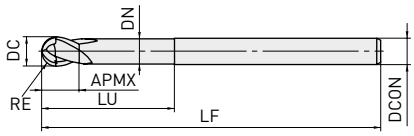
0
- 0.008



Type1



Type2



2 flute long neck ball nose end mill with original diamond coating for graphite machining.

Order Number	RE	DC	APMX	LU	DN	B2	LF	DCON	Effective length for inclined angle				Flutes	Stock	Type
									30'	1°	2°	3°			
DF2XLBR0010N005	0.1	0.2	0.2	0.5	0.18	11.5°	50	4	0.5	0.5	0.6	0.7	2	●	1
DF2XLBR0015N020	0.15	0.3	0.3	2	0.27	9.9°	50	4	2.1	2.2	2.4	2.6	2	●	1
DF2XLBR0015N030	0.15	0.3	0.3	3	0.27	9.1°	50	4	3.1	3.2	3.6	3.9	2	●	1
DF2XLBR0020N010	0.2	0.4	0.6	1	0.36	11.0°	50	4	1.0	1.0	1.1	1.2	2	●	1
DF2XLBR0020N020	0.2	0.4	0.6	2	0.36	10.0°	50	4	2.0	2.1	2.3	2.6	2	●	1
DF2XLBR0020N030	0.2	0.4	0.6	3	0.36	9.1°	50	4	3.1	3.2	3.5	3.9	2	●	1
DF2XLBR0020N040	0.2	0.4	0.6	4	0.36	8.4°	60	4	4.1	4.3	4.7	5.2	2	●	1
DF2XLBR0020N080	0.2	0.4	0.6	8	0.36	6.4°	60	4	8.3	8.7	9.5	10.5	2	●	1
DF2XLBR0020N120	0.2	0.4	0.6	12	0.36	5.1°	60	4	12.5	13.0	14.3	15.8	2	●	1
DF2XLBR0025N040	0.25	0.5	0.6	4	0.46	8.3°	60	4	4.1	4.3	4.7	5.2	2	●	1
DF2XLBR0025N050	0.25	0.5	0.6	5	0.46	7.7°	60	4	5.2	5.4	5.9	6.5	2	●	1
DF2XLBR0025N080	0.25	0.5	0.6	8	0.46	6.3°	60	4	8.3	8.7	9.5	10.5	2	●	1
DF2XLBR0030N020	0.3	0.6	0.9	2	0.56	9.9°	60	4	2.1	2.2	2.4	2.6	2	●	1
DF2XLBR0030N040	0.3	0.6	0.9	4	0.56	8.3°	60	4	4.2	4.4	4.8	5.2	2	●	1
DF2XLBR0030N050	0.3	0.6	0.9	5	0.56	7.6°	60	4	5.2	5.4	6.0	6.6	2	●	1
DF2XLBR0030N060	0.3	0.6	0.9	6	0.56	7.1°	60	4	6.3	6.5	7.1	7.9	2	●	1
DF2XLBR0030N080	0.3	0.6	0.9	8	0.56	6.2°	60	4	8.3	8.7	9.5	10.6	2	●	1
DF2XLBR0030N100	0.3	0.6	0.9	10	0.56	5.5°	60	4	10.4	10.9	11.9	13.2	2	●	1
DF2XLBR0030N160	0.3	0.6	0.9	16	0.56	4.1°	60	4	16.7	17.4	19.1	21.2	2	●	1
DF2XLBR0040N060	0.4	0.8	1.2	6	0.76	7.0°	60	4	6.3	6.5	7.1	7.9	2	●	1
DF2XLBR0040N080	0.4	0.8	1.2	8	0.76	6.1°	60	4	8.3	8.7	9.5	10.5	2	●	1
DF2XLBR0050N040	0.5	1	1.5	4	0.94	8.0°	60	4	4.2	4.4	4.8	5.3	2	●	1
DF2XLBR0050N060	0.5	1	1.5	6	0.94	6.8°	60	4	6.3	6.6	7.2	8.0	2	●	1
DF2XLBR0050N080	0.5	1	1.5	8	0.94	5.9°	60	4	8.4	8.8	9.6	10.6	2	●	1
DF2XLBR0050N100	0.5	1	1.5	10	0.94	5.2°	60	4	10.5	11.0	12.0	13.3	2	●	1
DF2XLBR0050N120	0.5	1	1.5	12	0.94	4.6°	60	4	12.6	13.2	14.4	15.9	2	●	1
DF2XLBR0050N160	0.5	1	1.5	16	0.94	3.8°	80	4	16.8	17.5	19.2	21.3	2	●	1
DF2XLBR0050N200	0.5	1	1.5	20	0.94	3.3°	80	4	21.0	21.9	24.0	26.6	2	●	1
DF2XLBR0050N300	0.5	1	1.5	30	0.94	2.4°	80	4	31.4	32.8	36.0	*	2	●	1
DF2XLBR0050N400	0.5	1	1.5	40	0.94	1.9°	80	4	41.8	43.7	*	*	2	●	1

* No interference

● : Inventory maintained. ★ : Inventory maintained in Japan.

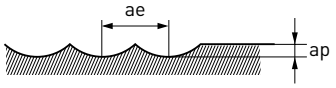
Order Number	RE	DC	APMX	LU	DN	B2	LF	DCON	Effective length for inclined angle				Flutes	Stock	Type
									30'	1°	2°	3°			
DF2XLBR0075N080	0.75	1.5	2.3	8	1.44	5.4°	60	4	8.4	8.8	9.6	10.6	2	●	1
DF2XLBR0075N100	0.75	1.5	2.3	10	1.44	4.7°	60	4	10.5	11.0	12.0	13.2	2	●	1
DF2XLBR0075N160	0.75	1.5	2.3	16	1.44	3.4°	80	4	16.8	17.5	19.2	21.2	2	●	1
DF2XLBR0075N200	0.75	1.5	2.3	20	1.44	2.8°	80	4	21.0	21.9	23.9	26.5	2	●	1
DF2XLBR0075N300	0.75	1.5	2.3	30	1.44	2.1°	80	4	31.4	32.8	35.9	*	2	●	1
DF2XLBR0075N400	0.75	1.5	2.3	40	1.44	1.6°	80	4	41.8	43.7	*	*	2	●	1
DF2XLBR0100N080	1	2	3	8	1.9	4.9°	60	4	8.3	8.7	9.4	10.4	2	●	1
DF2XLBR0100N100	1	2	3	10	1.9	4.2°	60	4	10.4	10.9	11.8	13.0	2	●	1
DF2XLBR0100N120	1	2	3	12	1.9	3.7°	60	4	12.5	13.0	14.2	15.7	2	●	1
DF2XLBR0100N160	1	2	3	16	1.9	2.9°	80	4	16.7	17.4	19.0	*	2	●	1
DF2XLBR0100N200	1	2	3	20	1.9	2.5°	80	4	20.9	21.8	23.8	*	2	●	1
DF2XLBR0100N250	1	2	3	25	1.9	2.0°	80	4	26.1	27.2	*	*	2	●	1
DF2XLBR0100N400	1	2	3	40	1.9	1.4°	100	4	41.7	43.5	*	*	2	●	1
DF2XLBR0100N600	1	2	3	60	1.9	0.9°	100	4	62.6	*	*	*	2	●	1
DF2XLBR0150N160	1.5	3	4.5	16	2.9	1.7°	80	4	16.7	17.3	*	*	2	●	1
DF2XLBR0150N250	1.5	3	4.5	25	2.9	1.2°	80	4	26.1	27.2	*	*	2	●	1
DF2XLBR0150N400	1.5	3	4.5	40	2.9	0.7°	100	4	41.7	*	*	*	2	●	1
DF2XLBR0150N600	1.5	3	4.5	60	2.9	0.5°	100	4	*	*	*	*	2	●	1
DF2XLBR0200N080	2	4	6	8	3.9	—	80	4	*	*	*	*	2	●	2
DF2XLBR0200N200	2	4	6	20	3.9	—	80	4	*	*	*	*	2	●	2
DF2XLBR0200N300	2	4	6	30	3.9	—	80	4	*	*	*	*	2	●	2
DF2XLBR0200N400	2	4	6	40	3.9	—	100	4	*	*	*	*	2	●	2
DF2XLBR0200N600	2	4	6	60	3.9	—	100	4	*	*	*	*	2	●	2
DF2XLBR0300N120	3	6	9	12	5.85	—	100	6	*	*	*	*	2	●	2

* No interference

DF2XLB

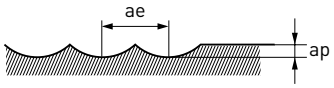
RECOMMENDED CUTTING CONDITIONS

		X				N			
Work material		**Graphite**				**Copper, Copper alloys**			
RE (mm)	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
R0.1	0.5	40000	800	0.01	0.03	40000	800	0.003	0.02
R0.15	2	40000	1200	0.03	0.08	40000	800	0.003	0.03
	3	40000	1200	0.03	0.08	40000	600	0.002	0.03
R0.2	1	40000	1500	0.05	0.15	40000	2000	0.015	0.04
	2	40000	1500	0.05	0.12	40000	1300	0.01	0.04
	3	40000	1300	0.04	0.12	40000	800	0.005	0.04
	4	40000	1300	0.04	0.1	32000	600	0.004	0.04
	8	30000	800	0.03	0.1	—	—	—	—
	12	20000	450	0.03	0.08	—	—	—	—
R0.25	4	40000	1500	0.05	0.15	40000	800	0.01	0.05
	5	38000	1300	0.05	0.15	36000	700	0.008	0.05
	8	30000	1000	0.04	0.12	28000	500	0.002	0.05
R0.3	2	40000	1800	0.07	0.2	40000	1500	0.03	0.06
	4	40000	1500	0.06	0.18	40000	1200	0.02	0.06
	5	40000	1500	0.06	0.17	40000	1100	0.015	0.06
	6	40000	1500	0.06	0.15	40000	1000	0.008	0.06
	8	37000	1200	0.05	0.15	35000	800	0.005	0.06
	10	35000	1000	0.05	0.15	—	—	—	—
	16	22000	530	0.04	0.12	—	—	—	—
R0.4	6	40000	1700	0.08	0.2	40000	1500	0.02	0.08
	8	40000	1700	0.08	0.15	30000	1200	0.008	0.08
R0.5	4	40000	2500	0.12	0.3	40000	2000	0.05	0.1
	6	40000	2500	0.1	0.3	40000	2000	0.03	0.1
	8	40000	2000	0.1	0.25	40000	1800	0.02	0.1
	10	40000	2000	0.1	0.2	33000	1400	0.01	0.1
	12	40000	2000	0.1	0.2	30000	1000	0.007	0.1
	20	30000	1100	0.08	0.2	—	—	—	—
	30	20000	600	0.06	0.15	—	—	—	—
	40	15000	400	0.04	0.12	—	—	—	—



When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine dedicated for graphite.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

		X				N			
Work material		**Graphite**				**Copper, Copper alloys**			
RE (mm)	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
R0.75	8	40000	2800	0.15	0.45	40000	2400	0.07	0.15
	10	40000	2800	0.15	0.45	32000	1800	0.05	0.15
	16	35000	2000	0.15	0.3	20000	900	0.03	0.15
	30	27000	1000	0.1	0.3	—	—	—	—
	40	21000	700	0.08	0.25	—	—	—	—
R1	8	40000	3000	0.23	0.7	40000	3000	0.1	0.2
	10	40000	3000	0.2	0.6	40000	2800	0.08	0.2
	12	35000	2500	0.2	0.6	35000	2300	0.08	0.2
	16	30000	2000	0.2	0.5	30000	1800	0.05	0.2
	20	30000	2000	0.2	0.5	20000	1200	0.04	0.2
	25	25000	1500	0.18	0.45	20000	1000	0.03	0.2
	40	20000	1000	0.15	0.4	—	—	—	—
	60	15000	500	0.1	0.3	—	—	—	—
R1.5	16	28000	3000	0.3	0.9	28000	3000	0.3	0.3
	25	20000	2000	0.25	0.75	20000	2000	0.25	0.3
	40	16000	1500	0.2	0.6	16000	1500	0.2	0.3
	60	14000	1000	0.17	0.45	—	—	—	—
R2	8	24000	3800	0.5	1.5	24000	3800	0.5	0.4
	20	21000	3300	0.5	1.5	21000	3300	0.4	0.4
	30	15000	2000	0.4	1.2	15000	2000	0.3	0.4
	40	13000	1600	0.35	1.0	13000	1600	0.25	0.4
	60	12000	1400	0.3	0.9	12000	1400	0.2	0.4
R3	12	17000	2800	0.6	2.0	17000	2800	0.6	0.6



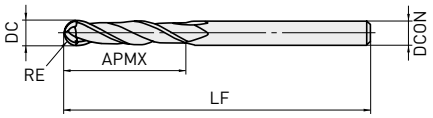
When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DF2MB

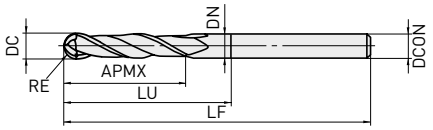
BALL NOSE, MEDIUM CUT LENGTH, 2 FLUTE, FOR GRAPHITE

X N

Type1



Type2



3≤RE≤6

±0.01

h6

DCON=6	8≤DCON≤10	DCON=12
0 - 0.008	0 - 0.009	0 - 0.011

2 flute ball nose end mill with original diamond coating for graphite machining.

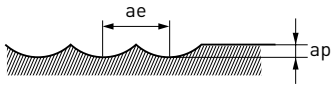
Order Number	RE	DC	APMX	LU	DN	LF	DCON	Flutes	Stock	Type
DF2MBR0300	3	6	30	—	—	100	6	2	★	1
DF2MBR0300A100	3	6	30	50	5.85	100	6	2	●	2
DF2MBR0300A150	3	6	30	50	5.85	150	6	2	●	2
DF2MBR0300N100A150	3	6	30	100	5.85	150	6	2	★	2
DF2MBR0400A110	4	8	40	60	7.85	110	8	2	●	2
DF2MBR0400A150	4	8	40	60	7.85	150	8	2	●	2
DF2MBR0500A120	5	10	50	70	9.7	120	10	2	●	2
DF2MBR0500A180	5	10	50	70	9.7	180	10	2	●	2
DF2MBR0500N140A180	5	10	50	140	9.7	180	10	2	★	2
DF2MBR0600A130	6	12	55	75	11.7	130	12	2	●	2
DF2MBR0600A200	6	12	55	75	11.7	200	12	2	●	2
DF2MBR0600N150A200	6	12	55	150	11.7	200	12	2	★	2

(Effective Coating Length : 1-1.5DC)

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

		X				N			
Work material		**Graphite**				**Copper, Copper alloys**			
RE (mm)	**OAL (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
R3	100	16000	1900	0.6	1.5	16000	1500	0.6	1.5
	150	12000	1200	0.4	1.2	12000	960	0.4	1.2
R4	110	12000	2000	0.8	2.0	12000	1600	0.8	2.0
	150	9200	1400	0.6	1.6	9200	1100	0.6	1.6
R5	120	9500	2200	1.0	2.5	9500	1800	1.0	2.5
	180	7300	1500	0.8	2.0	7300	1200	0.8	2.0
R6	130	8000	1800	1.2	3.0	8000	1400	1.2	3.0
	200	6100	1200	1.0	2.5	6100	960	1.0	2.5

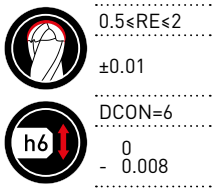


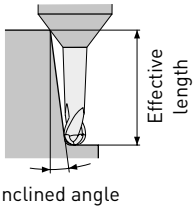
When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

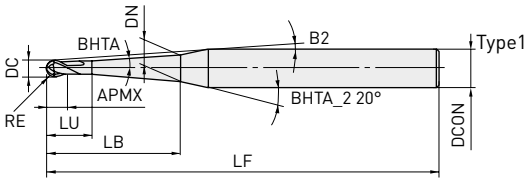
DF3XB

BALL NOSE, 3 FLUTE, TAPER NECK, FOR GRAPHITE

X N







3 flute taper neck ball nose end mill with original diamond coating for graphite machining.

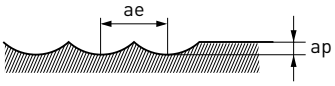
Order Number	RE	DC	APMX	LU	BHTA	LB	B2	DN	LF	DCON	Effective length for inclined angle				Flutes	Stock	Type
											30'	1°	2°	3°			
DF3XBR0050L030	0.5	1	1.5	3	0.5°	30	4°	1.42	100	6	30.4	32.1	32.8	34.6	3	●	1
DF3XBR0050L040	0.5	1	1.5	3	0.5°	40	3.2°	1.60	100	6	40.4	41.4	43.6	46.0	3	●	1
DF3XBR0050L050	0.5	1	1.5	3	0.5°	50	2.6°	1.77	100	6	50.4	51.7	54.4	*	3	●	1
DF3XBR0100L040	1	2	3	5	0.5°	40	2.6°	2.52	100	6	40.7	41.7	43.9	*	3	●	1
DF3XBR0100L060	1	2	3	5	0.5°	60	1.8°	2.86	130	6	60.7	62.2	*	*	3	●	1
DF3XBR0100L080	1	2	3	5	0.5°	80	1.4°	3.21	130	6	80.7	82.7	*	*	3	●	1
DF3XBR0150L060	1.5	3	4.5	7.5	0.5°	60	1.4°	3.82	130	6	60.8	62.2	*	*	3	●	1
DF3XBR0150L080	1.5	3	4.5	7.5	0.5°	80	1.1°	4.17	130	6	80.8	82.8	*	*	3	●	1
DF3XBR0200L100	2	4	6	9	0.5°	100	0.6°	5.49	160	6	100.8	*	*	*	3	●	1

* No interference

● : Inventory maintained. ★ : Inventory maintained in Japan.

RECOMMENDED CUTTING CONDITIONS

		X				N			
Work material		**Graphite**				**Copper, Copper alloys**			
RE (mm)	**LB (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
R0.5	30	20000	1100	0.05	0.13	16000	700	0.04	0.13
	40	15000	750	0.04	0.11	12000	480	0.03	0.11
	50	12000	500	0.03	0.10	9600	320	0.02	0.10
R1	40	20000	1800	0.13	0.40	16000	1100	0.10	0.40
	60	15000	900	0.09	0.27	12000	580	0.07	0.27
	80	12000	600	0.07	0.20	9600	380	0.06	0.20
R1.5	60	14000	1700	0.15	0.45	11000	1100	0.12	0.45
	80	12000	1200	0.12	0.35	9600	770	0.10	0.35
R2	100	10000	1100	0.20	0.50	8000	700	0.16	0.50



When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DFPSRB

CORNER RADIUS END MILL, SHORT CUT LENGTH, 2-4 FLUTE, HIGH PRECISION, FOR GRAPHITE

X N

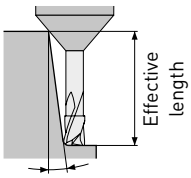
0.1≤RE≤1

±0.01

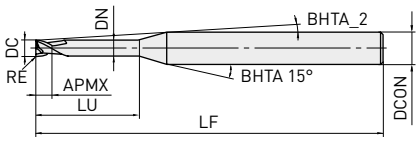
0.5≤DC≤12

0
- 0.02

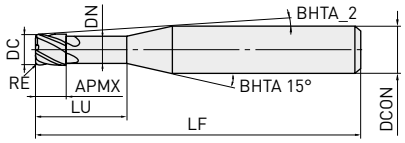
4≤DCON≤6	8≤DCON≤10	DCON=12
0 - 0.008	0 - 0.009	0 - 0.011



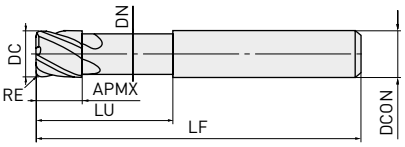
Type1



Type2



Type3



±0.01mm corner radius tolerance, 0—-0.02mm outer diameter tolerance.
Corner radius end mill with original diamond coating for precise and efficient graphite machining.

Order Number	RE	DC	APMX	LU	DN	BHTA_2	LF	DCON	Effective length for inclined angle				Flutes	Stock	Type
									30'	1°	2°	3°			
DFPSRBD0050R010N04	0.1	0.5	0.75	4	0.46	9.5°	60	4	4.1	4.3	4.6	5.0	2	●	1
DFPSRBD0050R010N05	0.1	0.5	0.75	5	0.46	8.7°	60	4	5.2	5.4	5.7	6.2	2	●	1
DFPSRBD0050R010N06	0.1	0.5	0.75	6	0.46	8.0°	60	4	6.2	6.4	6.9	7.5	2	●	1
DFPSRBD0050R010N10	0.1	0.5	0.75	10	0.46	6.1°	60	4	10.3	10.7	11.5	12.4	2	●	1
DFPSRBD0050R010N15	0.1	0.5	0.75	15	0.46	4.7°	60	4	15.5	16.0	17.2	18.6	2	●	1
DFPSRBD0080R010N06	0.1	0.8	1	6	0.76	7.7°	60	4	6.2	6.4	6.9	7.5	2	●	1
DFPSRBD0080R010N08	0.1	0.8	1	8	0.76	6.6°	60	4	8.3	8.6	9.2	9.9	2	●	1
DFPSRBD0100R010N08	0.1	1	1.5	8	0.94	6.3°	60	4	8.5	8.8	9.5	10.2	2	●	1
DFPSRBD0100R010N12	0.1	1	1.5	12	0.94	4.9°	60	4	12.6	13.1	14.1	15.2	2	●	1
DFPSRBD0100R020N08	0.2	1	1.5	8	0.94	6.3°	60	4	8.5	8.8	9.5	10.2	2	●	1
DFPSRBD0100R020N12	0.2	1	1.5	12	0.94	4.9°	60	4	12.6	13.1	14.1	15.2	2	●	1
DFPSRBD0100R020N16	0.2	1	1.5	16	0.94	4.0°	70	4	16.8	17.4	18.7	20.2	2	●	1
DFPSRBD0100R020N20	0.2	1	1.5	20	0.94	3.4°	70	4	20.9	21.7	23.3	25.1	2	●	1
DFPSRBD0100R020N30	0.2	1	1.5	30	0.94	2.5°	70	4	31.3	32.4	34.8	*	2	●	1
DFPSRBD0150R020N10	0.2	1.5	2.3	10	1.44	4.9°	70	4	10.5	11.0	11.8	12.7	2	●	1
DFPSRBD0150R020N20	0.2	1.5	2.3	20	1.44	2.9°	70	4	20.9	21.7	23.3	*	2	●	1
DFPSRBD0200R010N08	0.1	2	3	8	1.9	4.9°	70	4	8.4	8.7	9.4	10.1	4	●	2
DFPSRBD0200R020N12	0.2	2	3	12	1.9	3.7°	70	4	12.5	13.0	14.0	15.1	4	●	2
DFPSRBD0200R020N16	0.2	2	3	16	1.9	2.9°	70	4	16.7	17.3	18.6	*	4	●	2
DFPSRBD0200R020N20	0.2	2	3	20	1.9	2.5°	80	4	20.8	21.5	23.2	*	4	●	2
DFPSRBD0200R020N30	0.2	2	3	30	1.9	1.7°	80	4	31.2	32.2	*	*	4	●	2
DFPSRBD0200R020N40	0.2	2	3	40	1.9	1.4°	80	4	41.5	42.9	*	*	4	●	2
DFPSRBD0200R030N08	0.3	2	3	8	1.9	5.0°	70	4	8.4	8.7	9.3	10.1	4	●	2
DFPSRBD0300R020N20	0.2	3	4.5	20	2.9	1.4°	80	4	20.8	21.5	*	*	4	●	2
DFPSRBD0300R020N40	0.2	3	4.5	40	2.9	0.7°	80	4	41.5	*	*	*	4	●	2
DFPSRBD0300R030N12	0.3	3	4.5	12	2.9	2.1°	80	4	12.5	13.0	13.9	*	4	●	2
DFPSRBD0300R050N20	0.5	3	4.5	20	2.9	1.4°	80	4	20.8	21.5	*	*	4	●	2

* No interference

● : Inventory maintained. ★ : Inventory maintained in Japan.

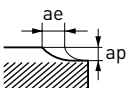
Order Number	RE	DC	APMX	LU	DN	BHTA_2	LF	DCON	Effective length for inclined angle				Flutes	Stock	Type
									30'	1°	2°	3°			
DFPSRBD0400R020N20	0.2	4	6	20	3.9	—	80	4	*	*	*	*	4	●	3
DFPSRBD0400R020N40	0.2	4	6	40	3.9	—	80	4	*	*	*	*	4	●	3
DFPSRBD0400R050N20	0.5	4	6	20	3.9	—	80	4	*	*	*	*	4	●	3
DFPSRBD0400R050N40	0.5	4	6	40	3.9	—	80	4	*	*	*	*	4	●	3
DFPSRBD0600R010N24	0.1	6	9	24	5.85	—	90	6	*	*	*	*	4	●	3
DFPSRBD0600R030N24	0.3	6	9	24	5.85	—	90	6	*	*	*	*	4	●	3
DFPSRBD0600R050N24	0.5	6	9	24	5.85	—	90	6	*	*	*	*	4	●	3
DFPSRBD0600R050N30	0.5	6	9	30	5.85	—	90	6	*	*	*	*	4	●	3
DFPSRBD0600R100N30	1	6	9	30	5.85	—	90	6	*	*	*	*	4	●	3
DFPSRBD0800R050N30	0.5	8	12	30	7.85	—	90	8	*	*	*	*	4	●	3
DFPSRBD0800R100N30	1	8	12	30	7.85	—	90	8	*	*	*	*	4	●	3
DFPSRBD1000R050N40	0.5	10	15	40	9.7	—	130	10	*	*	*	*	4	●	3
DFPSRBD1000R100N40	1	10	15	40	9.7	—	130	10	*	*	*	*	4	●	3
DFPSRBD1200R050N40	0.5	12	18	40	11.7	—	130	12	*	*	*	*	4	●	3

* No interference

DFPSRB

RECOMMENDED CUTTING CONDITIONS

			X				N			
Work material			**Graphite**				**Copper, Copper alloys**			
DC (mm)	**RE (mm)**	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
0.5	0.1	4	30000	1100	0.05	0.23	24000	700	0.04	0.23
	0.1	5	28000	960	0.05	0.23	22000	600	0.04	0.23
	0.1	6	25000	850	0.05	0.23	20000	540	0.04	0.23
	0.1	10	22000	600	0.04	0.21	—	—	—	—
	0.1	15	20000	500	0.03	0.18	—	—	—	—
0.8	0.1	6	28000	1300	0.08	0.45	22000	830	0.06	0.45
	0.1	8	22000	900	0.08	0.45	18000	580	0.06	0.45
1	0.1	8	25000	1500	0.1	0.6	20000	960	0.08	0.6
	0.1	12	22000	1300	0.1	0.6	18000	830	0.08	0.6
	0.2	8	25000	1500	0.1	0.45	20000	960	0.08	0.45
	0.2	12	22000	1300	0.1	0.45	18000	830	0.08	0.45
	0.2	16	18000	1000	0.08	0.4	14000	640	0.06	0.4
	0.2	20	15000	800	0.08	0.4	—	—	—	—
	0.2	30	12000	600	0.07	0.35	—	—	—	—
1.5	0.2	10	18000	1400	0.15	0.8	14000	900	0.12	0.8
	0.2	20	12000	900	0.12	0.65	9600	580	0.1	0.65
2	0.1	8	24000	3300	0.2	1.2	19000	2100	0.16	1.2
	0.2	12	22000	3000	0.2	1.2	18000	1900	0.16	1.2
	0.2	16	19000	2500	0.2	1.2	15000	1600	0.16	1.2
	0.2	20	16000	2000	0.2	1.2	13000	1300	0.16	1.2
	0.2	30	13000	1600	0.16	1.0	—	—	—	—
	0.2	40	11000	1200	0.14	0.8	—	—	—	—
	0.3	8	24000	3300	0.3	1.2	19000	2100	0.24	1.2
3	0.2	20	18000	3000	0.3	2.0	14000	1900	0.24	2.0
	0.2	40	12000	1800	0.25	1.7	9600	1100	0.2	1.7
	0.5	20	18000	3000	0.3	1.5	14000	1900	0.24	1.5
	0.3	12	20000	4500	0.3	1.5	16000	2900	0.24	1.5
4	0.2	20	18000	4200	0.4	2.7	14000	2700	0.3	2.7
	0.2	40	13000	2800	0.4	2.7	10000	1800	0.3	2.7
	0.5	20	18000	4200	0.4	2.3	14000	2700	0.3	2.3
	0.5	40	13000	2800	0.4	2.3	10000	1800	0.3	2.3
6	0.1	24	14000	4600	0.6	3.8	11000	2900	0.5	3.8
	0.3	24	14000	4600	0.6	3.8	11000	2900	0.5	3.8
	0.5	24	14000	4600	0.6	3.8	11000	2900	0.5	3.8
	0.5	30	14000	4600	0.6	3.8	11000	2900	0.5	3.8
	1	30	14000	4600	0.6	3.0	11000	2900	0.5	3.0
8	0.5	30	10500	4000	0.8	5.3	8400	2600	0.6	5.3
	1	30	10500	4000	0.8	4.5	8400	2600	0.6	4.5
10	0.5	40	8700	3500	1.0	6.8	7000	2200	0.8	6.8
	1	40	8700	3500	1.0	6.0	7000	2200	0.8	6.0
12	0.5	40	7200	3000	1.2	8.0	5800	1900	1.0	8.0



When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DF4JC

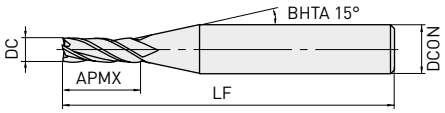
END MILL, SEMI LONG CUT LENGTH, 4 FLUTE, FOR GRAPHITE

X N

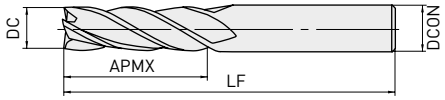
3≤DC≤12
0 - 0.02

DCON=6	8≤DCON≤10	DCON=12
0 - 0.008	0 - 0.009	0 - 0.011

Type1



Type2



4 flute end mill with original diamond coating for graphite machining.

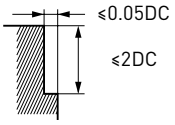
Order Number	DC	APMX	LF	DCON	Flutes	Stock	Type
DF4JCD0300	3	12	60	6	4	●	1
DF4JCD0400	4	16	60	6	4	●	1
DF4JCD0600	6	24	60	6	4	●	2
DF4JCD0800	8	28	70	8	4	●	2
DF4JCD1000	10	35	90	10	4	●	2
DF4JCD1200	12	36	110	12	4	●	2

● : Inventory maintained. ★ : Inventory maintained in Japan.

DF4JC

RECOMMENDED CUTTING CONDITIONS

	X				N			
Work material	**Graphite**				**Copper, Copper alloys**			
DC (mm)	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
3	22000	2500	6	0.15	10600	280	6	0.15
4	18000	2900	8	0.2	8000	330	8	0.2
6	14000	3200	12	0.3	6400	380	12	0.3
8	10500	2900	16	0.4	4000	420	16	0.4
10	8700	2600	20	0.5	3200	460	20	0.5
12	7200	2200	24	0.6	2700	460	24	0.6



When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine dedicated for graphite.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

DF4XL

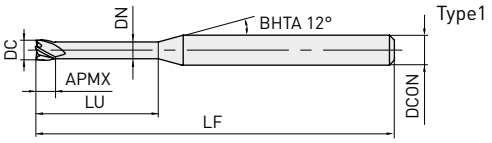
END MILL, LONG NECK, 4 FLUTE, FOR GRAPHITE

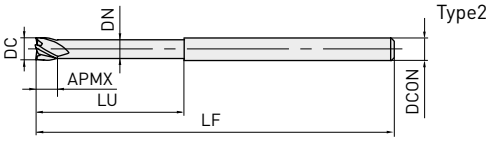
X N

1≤DC≤12

0
- 0.02

4≤DCON≤6	8≤DCON≤10	DCON=12
0 - 0.008	0 - 0.009	0 - 0.011





4 flute long neck end mill with original diamond coating for graphite machining.

Order Number	DC	APMX	LU	DN	LF	DCON	Flutes	Stock	Type
DF4XLD0100N060	1	1.5	6	0.94	50	4	4	●	1
DF4XLD0100N080	1	1.5	8	0.94	50	4	4	●	1
DF4XLD0100N100	1	1.5	10	0.94	50	4	4	●	1
DF4XLD0150N100	1.5	2.3	10	1.44	60	4	4	●	1
DF4XLD0150N160	1.5	2.3	16	1.44	60	4	4	●	1
DF4XLD0200N100	2	3	10	1.9	60	4	4	●	1
DF4XLD0200N160	2	3	16	1.9	60	4	4	●	1
DF4XLD0200N200	2	3	20	1.9	60	4	4	●	1
DF4XLD0300N160	3	4.5	16	2.9	70	4	4	●	1
DF4XLD0300N200	3	4.5	20	2.9	70	4	4	●	1
DF4XLD0300N300	3	4.5	30	2.9	70	4	4	●	1
DF4XLD0400N200	4	6	20	3.9	80	4	4	●	2
DF4XLD0400N400	4	6	40	3.9	80	4	4	●	2
DF4XLD0600N300	6	9	30	5.85	70	6	4	●	2
DF4XLD0800N300	8	12	30	7.85	90	8	4	●	2
DF4XLD1000N300	10	15	30	9.7	90	10	4	●	2
DF4XLD1200N300	12	18	30	11.7	110	12	4	●	2

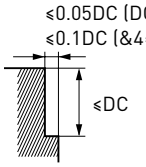
● : Inventory maintained. ★ : Inventory maintained in Japan.

DF4XL

RECOMMENDED CUTTING CONDITIONS

SHOULDER MILLING

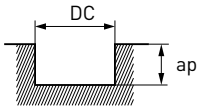
		X				N			
Work material		**Graphite**				**Copper, Copper alloys**			
DC (mm)	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**ae (mm)**
1	6	30000	1300	1	0.05	30000	1300	1	0.05
	8	25000	1000	1	0.05	25000	1000	1	0.05
	10	22000	700	1	0.05	22000	700	1	0.05
1.5	10	25000	1200	1.5	0.075	21000	1000	1.5	0.075
	16	18000	800	1.5	0.075	18000	800	1.5	0.075
2	10	22000	1500	2	0.1	16000	1100	2	0.1
	16	19000	1100	2	0.1	16000	930	2	0.1
	20	16000	800	2	0.1	16000	800	2	0.1
3	16	21000	1900	3	0.15	10600	960	3	0.15
	20	18000	1500	3	0.15	10600	890	3	0.15
	30	14000	1000	3	0.15	10600	760	3	0.15
4	20	18000	2400	4	0.4	8000	1100	4	0.4
	40	13000	1500	4	0.4	8000	920	4	0.4
6	30	14000	3200	6	0.6	5300	1200	6	0.6
8	30	10500	2900	8	0.8	4000	1100	8	0.8
10	30	8700	2600	10	1.0	3200	960	10	1.0
12	30	7200	2200	12	1.2	2650	800	12	1.2



When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

SLOTTING

		X			N		
Work material		**Graphite**			**Copper, Copper alloys**		
DC (mm)	**LU (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**	**n (min^{-1})**	**Vf (mm/min)**	**ap (mm)**
1	6	30000	1000	0.1	30000	980	0.1
	8	25000	700	0.08	25000	700	0.08
	10	22000	500	0.06	22000	500	0.06
1.5	10	25000	1100	0.14	21000	750	0.14
	16	18000	600	0.1	18000	600	0.1
2	10	22000	1200	0.2	16000	820	0.2
	16	19000	800	0.16	16000	700	0.16
	20	16000	600	0.12	16000	600	0.12
3	16	21000	1400	0.3	10600	720	0.3
	20	18000	1100	0.25	10600	670	0.25
	30	14000	700	0.2	10600	570	0.2
4	20	18000	1800	0.5	8000	820	0.5
	40	13000	900	0.4	8000	690	0.4
6	30	14000	2300	1.2	5300	900	1.2
8	30	10500	2000	2.0	4000	820	2.0
10	30	8700	1900	3.0	3200	720	3.0
12	30	7200	1700	4.0	2650	600	4.0



When high machining accuracy is needed, or the workpiece becomes chipped, we recommend lowering the feed rate.
Use a milling machine suitable for graphite machining.
If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

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