ST. MARYS CARBON COMPANY BRUSH GRADE DESIGNATIONS

A – Carbon and Carbon-Graphite

B – Electrographitic

C – Graphite

F – Metal-Graphite

G – Metal-Graphite
(over 80% metal content)

Classification Of Carbon Brush Materials

Five general classifications compose the types of brush materials available for electrical machines, they are:

1) Carbon brushes

2) Carbon-Graphite brushes

3) Graphite brushes

4) Electrographitic brushes

5) Metal-Graphite brushes

Carbon and Carbon-Graphite Brushes

Carbon and carbon-graphite brushes are composed of several forms of carbon. Among these are petroleum coke, retort carbon, lampblack and graphite. The binder commonly employed is a coal tar derivative. These brushes are characterized by their moderate current carrying capacity, high mechanical strength and pronounced cleaning action.

Graphite Brushes

Most brushes in this classification are composed of a crystalline form of graphite and a binding agent. The advent of higher speed machines made the development of these graphite grades necessary. They are used on many fractional horsepower applications.

GENERAL APPLICATION OF BRUSH MATERIALS

Type of Equipment	Type of Brush Materials Used
Medium- and high-speed heavy-duty generators or motors with undercut mica.	Electrographitic brushes non-abrasive grades.
Medium- and high-speed heavy-duty generators and motors with undercut mica and periodic overloads.	Electrographitic brushes with cleaning action. Graphite brushes with cleaning action.
Cranes, hoists, etc., with undercut mica commutators.	Carbon-graphite brushes with cleaning action. Electrographitic brushes with or without cleaning action.
Cranes and hoists, with flush mica commutators.	Carbon-graphite brushes with cleaning action.
Heavy-duty mill motors.	Carbon-graphite brushes of fine dense structure with cleaning action. Electrographitic brushes.
Turbine field rings (steel). Rotary converter slip rings. Automotive starters.	Graphite brushes with cleaning action; light weight, low inertia grades. Metal-graphite brushes.
Induction-motor slip rings. Alternators. Synchronous motors, excitation.	Metal-Graphite brushes where service demands it. Graphite brushes on large machines with many brushes per ring. Electrographitic brushes on smaller machines with fewer brushes per ring.
Plating generators. Battery-charging generators. Industrial truck motors.	Metal-graphite brushes having high current-carrying capacity.

Electrographitic

Carbon brush grades are subject to an extremely high temperature by a process known as graphitizing. This treatment completely volatilizes the impurities from with in the material and converts carbon to the graph ite form. Modern motors require material with a high current-carrying capacity and a long-wearing quality. These characteristics have made the electrographitic brush the most widely used.

Metal-Graphite Brushes

Metal content in this classification of brushes ranges from 15 to 98 percent. Copper is the most widely used metal, although others are employed depending on the application involved. Brush grades of this type are characterized by their extremely high current-carrying capacity. Used particularly on low-voltage D-C machines, slip ring service and contacts.

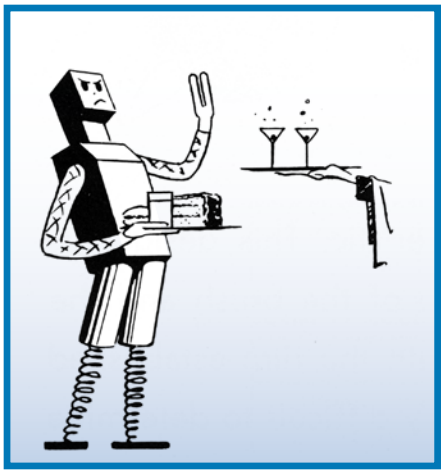
BRUSH GRADE
Classifications & Characteristics

St. Marys Carbon Company

Characteristics

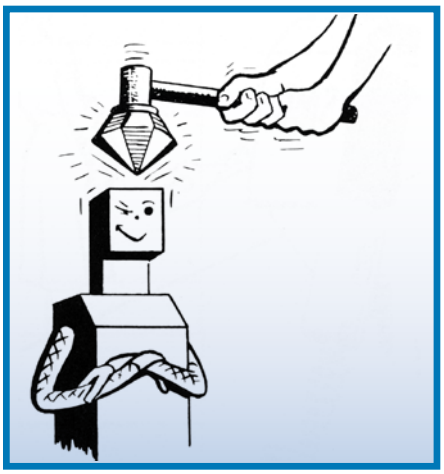
The characteristics of carbon brush material measured by carbon brush manufacturers are as follows:

1) Specific resistance
2) Hardness
3) Transverse strength
4) Current-Carrying capacity
5) Contact drop
6) Coefficient of friction
7) Abrasiveness
8) Allowable speed



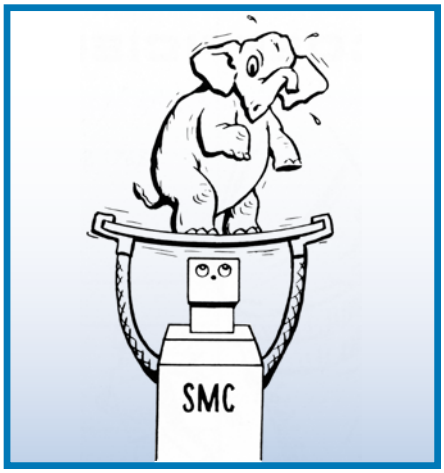
Specific Resistance

This characteristic measures the opposition offered by the brush material to the flow of current. This resistance is measured in the length direction of the material as resistivity measured in the direction of the width or thickness may be entirely different. It is expressed in ohms per cubic inch .



Hardness

This characteristic can be measured in a number of ways. The carbon industry has standardized on the use of the Scleroscope for measuring hardness. This consists of observing the height to which a specially constructed diamond-pointed steel hammer rebounds when released from a standard distance above the test piece. Brush materials are now available ranging from 7 to 85 on the Scleroscope scale. Figures used in the Grade Characteristic Table should be considered as representative of the average run due to the widely varying readings or methods used. Hardness is used mainly as a quality control during manufacturing.



Transverse Strength

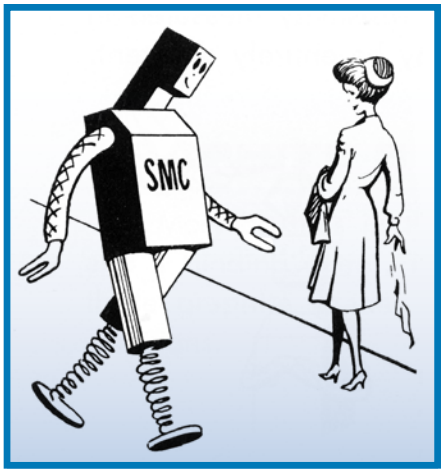
This characteristic refers to the transverse breaking strength of the brush material. It is determined by applying a load to a simple beam of material to the point of breakage. It is expressed in pounds per square inch. It is also used mainly for production control purposes.

Current Carrying Capacity

Current-carrying capacity is expressed in amperes per square inch and is the actual load current per square inch of cross section that a brush can carry without injurious heating under operating conditions. This property is greatly influenced by the machine design and other factors as ventilation and operating temperatures. Here again only relative figures can be used because so many variables, beyond the control of the brush manufacturer, control the current-carrying capacity of the brush.

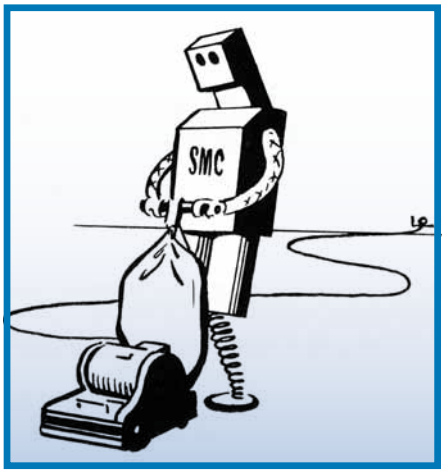
Contact Drop

Contact drop is an operating characteristic. This designates the voltage drop between the contact face of the brush and the commutator or slip ring. Its value varies with the film established on the commutator or ring. As it is extremely difficult to determine this characteristic accurately, it is standard in the carbon industry to designate it by general terms as “low,” “medium” and “high.”



Coefficient Of Friction

This property is known as the resistance or force that is offered by the face of the brush end, commutator or slip ring while they are in sliding contact with each other. This is expressed as the ratio between the face of friction and the pressure perpendicular to the sliding surfaces. Changes in the moisture content of the air and the presence of any chemical fumes or other contamination greatly influences this property. In view of these variables it is also referred to in such broad terms as “low,” “medium” and “high.”



Abrasiveness

This property enables a brush to remove film from the commutator and keep it in a polished condition . There is no specific measurement in the carbon industry for this cleaning action. However, general terms as “pronounced,” “slight” and “no cleaning action” are used. Flush mica communtators containing hard mica require abrasive brushes as do machines on which intermittent heavy overloads occur. Non-abrasive brushes should be used on all undercut communtators.

Speed

This is the surface speed of a commutator or slip ring expressed in feet per minute. This property depends upon a great many variables such as spring pressure, current density, brushholders, machine vibration, etc. Under these circumstances, speed is usually listed as only an approximation of the actual allowable speed.