

# Typical Grade Characteristics

## Electrographitic

Grade	Specific Resistance ( $\mu\Omega \times \text{cm}$ ) ( $\mu\Omega \times \text{in.}$ )	Normal Current (A/cm <sup>2</sup> ) (A/in <sup>2</sup> )	Contact Drop	Apparent Density (gms/cc)	Shore Hardness	Transverse Strength (MPa) (lb/in <sup>2</sup> )	Coefficient of Friction	Surface Speed (m/sec) (ft./min)	Application Comments
CB304	6,600 2,650	12.5 80	High	1.56	60	30 4,200	Low	35 7,000	Excellent commutation with low humidity protection for excavator generators requiring slight polishing action.
CB309	6,300 2,500	12.5 80	High	1.58	58	28 4,000	Low	40 8,000	A treated grade with excellent commutating and riding ability. Longer life at lower humidity - mainly generators.
CB310	7,100 2,800	12.5 80	High	1.45	40	14 2,000	Low	40 8,000	A grade where commutation is the most important factor. Successfully used on motors and Westinghouse exciters.
CB322	6,300 2,500	12.5 80	High	1.60	60	30 4,200	Low	40 8,000	Similar to CB309, without low humidity protection.
CB330	5,800 2,300	12.5 80	High	1.60	65	33 4,800	Low	40 9,000	Successfully used on motors and generators where long life is required.
CB335	7,100 2,800	12.5 80	High	1.53	55	25 3,600	Low	45 9,000	A treated grade with exceptional commutating ability, used on Westinghouse hoist and drag motors.
CB340	2,750 1,100	10.0 65	Medium	1.70	55	32 4,700	Very Low	30 6,000	A low friction, high filming grade with medium commutating ability, suitable for G.E. exciters.
CB345	5,600 2,200	14.0 90	High	1.56	56	24 3,500	Low	50 10,000	Performs well where high loads and temperatures are encountered, as excavator hoist and drag motors.
CB349	5,600 2,200	14.0 90	High	1.58	58	26 3,400	Low	45 9,000	Similar to CB345, with additive for film forming and low humidity protection.
CB350	7,100 2,800	12.5 80	High	1.52	50	22 3,200	Low	45 9,000	Excellent commutation for high voltage machines; used on motors and generators where low humidity is not a problem.
CB367	5,900 2,400	12.5 80	High	1.61	60	28 4,000	Low	45 9,000	Excavator generator grade treated for long life with humidity protection.
CB386	5,600 2,200	12.5 80	High	1.58	65	28 4,000	Low	45 9,000	Very successfully used on motors and generators requiring long brush life with additive for film forming.
CB397	5,800 2,300	12.5 80	High	1.64	62	30 4,200	Low	45 9,000	Similar to CB367, slightly stronger for increased brush life.
AC137X	5,400 2,100	12.5 80	High	1.75	85	44 6,500	Low	50 10,000	A very strong grade successfully used on all types of traction motors.
AC144	1,500 600	12 75	Low	1.67	40	21 3,000	Low	30 6,000	A dense strong material suitable for slip ring applications.
AC155	5,100 2,000	12.5 80	High	1.72	62	34 5,000	Low	50 10,000	Excellent performance and brush life for traction motors especially high temperature and low humidity.
A10R7	3,050 1,200	10.0 65	Medium	1.68	55	33 4,800	Very Low	35 7,000	A treated grade for use on slip rings where low humidity is causing poor brush performance.
535	6,900 2,700	12.5 80	High	1.53	55	25 3,600	Low	45 9,000	Treated for long life, excellent grade for heavily loaded, large DC machines.
2143	6,300 2,500	12.5 80	High	1.61	65	31 4,300	Low	40 8,000	Excellent commutation and riding properties, low in friction - most suitable for generator service.
2192	5,100 2,000	14.0 90	High	1.56	55	26 3,400	Low	50 10,000	A versatile grade used on medium and large motors - especially where very high peak loads are encountered.
2217	5,100 2,000	12.5 80	High	1.67	57	27 3,700	Low	50 10,000	Specially formulated for use in motors and generators subject to low humidity operating conditions.
EG309T	4,200 1,700	12 75	Medium	1.54	55	26 3,400	Low	50 10,000	Successfully used on Mine Winder motors operating at medium to high loads.
EG7097	3,900 1,550	12 75	Medium	1.64	65	37 5,200	Low	50 10,000	A treated brush with high filming properties for long life on motors and generators.

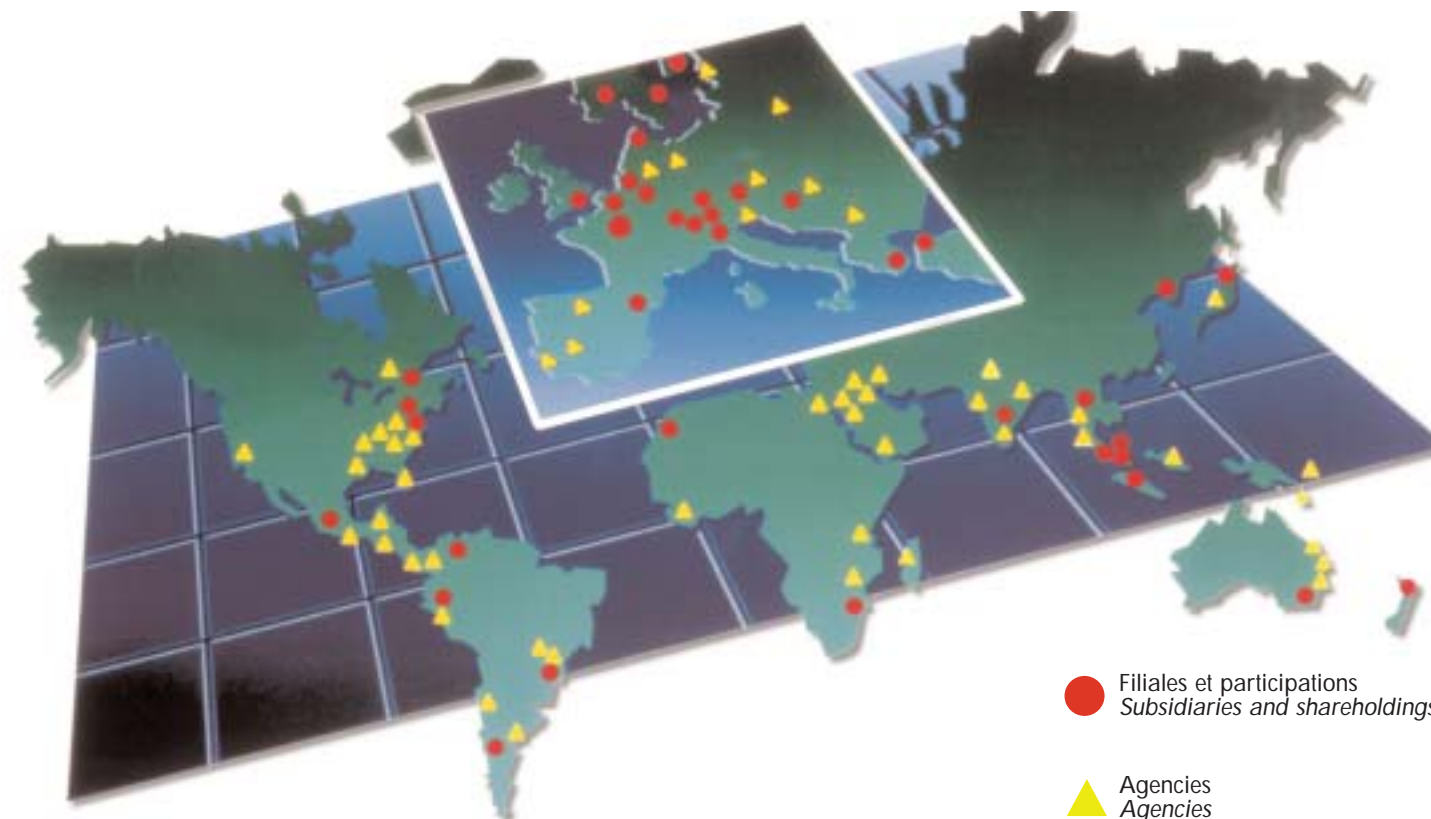


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# CARBON BRUSHES FOR MINING EQUIPMENT



# Introducing "The New CB300 Series of Carbon Brushes"

Carbone Lorraine has recognized the need for improved carbon brush materials, particularly for DC equipment used in the Open Pit/Open Cut type of mining.

Extensive laboratory and field testing has resulted in the development of the new CB300 series carbon brush grades that will provide the key elements of desired performance -

- Excellent commutation – minimal sparking or erosion
- Stable film (patina) – special treatments for film control and to maintain stable film formation over a wide range of temperature and humidity conditions
- Low friction – minimal commutator wear
- Long life brush

The same high degree of performance can be obtained on Wheel Motors and Traction Motors with Carbone's specially engineered AC series of grades.

For Underground Mining applications, Carbone Lorraine's brush grades have been successfully used on all types and makes of equipment for many years.

The overall benefits of the use of these Carbon Brush grades are improved machine performance and a reduction in maintenance costs.

## DRAGLINES



**D**ragline generators are generally prone to performance problems such as film stripping, copper drag, commutator wear and rapid brush wear. These problems are mainly related to climatic conditions as well as demanding operating requirements. A number of different brush grade formulations have been developed, and field tested, to suit these varied conditions to provide acceptable and predictable overall brush performance.

Dragline motors have not presented any major commutation or brush related problems. For this application, a brush grade with good commutating qualities and some degree of polishing action is desirable in order to maintain a stable commutator film.

### Typical Grade Selections:

General Electric Generators – CB304, CB309, CB367, CB397

General Electric Motors – CB345, CB350

General Electric Exciters – CB340

Westinghouse Generators –  
CB367, CB322

Westinghouse Motors –  
CB335, CB310

Westinghouse Exciters –  
CB310



## SHOVELS



**F**or Bucyrus-Erie and Marion Shovels equipped with General Electric or Westinghouse electric motors, the problems and conditions relate closely to that of the Draglines. For that reason, grade selection is the same. P&H Shovel motors and generators also require carbon brush grades that have excellent commutating ability and special treatments for film control to suit the operating environments.

### Recommended Grade Selections – field tested for extra long life :

P&H Motors – Hoist, Swing, Propel, Crowd -  
CB349, CB386

P&H Generators – CB330, CB367

A listing of carbon brushes for all applications available upon request.



## LOADERS



**E**xcellent commutation combined with good brush life and stable film formation, are the main elements required of the carbon brush for these traction motors.

Carbone grade AC137X will provide this high degree of performance under most conditions, preferably in a 3-wafer type configuration; this grade and design is being successfully used on L800, L1000 and L1100 loaders.

### Traction Motor Types:

L1000 – N-11

L1100 & L1400 – L-14B

L1800 – J-2 Heavy Duty

A.C. Generators – AC144, A10R7



## TRUCKS



**T**he operating conditions of wheel motors can be most severe. High speeds, high loads, extensive dynamic braking, elevated temperatures combined with varied climatic conditions are some of the main elements that can result in premature commutator deterioration, rapid brush wear, flashovers and generally poor commutation.

Carbone grade AC155 was specifically developed for this application to improve vehicle availability, by providing long predictable brush life and reduced commutator wear by maintaining an excellent film formation in all types of climates. Field tests have been conducted in Chile, Australia, U.S.A. and Canada with consistent wear rates of 6-7mm.per 1000 hours in every case. This includes Wheel Motor types 772, 776, 787 and 788.

### Grade Selections:

Wheel Motors - AC155

Alternators - AC144, A10R7



## UNDERGROUND



**D**ue to the varied electrical loading of Main and Skip hoist motors and generators used in underground mining, special brush grades are required in order to maintain stable commutator film under these conditions. High peak starting loads can cause excessive brush arcing and possible commutator burning, whereas extended periods of light load operation, or idling, in the case of generators, film stripping and rapid brush wear can result.

Carbone's specially treated grades will maintain a stable film at light loads and provide the necessary commutating ability for the peak loads and normal operation.

### Typical Grade Selections:

Main and Skip Hoist Motors - 535, 2192, EG309T

Generators - 2217, 2143, EG7097

