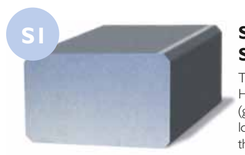
Innovating tomorrow's solutions today

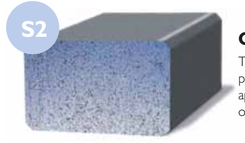
Morgan Advanced Materials offer Morganite & National Carbon Brushes Material Grades you can trust

Surface appearance of brushes and patina



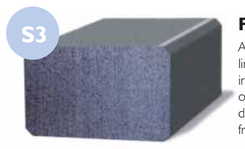
S1 Smooth Polished Surface

This indicates good performance. However, if the polish is mirror-like (glazed), high frequency chatter due to low current may be the cause. Check the side-faces of the brush for signs of vibration.



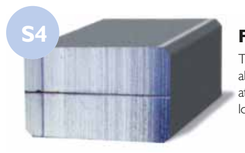
S2 Open Textured Surface

This, again, indicates that brush performance is satisfactory. Actual appearance will depend on the type of grade.



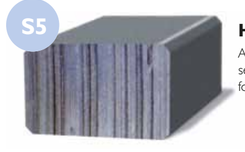
S3 Finely Lined Surface

Another satisfactory condition. Fine lines indicate the presence of dust in the atmosphere. This may be overcome by the use of filters or ducting the machine's air supply from another area.



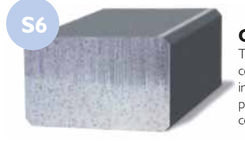
S4 Finely Serrated Surface

This is a further development of (S3) above. The causes are normally atmospheric contamination or lack of load current.



S5 Heavy Serrated Surface

As (4) above, but problem is more severe or has been allowed to continue for longer.

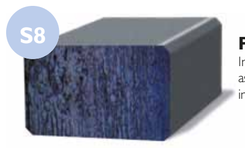


S6 Ghost Marked Surface

This may be associated with difficult commutation and can arise from incorrect neutral position, interpole problems or other causes of poor commutation.

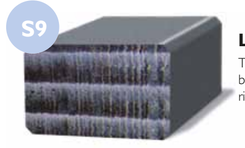
S7 Burnt Edges

Normally occurs on the trailing edge of the brush. Caused by poor commutation and heavy sparking.



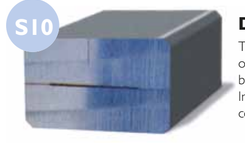
S8 Pitted Surface

Indicates heavy under-brush sparking as a result of current overload or brush instability.



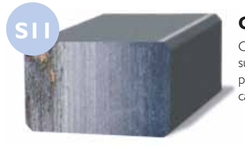
S9 Laminated Surface

This is an unusual condition caused by an armature winding fault giving rise to poor commutation.



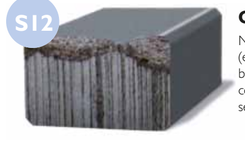
S10 Double-bedded Surface

This occurs as a result of brush tilting on a reversing machine, i.e. the brush beds itself in both directions of rotation. In itself this does not give any cause for concern.



S11 Copper Particles

Copper pick-up from commutator surface can result from copper drag problems or heavy peak loads. Can cause further commutator wear.



S12 Chipped Edges

Normally occurs on the leading (entering) edge of the brush. breakage can result from poor commutator profile, high micas and severe brush instability.

P1 Light Film

Over the entire commutator surface is one of the many normal conditions often seen on a well functioning machine. Film tone is dependent on the brush grade and current density.

P2 Patina Dark

Good condition. Film can be light to dark in colour but the important feature is that it is uniform and even. Normally, a good film will have a slightly polished appearance.

P3 Blotchy Film

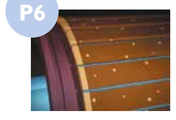
This nonuniform filming condition is the most common appearance. The accumulated tolerances in the machine such as commutator roundness, brush contact pressure, unequal magnetic fields and chemical vapors all contribute to this type of film development.

P4 Slot Bar Filming

Repeating light and dark filming patterns related to the number of armature coils per slot. This pattern is dependent on the machine design and usually not a function of the brush grade.

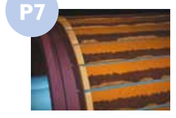
P5 Streaking

Of only the film is not detrimental to the commutator. Brush and commutator life are not at risk in this condition. If metal transfer develops, this condition will progress into threading. This type of filming can be dependent on current density or brush grade.



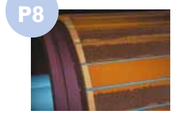
P6 Bright Spots

Bright spots in the film suggest poor contact or overloading, the resultant under-brush sparking tends to destroy the patina and will eventually erode the commutator.



P7 Bar Burning

Is the erosion of the trailing edge of the commutator bar. Failed machine components, maladjusted electrical symmetry of the machine or a poor commutating brush can result in bar burning. If not corrected, this condition can cause severe commutator damage or a flashover.



P8 Slot Bar Burning

Results in commutator erosion of every second, third, or fourth bar depending on the winding design of the armature. Improper brush material, brush design or electrical ad justment of the machine can cause this condition. This condition severely damages the commutator and reduces brush life.

P9 Patina Streaked With Collector Wear

A streaky film with no commutator wear, tracks can vary in width and colour. Caused by atmospheric conditions (humidity, oil vapour or other gases) or insufficient load.

P10 Pitch Bar Burning

Results in commutator bars being eroded in a pattern related to 1/2 the number of brush arms, progressing into a pattern equal to the number of brush arms. This condition is caused by a cyclic mechanical or electrical disturbance such as an unbalanced armature, misaligned shafts, bent shaft, bad bearings, weak foundation, failed equalizers or a poor riser connection. If not corrected this condition will result in a flashover

P11 Grooving

Is the uniform circumferential wear, the width of the brush, that is exhibited on the commutator. Excessive abrasive dust in the atmosphere or an abrasive brush can cause this condition. Extreme light spring pressure (below 1.5 psi) can also cause this condition. Proper brush applications and filtering the air on force ventilated motors can reduce the commutator wear.

P12 Copper Drag

Occurs when high energy transfers copper in a molten state. These particles become coated by contaminants from the surrounding environment or the brush treatment and do not oxidize properly to form the film on the commutator surface. These particles accumulate at the edge of the bar, eventually shorting across the insulating mica. This condition needs to be addressed immediately when discovered or serious damage may occur. Chamfering the commutator bar edges is necessary to stop the progression of this condition.

If you notice different appearances to those above, we can optimise the performance of your machine:

For this, indicate the relevant conditions as well as the following information:

Machine make **Type**

Use

Identification plate

KW: **Rotor Volts:** **Rotor Amps:** **R/min:**

Number of poles: **Number of brushes/pole:**

Symptoms

Understanding Brush Dimensions

Brushes usually fit on slip rings & commutators (collectors) as arrangement below.

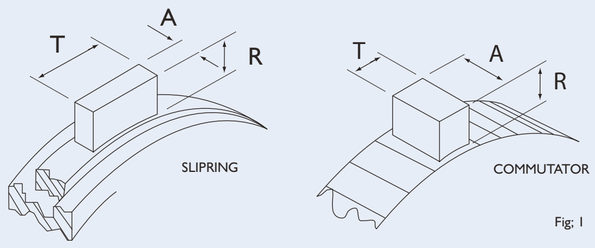


Fig: 1

DIMENSIONS T = Tangential, A = Axial, R = Radial } To the running surface of the collector

Typical Standard Information

GRADE IN USE

DIMENSIONS

T A R

SLIPRING COMMUTATOR

° TOP ° BOTTOM

Fitting Brushes and Holders - General points

Bedding in Brushes

New brushes must be bedded to fit the collector over their whole area of contact. Abrasive cloth is drawn between the brush and collector until the brush assumes the correct curvature. It is important that the abrasive cloth is 'wrapped' around the collector as much as possible to ensure the correct curvature is imparted on the brush face. For radial or trailing brushes draw the cloth only in the same direction as the rotation of the collector. For reaction brushes the cloth should be drawn against rotation. Alternatively a bedding stone held against the rotating collector may be used.

After bedding, the holders and brushes must be thoroughly cleaned. Brushing and or vaccuming is recommended. Using a compressed air line is not recommended.

Clearance

After bedding and cleaning, check that the brushes are free to move easily in their boxes. Morgan Advanced Materials brushes & holders are all manufactured to either IEC 136 or DIN 4300 tolerances.

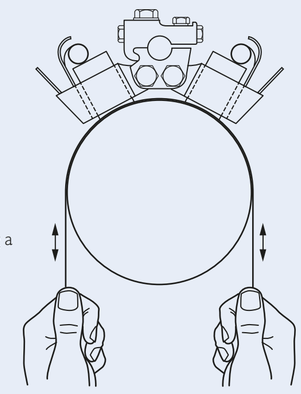


Fig. 2: Bedding in Brushes

Clearance between Brush Holder and Collector

Set the holder so that the distance between its lower edge and the collector is approximately 2.5mm – If this distance is less than 2mm or more than 3mm re-set the holder, using the adjustment provided in the holder/clamp assembly, or by adjusting the brush arm.

Angle at which Brush Holder meets the Collector

Care should be taken to set the brush holders at the angle for which, they are designed.

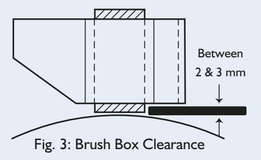


Fig. 3: Brush Box Clearance

Spring Pressure

Measurement of Brush Pressure.

The pressure on all the brushes fitted on a collector should be the same. Periodically brushes and holders should be cleaned and the pressure checked by means of a spring balance (see figure 4) or a Morgan electronic device.

The applied pressure of most brush grades on industrial machines is generally between 180gcm^{-2} (2.5lbin^{-2}) and 210gcm^{-2} (3lbin^{-2}).

Certain (treated) grades can best run at slightly higher pressures >210gcm^{-2} (3lbin^{-2}) With small brushes or on machines subject to vibration or with out of round collectors, it is advisable to use pressures up to 50% higher in the range of 210-280gcm^{-2} (3-4lbin^{-2}). The higher pressure enables improved contact and reduced electrical wear of the brushes.

On traction motors, and on some fractional horsepower machines, higher pressures of 280-490gcm^{-2} (4-7 lbin^{-2}) are required.

How to measure spring pressure. Reference Fig: 4

Attach a spring balance to the tip of the finger and pull in a direction at right angles to the brush top until the finger just lifts from the top of the brush. The lifting point can be confirmed by just being able to slide the paper from beneath the brush face.

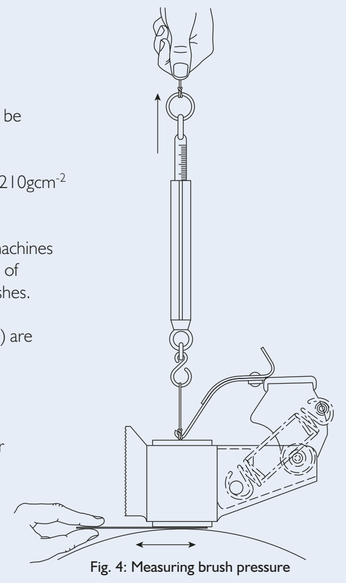


Fig. 4: Measuring brush pressure

Constant Force (CF) Springs

The characteristics of CF springs show the force is constant over a wide range of spring extensions, as the spring travels down the brush box the force remains constant until it has reached 0.8* Dia of coil.

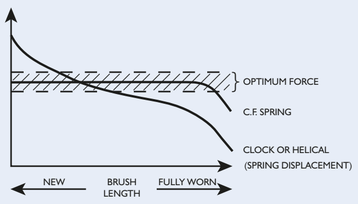


Fig. 5:

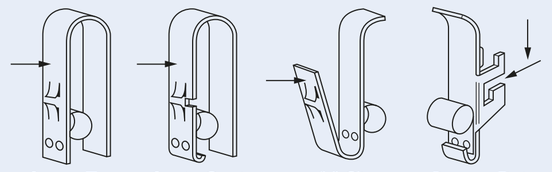


Fig. 6:

Care and handling of the C.F. spring unit

1. To release the spring unit (ref Fig: 6) apply pressure on the latching side of the clip, as shown by arrow. This will allow the clip to become free and rise out of the brush box under the tension between spring and brush.
2. When refitting, ensure that the spring clip is correctly placed in the brush guide and that the latching engages in the hole. Check by a slight pull on the clip to see that engagement is positive.
3. Check the Direction of the Brush top bevel (Ref Fig: 7).
4. Check that the spring locates in the groove both circumferentially and axially when using square top brushes.
5. Do not extend the spring by hand and allow it to recoil under its own force.

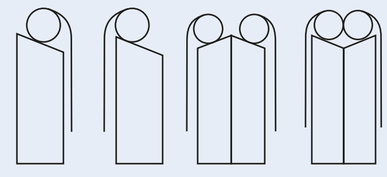


Fig. 7: Direction of brush top bevels

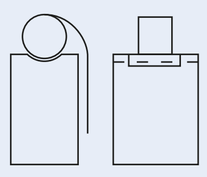


Fig. 8: Correct positioning of spring in top radius

Technical training courses available

For a more comprehensive insight into carbon brushes and electrical machines request price and availability of our 300 page Carbon Brushes and Electrical Machines Manual from Morgan Advanced Materials

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