

Carbon Brush

Electro Graphite

Composition	Grade	Bulk Density	Hardness	Electrical resistivity	Flexural strength	Coefficient of friction	Contact voltage drop	Max peripheral speed	Max current density	Features/Application
		g/cm ³								
Electro Graphite	401	1.68	18	9	10	M	M	30	10	Good film formation. Suitable for slip rings that easily generate streaking.
	502	1.77	51	11	37	M	M	25	10	Good roughing resistance because of fine grain isotropic structure. Suitable for low speed, small capacity DC motors and slip rings.
	503	1.68	46	13	29	M	M	30	10	Same as 502, good roughing resistance because of fine grain isotropic structure. Suitable for small/med capacity motors of faster speed than 502.
	176	1.62	28	14	16	M	M	45	12	Good film formation. Good commutation performance. Suitable for DC motors up to medium capacity.
	BZ-229	1.60	23	22	11	M	M	40	12	Moderate film adjusting function. Suitable for medium and higher capacity mill motors.
	BZ-256	1.61	28	19	14	M	M	40	12	Better film formation than BZ-229. Suitable for medium and higher capacity mill motors.
	213	1.61	32	23	16	M	M	40	12	Better film adjusting effect than 176. Suitable for DC motors up to medium capacity.
	321	1.74	62	34	31	M	M	35	10	Good wear resistance. Suitable for traction motors.
	TH-03	1.75	68	40	35	M	M	35	10	
	351A	1.63	49	47	22	H	M	40	10	Standard material for commutation brushes. Suitable for medium capacity DC motors.
641	1.64	59	75	12	H	M	40	10	Suitable for difficult commutation high capacity DC motors and universal motors.	

*Coefficient of friction : H...0.25~ , M...0.20~0.25 (measurement condition/ Slip ring : Copper, Speed : 9.3m/s, Current : 0A)
 *Contact voltage drop : M...0.5~1.0V/pc (measurement condition/Slip ring : Copper, Speed : 9.3m/s, Current : DC10A/cm²)
 *The colored grades use imported materials.

Copper Graphite

Composition	Grade	Bulk Density	Hardness	Electrical resistivity	Flexural strength	Coefficient of friction	Contact voltage drop	Max peripheral speed	Max current density	Features/Application
		g/cm ³								
Graphite	402	1.71	24	10	18	M	M	25	10	Has film adjusting effect. Suitable for thick film slip rings.
	801	1.65	30	35	19	M	M	45	15	Good wear resistance. Suitable for pump motors for power steering.
	TR-52	1.74	30	14	16	M	M	40	12	Better commutation performance than 788. Suitable for forklifts of 48V or more.
	TR-19	1.51	33	200	19	M	M	40	12	Good wear resistance. Suitable for 3-phase commutator motor.
Copper Graphite I	M-90	6.30	15	0.32	108	M	VL	20	25	High strength copper alloy type. Suitable for contacts and grounds.
	M-1T	6.19	13	0.27	108	M	VL	22	22	
	M-2T	5.70	15	0.50	80	M	VL	25	20	
	M-1	5.41	12	0.08	42	L	VL	30	25	High copper content. Very low temperature rise and contact voltage drop. Suitable for high electrical capacity generators and motors.
	M-1F	5.30	18	0.15	49	L	VL	30	25	
	M-2H	4.93	13	0.10	34	L	VL	30	20	
	M-2HF	4.80	18	0.33	44	M	VL	30	20	
	M-2	4.40	15	0.50	29	L	VL	30	20	The copper content amount is next to M1, M-2H class and good wear resistance. Suitable for large capacity generators and slip rings for general rotary machine.
	M-2F	4.35	15	0.50	44	M	VL	30	20	
	M-3H	4.04	16	0.70	29	M	VL	30	18	
	M-3HF	4.05	20	0.60	44	M	VL	30	18	
	M-3	3.78	17	1.00	29	L	VL	30	18	
	M-4	3.48	17	2.00	25	L	L	30	18	
	M-550	2.96	25	2.50	39	M	L	35	15	Good wear resistance. It is particularly suitable for stainless steel slip rings.
	M-750	2.32	23	6.00	32	M	L	35	15	
	788	2.02	23	9.00	23	M	M	45	12	Good demontional stability in high temperature. Suitable for forklifts of 48V or less.
	M-2TB	5.74	12	0.48	65	M	VL	25	20	Lead-free material. As with M-2T, this material is suitable for contacts and grounding.
	M-1B	5.30	10	0.10	43	L	VL	30	25	Lead-free material. As with M-1, this material is suitable for large-capacity generators and electric motors.
	M-2B	4.34	13	0.28	31	L	VL	30	20	Lead-free material. As with M-2, this material is suitable for large-capacity generators and electric motors, as well as slip rings used on general-purpose rotating machines.
	M-4B	3.43	20	1.30	32	L	L	30	18	Lead-free material. As with M-4, this material is suitable for small- to medium-capacity generators and electric motors.
M-1C	5.15	13	0.10	59	L	VL	30	25	Material designed to resist residual expansion. As with M-1, this material is suitable for large-capacity generators and electric motors.	
M-2C	4.35	13	0.32	34	L	VL	30	20	Material designed to resist residual expansion. As with M-2, this material is suitable for large-capacity generators and electric motors, as well as slip rings used on general-purpose rotating machines.	
M-4C	3.45	20	1.10	45	L	L	30	18	Material designed to resist residual expansion. As with M-4, this material is suitable for small- to medium-capacity generators and electric motors.	
M-550C	2.96	25	2.50	39	M	L	35	15	Material designed to resist residual expansion. As with M-550, this material is suitable for stainless steel slip rings.	

*Coefficient of friction : H...0.25~ M...0.20~0.25 L...0.20 (measurement condition/ Slip ring : Copper, Speed : 9.0m/s, current : 0A)
 *Contact voltage drop : M...0.5~1.0V/pc L...0.25~0.5V/pc VL...0.25V/pc and below (measurement condition/Slip ring : Copper, Speed : 9.0m/s, Current : DC10A/cm²)

Silver Graphite

Composition	Grade	Bulk Density	Hardness	Electrical resistivity	Flexural strength	Coefficient of friction	Contact voltage drop	Max peripheral speed	Max current density	Features/Application
		g/cm ³								
Silver Graphite	SX-50	3.20	15	2.70	29	M	VL	20	12	Very low temperature rise and contact voltage drop. Suitable for low voltage, low current tachometers and ground contacts.
	SX-70	4.45	15	0.25	40	M	VL	20	15	
	SX-90	6.85	18	0.05	84	M	VL	20	22	

*Coefficient of friction : M...0.20~0.25 (measurement condition/Slip ring : Copper, Speed : 9.0m/s, Current : 0A)
 *Contact voltage drop : VL...0.25V/pc and below (measurement condition/Slip ring : Copper, Speed : 9.0m/s, Current : DC10A/cm²)

Resin bonded Graphite

Composition	Grade	Bulk Density	Hardness	Electrical resistivity	Flexural strength	Coefficient of friction	Contact voltage drop	Max speed	Max current density	Features/Application
		g/cm ³								
Resin bonded Graphite	X-03	1.50	12	200	15	L	H	54	20	Good rideability. Suitable for 100-120V high efficiency cleaners.
	X-09	1.52	14	260	15	L	H	54	20	
	X-17	1.54	15	330	18	L	H	54	20	
	X-72	1.47	19	380	14	L	H	48	20	
	X-88	1.52	14	360	20	L	H	54	20	
	X-05	1.48	15	400	18	L	H	50	20	Good rideability. Suitable for 120-240V cleaners.
	X-10	1.52	15	270	17	L	H	50	20	
	X-80	1.51	17	360	22	L	H	48	20	
	X-13	1.48	19	700	22	L	H	50	15	
	X-24	1.53	16	440	28	L	H	50	15	
	X-26	1.53	23	340	23	L	H	50	15	
	X-85	1.48	20	400	14	L	H	48	20	
	X-89	1.53	19	350	21	L	H	48	20	
	X-93	1.50	18	640	27	L	H	50	15	
	X-11	1.35	15	1100	14	L	VH	54	13	
	X-91	1.35	15	1100	17	L	VH	54	13	Good commutation performance. Suitable for 200-240V cleaners.
	X-94	1.36	14	1200	17	L	VH	54	13	
	X-04	1.36	17	1600	11	L	VH	54	10	Good commutation performance. Suitable for 200-240V cleaners, small motors.
	X-14	1.35	15	1100	17	L	VH	54	10	
	X-78	1.51	17	370	22	L	H	48	20	Good commutation performance. Suitable for 100-120V cleaners and hand towels.
X-23	1.44	19	650	17	L	H	50	15	Good commutation performance. Suitable for 200-240V cleaners and hand towels.	
X-73	1.52	24	920	24	L	VH	40	13		
B-2	1.75	25	390	24	L	H	25	8	Suitable for juicers, dryers. Moldable by press to size up to 18mm length max.	

*Coefficient of friction : L...~0.20 (measurement condition/Current density : AC10A/cm², Speed : 20m/s, Spring pressure : 50kPa)
 *Contact voltage drop : VH...3.0V/pc and over H...2.0~3.0V/pc (measurement condition/Current density : AC10A/cm², Speed : 20m/s, Spring pressure : 50kPa)

Carbon Graphite

Composition	Grade	Bulk Density	Hardness	Electrical resistivity	Flexural strength	Coefficient of friction	Contact voltage drop	Max peripheral speed	Max current density	Features/Application
		g/cm ³								
Carbon Graphite	C-3	1.62	35	240	24	L	H	35	13	Comparative low resistivity. Suitable for 100-120V power tools.
	107	1.62	34	100	29	L	H	35	13	
	113	1.58	37	290	27	L	H	35	13	
	130	1.74	27	70	20	L	H	35	20	
	C-1	1.49	30	330	13	L	H	35	12	Suitable for 100-120V and 200-240V cleaners.
	TX-174	1.55	36	390	24	L	H	35	18	Good commutation performance, wear resistance. Good breaking action. Suitable for 100-120V and 200-240V power tools and cleaners.
	105S	1.55	36	390	24	L	H	35	18	
	108	1.55	36	390	24	L	H	35	18	
	118	1.64	34	390	23	L	H	35	18	
	129	1.64	34	620	20	L	H	35	18	
	111	1.61	37	600	23	M	VH	35	13	Good commutation performance and wear resistance. Suitable for 200-240V cleaners.
	114	1.62	35	900	20	M	VH	35	13	Good commutation performance. Suitable for 200-240V power tools and washing machines.
	122	1.62	42	840	22	M	VH	35	13	
	124	1.60	47	790	26	M	VH	35	13	
	127	1.53	33	850	21	M	VH	35	13	
119	1.59	44	1300	20	M	VH	35	13	Good commutation and sliding performance. Suitable for 200-240V power tools and washing machines.	
B-1	1.75	47	450	13	L	H	25	8	Suitable for small power tools and juicers. Moldable by press size to up to 12mm max.	
C-2	1.55	44	660	17	L	H	25	10	Suitable for small power tools and juicers. Moldable by press size to up to 1.5mm max.	
C-2N	1.58	18	660	14	L	H	25	10	Suitable for small power tools and juicers. Moldable by press size to up to 1.5mm max. Better noise prevention and film adjusting effect than C-2.	
FX-08	1.66	32	590	19	L	H	25	10	Suitable for small power tools and juicers. Moldable by press size to up to 18mm max. Better noise prevention and film adjusting effect than C-2.	

*Coefficient of friction : M...0.20~0.25 L...0.20 and below (measurement condition/Current density : AC10A/cm², Speed : 20m/s, Spring pressure : 50kPa)
 *Contact voltage drop : VH...3.0V/pc and over H...2.0~3.0V/pc (measurement condition/Current density : AC10A/cm², Speed : 20m/s, Spring pressure : 50kPa)

The max speed and current density vary depending on the commutator and slip ring condition and use condition.
 The above applications are some examples. Please contact our sales department to consult on selecting the most appropriate grade.