

## 1 – WHAT DOES SEATING MEAN?

The seating process consists in **giving to the contact face** of a new **carbon brush the exact curvature** of the commutator or of the ring. It also establishes the correct surface roughness on the brush contact face. This ensures a good mechanical and electrical contact when the brush is put into service, as illustrated by figure 1.



Fig. 1 – Improper (✗) and correct (✓) seating of a carbon brush contact face

**Seating** shall not be confused with **bedding**, which corresponds to the step of forming the skin on the commutator / slip ring, taking several hours of operation.

Seating requires particular care when:

- the commutator or slip ring rotates at high speed and/or vibrates
- the radius of curvature of the commutator or slip ring is very small - especially if split brushes are used (fig. 2).

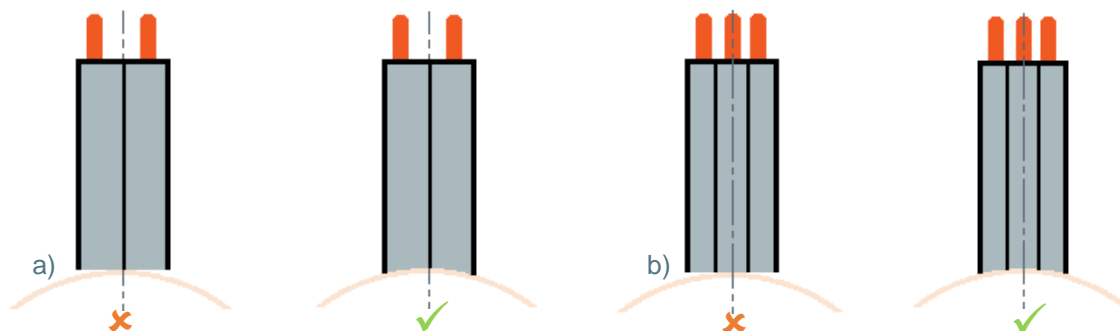


Fig. 2 – Incorrect (✗) and correct (✓) seating of the contact surface of a dual-wafer (a) or three-wafer (b) split brush

As far as split brushes are concerned, should the seating be incorrect or incomplete, there is a risk that such brushes may make contact with the commutator only at limited areas:

- for a dual-wafer brush (fig. 2.a): at the area comprising the edges of the brush face
- for a three-wafer brush (fig. 2.b) at the central wafer only

These areas will bear all the load, and the consequences could be very serious both for the commutator / slip ring as well as for the brush.

**Note:**

New brushes are sometimes supplied with **preformed contact faces**, that is to say, with the contact surface machined to the radius requested. **This radius is only approximate and does not exempt from performing the seating operation** (except case 2 explained in clause Remarks).

The advantage of preforming is that it considerably shortens the time taken for the seating operation.

## 2 – BRUSH SEATING PROCEDURES

Depending on the size of the machine and the number of brushes, several methods are available.

### ON THE MACHINE

Seating is more often carried out on the machine itself, in accordance with various procedures depending upon the machine type and size.

Before mounting the brushes on the machine make sure that:

- the position of the brush-holders is correct (angle and distance to the rotating surface)
- brush pressure is adjusted and uniform on all the carbon brushes
- all brushes slide properly in their brush-holder boxes

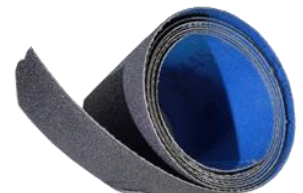
Refer to our Technical Guide for Maintenance.

### METHOD A: CONTACT SURFACE SEATING WITH AN ABRASIVE CLOTH

An abrasive cloth is made of **medium size grain** (grain 80), preferably made of silicon carbide, embedded on a cloth.

It shall be **applied**, abrasive side facing out:

- on the whole periphery of the commutator or slip ring, as illustrated by figure 3
- or only on part of it, when seating brushes line by line (which is usually necessary for a large machine) as shown by figure 4, by using an appropriate tool (clips) or hands



New brushes are placed into position in their brush-holders and pressed against the abrasive cloth. Then, depending on above case, the rotor (fig. 3) or the abrasive cloth (fig. 4) is **oscillated back and forth until it is observed that all contact surfaces are completely seated**.

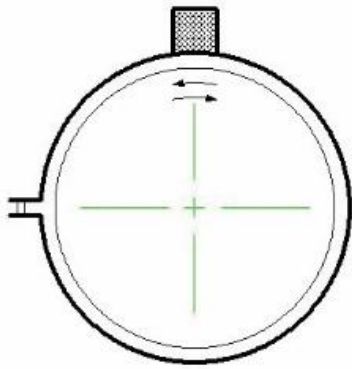


Fig. 3 ✓

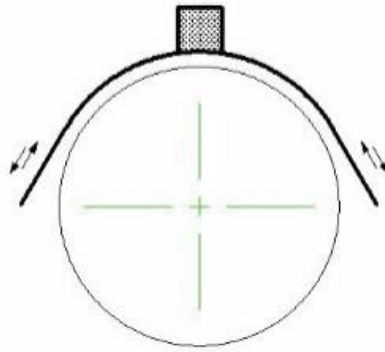


Fig. 4 ✓

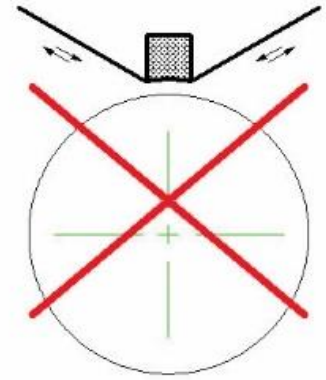


Fig. 5 ✗

Fig. 3 to 5 – Contact surface seating method with abrasive cloth

When seating the brushes arm by arm by hand (fig. 4), ensure that the cloth always makes contact with the commutator or slip ring well outside the area covered by the brush. Otherwise (fig. 5) it will lead to a reduced or uneven contact surface area under the brush.

### METHOD B: CONTACT SURFACE SEATING WITH A SEATING STONE

This method may be used on large or very large machines whilst rotating and whilst open and **always under zero or very low voltage**.

The abrasive seating stone, generally a soft pumice stone, is applied against the commutator or slip ring surface in front of the brushes while the rotor rotates. The abrasive dust acts as a grinding agent wearing the carbon exactly to the shape of the commutator.



This method is good when it is not abused because the dust from the stone will slightly wear the metal of the commutator or rings. It is only applicable for seating necessitating the removal of only a small amount of carbon.

After seating with an **abrasive stone** it is necessary to **roughen** the contact surface of the commutator or slip ring, by using a medium grain grinding stone (see TDS-02 and TDS-08).

#### Very important note:



**After seating by whatever method, it is necessary to thoroughly blow out the commutator and the contact surfaces of the brushes in order to completely remove the abrasive dust and carbon dust. This operation must be carried out with brushes held out of the brush-holders. Brush-holders and parts around the commutator or slip ring may need also to be blown out (when possible by vacuum cleaning).**

## ON A GRINDING WHEEL

Brush seating for commutators or rings of small to medium diameter (up to 500 mm) may be performed on a grinding wheel of a diameter equal to that of the commutator or ring.

Naturally, during this operation it is necessary for the brush to be held in place against the wheel, not by hand, but by means of a suitable brush-holder fixed at 2 or 3 mm from the grinding wheel.

The method is rapid but only approximate. It is suitable for large series of motors of the same type (traction motors, for example).

**After seating, always blow away carefully any dust on the brush contact surface so that no abrasive grains remain embedded in the brush contact surface.**

### REMARKS:

1. For **reversing machines**, the grinding must be carried out successively for **both working directions**. For **unidirectional machines** it is obvious that the brushes must be ground **in the direction of normal rotation**.
2. When individual brushes are replaced one by one on large machines, carbon brushes with a **pre-formed radius** may be fitted without seating their contact surfaces, **but only if**:
  - the number of the replaced carbon brushes is **lower than 20% of the total number of carbon brushes** per polarity,
  - and the new carbon brushes are uniformly distributed around the commutator / slip ring.

Brushes seated in this way become bedded by normal frictional wear and, if their number is within above-indicated limits, they will not adversely affect the operation of the other brushes during this natural bedding period.

3. Sometimes, particularly for high speed rings, new brushes are supplied with straight, unradiused, but grooved or gridded contact surfaces. Nevertheless, even with special contact surfaces it is still necessary to seat brushes.
4. It should also be kept in mind that even properly seated brushes are likely to vibrate on commutators or slip rings which have been turned with a diamond tool, that is to say "glossy". We recommend that such glossy surfaces should always be roughen by using a medium grain grinding stone to help graphite to deposit on the surface and forming a suitable skin.

Mersen market tools for maintenance. Consult our brochure « Tools & devices for maintenance of electric machines » available on our website.

#### List of citations:

- *Maintenance Technical Guide: "How to maintain carbon brushes, brush-holders, commutators and slip rings"*
- *TDS-02: "Condition of the surface of commutators and slip rings – Roughness"*
- *TDS-08: "Preventive maintenance"*

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