

COPPER BRIDGING OF COMMUTATOR BARS (COPPER DRAGGING)

TECHNICAL NOTE ■ STA BE 16-43 GB

A fault generally noticed on grooved commutators, which is manifest by a slow development of feathers of copper at the edge of the commutator bar.

SPECIFIC PECULIARITIES

- When the phenomenon is not masked by secondary effects, dragging always results from a process of abrasion or by hammering of the metal and not by fusion.
- It takes the form of scales, or flakes or of "burrs" similar to that which remains attached to the trailing edges of the bars in the course of stoning or turning the commutator (*fig. 1*).



Fig. 1

- This dragging or feathering extends, circumferentially, the threaded area of the commutator bars and is more likely to be observed on the trailing edges of bars of unidirectional machines (*fig. 2*). End play of the rotor amplifies this phenomenon due to alternating axial motion of bars under the brushes.

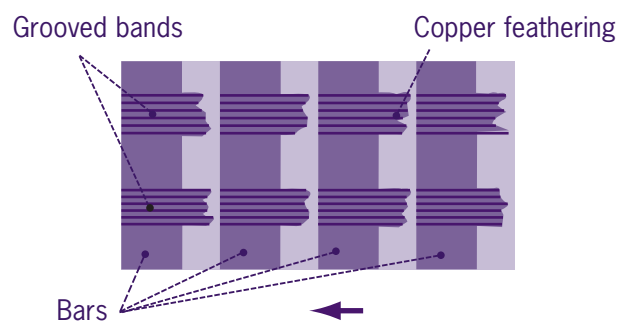


Fig. 2

ISO 9001: 2000 | ISO 14001

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CAUSES

A grade which is naturally designed to control its skin under special working conditions (slight polishing action) can become aggressive for the collector bars if these conditions are not respected.

- Severe and long overloadings ($J_B < 8A/cm^2$).
- Too heavy ventilation (especially in winter) or too cold air employed (a good capacity of filming needs a temperature of about 35 to 40°C minimum).
- Polluted surroundings by:
 - * abrasive dust (cement, talc, silica,...).
 - * aggressive chemical agent (such as silicone vapour, or silane).
- Unequal pressure on the brushes,
- Bad surface conditions of commutators after rectification (insufficient roughness, see Technical Note STA BE 16-1).

EFFECTS

Copper dragging can seriously shorten the life of a machine for if the interbar distance is reduced to zero by the completion of a copper bridge or even to a certain minimum distance there is a serious danger of destructive flashover.

The shorter the interbar distance and the higher the interbar voltage the greater is the danger. It is the case of motors without compensation winding having rapid load variations and/or with static feeding with high ripple level.

REMEDIES

- The best remedy involves frequent examination and removing the dragged copper as soon as it is noticed by means of a fibre-glass brush or similar tool. This operation is a preventive maintenance operation.
- Chamfer the edges of the bars and/or relieve the edges with an appropriate tool (diamond-shaped chisel).
- **If at all possible**, reduce the number of brushes on each arm so as to increase the current density in the remaining brushes. By this method, the risk of brush vibration is diminished, and, consequently, the hammering effect on the bars.
- **If at all possible**, replace the brush grade when the load (or loads) of the motor is known.

Applying the /T or /J treatment to the brushes is a compromise. It preserves the essential commutating properties of the grade and also reduces the risk of copper dragging.



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