

GHOST MARKING ON SLIP-RINGS OF SYNCHRONOUS MACHINES

TECHNICAL NOTE ■ STA BE 16-44 GB

SPECIFIC PROPERTIES

Ghost marks, which sometimes appear on bronze or steel rings of synchronous motors, or alternators, are in fact imprints of the brush contact face in the metal. Due to sparks provoked during each passage under the brush these ghost marks will rapidly develop if they are not corrected and will convert into flats leading to serious damage of rings.

CAUSES

There are two forms of mechanisms: by Electrolysis or by Electrical Discharge Machining.

I - Electrolysis

Ghost marks are formed on bronze or steel rings when the machine is **stopped** and on both polarities through a “primary cell” effect the two poles of which are the brush and the ring.

Electrolytic attack is especially strong when:

- the ambient atmosphere is very warm, humid and salty,
- the difference between ionization potentials of the brush and ring is large.

Electrolytic action is self-limiting but only slowly through anodic polarization.

Cures

The development of this defect can be checked by application of paraffin wax to the rings or the impregnation of the brushes with an appropriate wax solution. **These cures are partly effective only.**

There is only one sure method of preventing all risk of attack whilst the machine is stopped; it is to lift the brushes from their box or to insulate them from the ring by inserting some insulating paper between the brush and the ring.

This latter precaution is more particularly recommended for marine applications since electrolytic attack can develop very rapidly on shipboard or dockyard equipment.

II - Electrical Discharge Machining

The ghost marks form on the bronze or steel rings **in motion** and more frequently appear on the negative than the positive polarity in the case of synchronous machines.

The phenomenon can be slow or sometimes **instantaneous**.

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A **slow** development of marking results from the cumulative effect of weak electro-erosive action produced by repetitive sparking with each revolution, and always at the same precise point on the ring.

a) The sparking has an origin either electrical or mechanical:

- electrical overload of synchronous pulsating origin coming from a supply by thyristors with high amplitude residual fluctuation,
- periodic shocks coming from unbalance or other mechanical defects in the transmission or in the rotating mass, or a phenomenon of resonance of the brush and brush-holder.

Preventive cures

- Use high polishing grades (the grade selection depends upon the operating conditions: please contact us),
- Increase the brush pressure,
- Reduce the current density, mainly if the brushes are over loaded,
- **When possible**, use a special rubber abrasive or pumice stone to lightly abrade the surface on the appearance of sparking and search for the development of ghosting by stroboscope.

b) Instantaneous ghosting appears following a very short but very heavy current overload on the brushes. The cause is accidental as, for instance, the over voltage due to the unloading of an alternator under load. Breaking the current entails demagnetisation of the stator iron with a shock wave in the magnetising circuit.

The edges of the ghost marks in this particular case (Fig. 1) are marked in the tangential direction but blurred in the axial direction of the rings. The two blurred zones on each side of the main ghost mark allow the evaluation with acceptable precision of the time of the imprint formation (about 20 micro-seconds).

Cures

Protection of the excitation circuit against over voltage by a rotating assembly of variable resistors type “Carbohm” varistors.

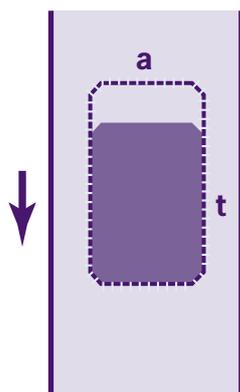


Fig. 1

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