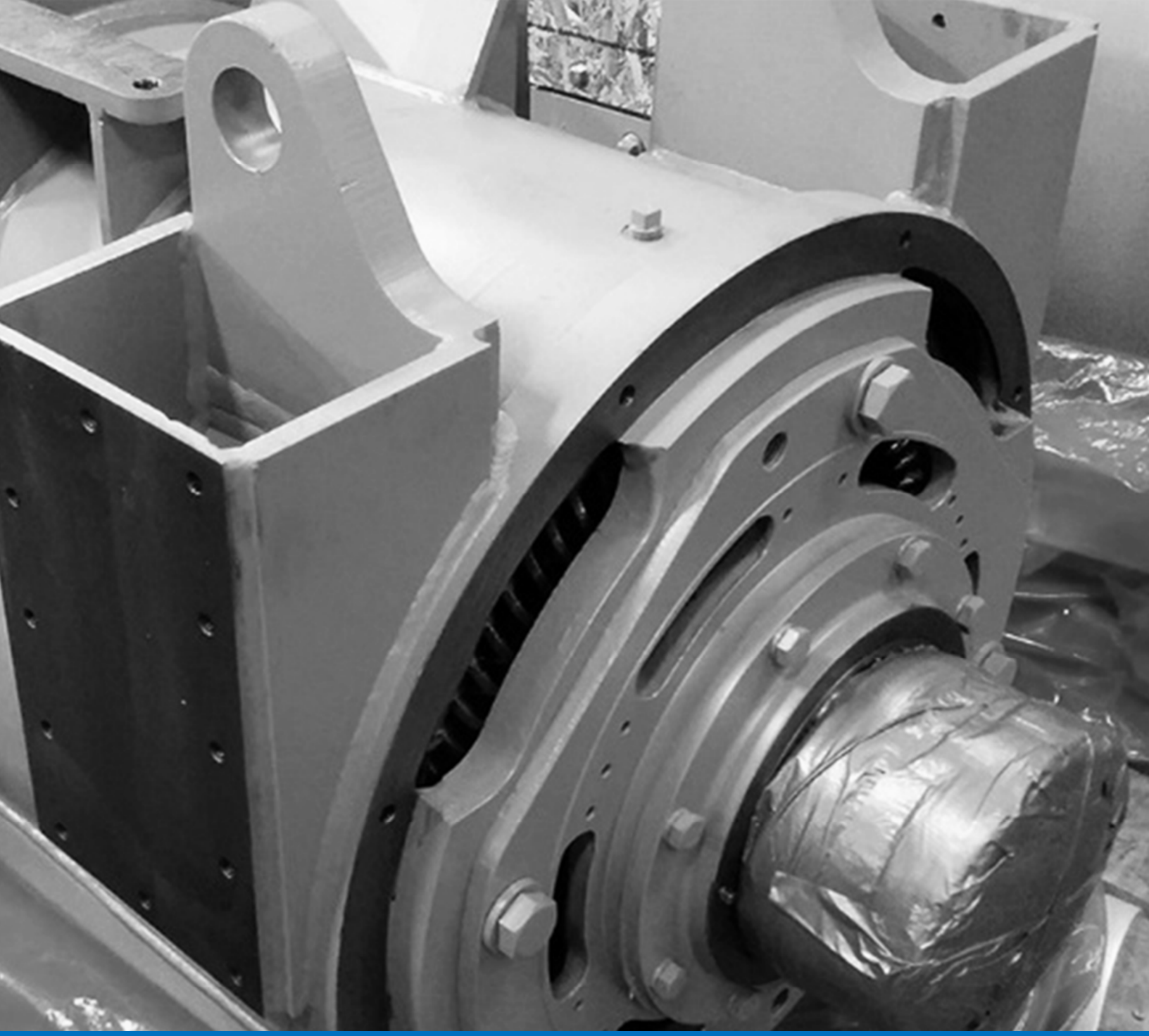

COMMUTATOR WEAR **GUIDE**

TECHNICAL INFORMATION EDUCATION SERIES

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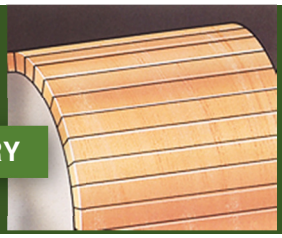
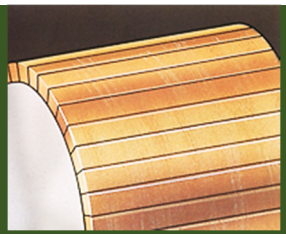
Commutator Appearance Guide

In addition to the physical appearance of the surface of the commutator, the skin or patina (film) is of equal importance for the good running of the carbon brushes. Each carbon brush builds a characteristic patina (film) which is affected by operating and ambient conditions. The patina (film) consists mainly of copper oxides, graphite deposits and absorbed water, and its appearance is of importance for the assessment of the running behavior of the commutation set. The following pictures are used by carbon brush manufacturers and users of brushes as a guide to assist in judging the operation of carbon brushes.

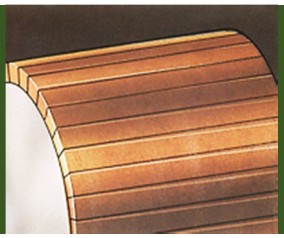
SATISFACTORY



LIGHT FILM: Indicates good brush performance. Light load, low humidity, brush grades with low filming rates, or film reducing contamination can cause lighter color.

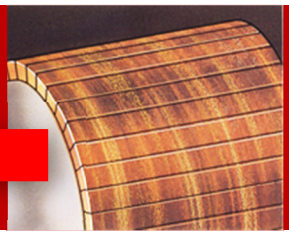


MEDIUM FILM: Is the ideal commutator condition for maximum brush and commutator life.

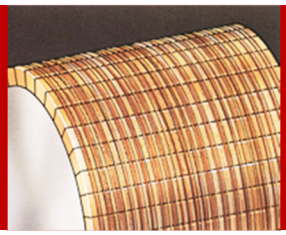


HEAVY FILM: Results from high load, light humidity or heavy filming rate grades. Colors not in the brown tones indicate contamination resulting in high friction and high resistance.

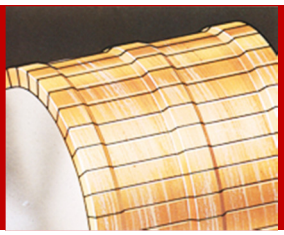
WARNING



STREAKING: Results from metal transfer to the brush face. Light loads and/or light spring pressure are the most common causes. Contamination can also be a contributing factor.

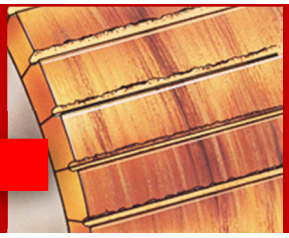


THREADING: Is a further development of the streaking condition as the metal transferred becomes work hardened and machines into the commutator surface. This condition can be avoided by increased loads and increased spring pressure.

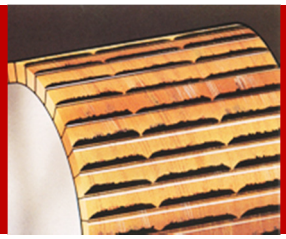


GROOVING: May result from an overly abrasive brush grade. The more common cause is poor electrical contact resulting in arcing and the electrical machining of the commutator surface. Increased spring pressure reduces this electrical wear

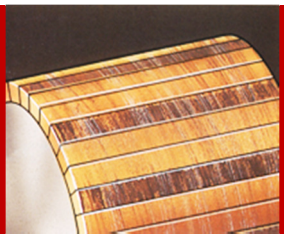
WARNING



COPPER DRAG: Develops as the commutator surface becomes overheated and softened. Vibration or an abrasive grade causes the copper to be pulled across the slots. Increased spring pressure will reduce commutator temperature.



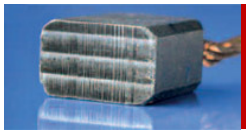
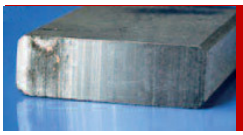
BAR EDGE BURNING: Results from poor commutation. Check 1.) that the brush grade has adequate voltage drop, 2.) that the brushes are properly set on neutral, and 3.) that the interpole strength is correct



SLOT BAR MARKING: Results from a fault in the armature windings. The pattern relates to the number of conductors per slot.

Carbon Brush Performance Assessment

Notice the appearance of the brush sliding face. The following pictures show typical brush sliding faces. For easy identification, we suggest you use the symbols S1, S3 etc. S1, S3 and S5 are satisfactory sliding faces, indicating that there are no mechanical or electrical problems. Depending on the carbon material, the sliding surface appears dense or porous, and shiny, dull or matte. If there is dust in the circulating air, fine hair-lining may occur, as shown in S5.

	S1 Dense, shining sliding face	Normal operation
	S3 Slight porous sliding face	Normal operation
	S5 Fine hairlining	Normal operation, slight dust influence
	S7 Hairlining	CAUSES Underload; influence of dust, oil, or grease, weak spring pressure
	S9 Tracking with hairlining and grooves	CAUSES Like S7, but stronger
	S11 Ghost marks, difficult commutation	CAUSES: Commutation problems, e.g., false or incorrect position of the neutral zone or interpole
	S13 Burning edge of leaving or trailing edge	CAUSES: Difficult commutation, heavy sparking, interruption of contact due to out of round of commutator or insufficient brush holder spring pressure
	S15 Eroded brush face	CAUSES Electrical overload, interruption of contact
	S17 Lamination of sliding face	CAUSES: Burned segments of the sliding face, caused by a winding fault giving voltage surge during commutation
	S19 Double facing here for a twin brush	CAUSES Tilting of the brush in dual direction machine
	S21 Copper nests	CAUSES Pick up of copper particles, often following copper drag
	S23 Broken edges	CAUSES: High raised lamination, commutator seriously out of round, brush chatter by low load and idle running

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