

Technical Support – Rotating Machines

Mounting Brushes General Points

SAFETY

NB when working on rotating electrical equipment it is essential that basic safety guidelines are observed, e.g. ensure equipment is fully isolated before any work commences. Eye protection and facemasks must be used when bedding brushes and blowing out machine enclosures. Check with the site Health & Safety representative before conducting any work to ensure local safety procedures are complied with.

BEDDING

New brushes must be bedded to fit the commutator over their whole area of contact. Abrasive cloth is drawn between the brush and commutator until the brush assumes the correct curvature. It is important that the abrasive cloth is 'wrapped' around the commutator 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 commutator. For reaction brushes the cloth should be drawn against rotation. Alternatively a bedding stone held against the rotation commutator may be used.

After bedding, the holders and brushes must be thoroughly cleaned. Brushing and then blowing with a compressed air line is recommended followed by thorough vacuum cleaning to remove all debris.

CLEARANCE

After bedding and cleaning, check that the brushes are free to move easily in their boxes. The most suitable clearance between brush and box is dictated by the conditions, but 0.1mm (0.004) is usually a suitable value.

SPRING PRESSURE

The pressure on all the brushes of a set should be the same. Periodically brushes and holders should be cleaned and the pressure checked by means of a spring balance (see sketch below) or an electronic device such as a Bintpress D5. The applied pressure of most brush grades on industrial machines is generally 180g/cm² (2.5 lb/in²) or 210g/cm² (3 lb/in²).

Certain (treated) grades can best run at slightly higher pressures >210g/cm² (3lb/in²) – please contact your local Morgan representative for specific advice. With small brushes or on machines subject to vibration or with out of round commutators (and slip rings), it is advisable to use pressures up to 50% higher a range of 210 to 280g/cm² (3 to 4lb/in²). 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 to 490g/cm² (4 to 7 lb/in²) are required.

BRUSH HOLDERS

Brush holders should be set within 2 – 3mm (3/32" – 1/8") of the commutator surface, with front and back faces parallel with the commutator segments and mounted at the intended angle – i.e. at 90° in the case of radial holders.

Brush holders are sometimes staggered axially so that every track on the commutator is swept by an equal number of positive and negative brushes (the sketch on page ten shows the correct arrangement for a 6 pole machine). This will minimise the formation of wear ridges. Fuller information on this subject is available in the Morgan Publication on "Brush Stagger".

COMMUTATORS & SLIP RINGS

Commutators and slip rings should be smooth and true. A commutator which is in bad condition should be reground, or turned (see [Commutators - Surface Maintenance](#)). In general a commutator with a TIR (Total Indicated Reading) of greater than 70µm (0.003") and/or bar to bar variance of 7.5µm (0.0003") needs to be reground or turned.

If it is impossible to regrind a worn commutator, a commutator grinding stone can be used to reduce flats, ridges, high mica and rough spots. In this way the performance of the machine may be improved sufficiently to allow continued operation.

If the Mica is sufficiently recessed the segment edges should be bevelled and any flakes of mica adhering to the edges of the segments should be carefully removed (see sketch [here](#)).

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 (as sketch opposite). Adjust the spring tension on the holder until the spring balance reading is equal to that given by the formula.

$$T = P \times A \times K$$

Where T = spring balance tension in grams or lbs.

P = desired brush pressure in g/cm² or lb/sq".

A = brush cross section in cm² or sq".

K = top bevel factor.

Values for K for various angles of top bevel are:

	Factor K
Top bevel Less than 15°	1.0
15°	1.03
20°	1.06
25°	1.10
35°	1.22
40°	1.30

