



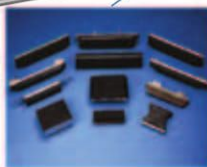
Aegis SGR™



Wheel Flange  
Lubrication



Earthing Unit



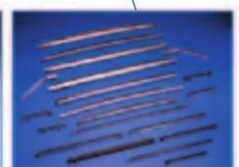
3rd Rail Shoes



Holders



Brushes & Contacts



Pantograph Carbons

**Morgan AM&T is a leading global supplier to the Railway Industry, providing products, services and solutions for electric motors and current collector systems.**

Morgan AM&T spans the world, supplying not only carbon pantograph strips but also carbon brushes, brush holder assemblies, third rail shoes, earthing units and expertise.

By combining our product range and technical expertise we can assist in optimising system performance. Morgan AM&T has highly trained Technical Sales Engineers for local support, backed up by a team of Traction Experts and together they provide technical solutions for all our customers.

**Morgan AM&T work with all major global OEM's, Railways and Urban Transport Systems.**

**Morgan can offer:-**

- Local sales engineering support
- Application engineering technical support team to investigate problems and offer solutions.
- Design improvements for better performance and reliability.
- Over a 100 years of traction experience.
- Material technology & development facilities
- Machine Test Centre to simulate field conditions
- Technical training courses either held at the customer's site, a Morgan regional business unit or in our technical centre of excellence.



#### Typical design Features

Pressure systems employing clock springs for robust performance. Constant force Springs for compact designs. Copper based alloys have become established as optimum for the holder bodies.

Brush pockets are broached to give the required tolerances, IEC136 being widely accepted as the industry standard. Surface finishes, such as electroplating or painting can be applied when required.

#### End Mounted assemblies

End mounted holder assemblies complete with supports and terminal plates. Typical of designs supplied for use on battery locos, light rail and metro applications. Either clock springs or constant force springs may be specified.

#### Earth Return Current Units

Employing novel materials and design, Morgan has developed units for a variety of applications including Locomotive, EMU and Light Rail solutions.

#### Pins, Pillar & Insulators

Double ended mounting pins, pillars and stand off insulators. Moulded in either high strength GRP with excellent electrical and mechanical properties or mica glass for special high temperature requirements.

#### Spring Clips

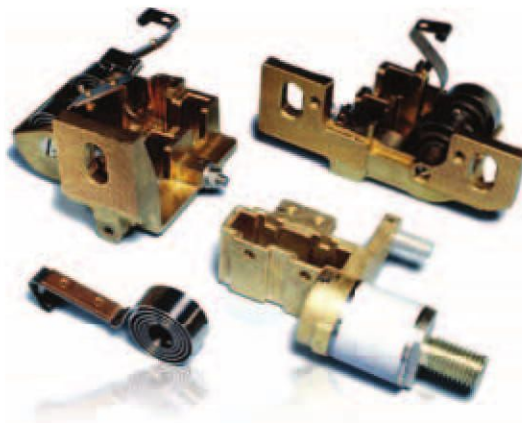
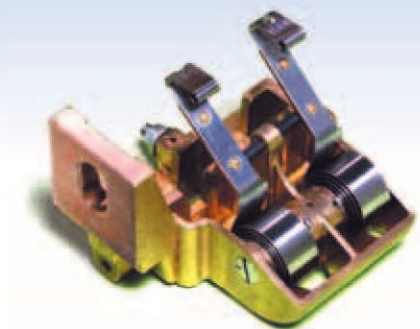
In addition to offering a wide range of class leading carbon brush materials, we are able to offer brush holders and their components such as replacement springs clips.

#### Engineering Innovation

Our design team will take your current product and re-engineer it to optimise performance and improve reliability

#### Morgan New Improved Re-design

- Design review
- Individual brush pockets to improve commutation and contact.
- Adopt semi-captive C/F.
- Springs can be replaced in situ.
- Include spring hold off facility.
- Weight reduction.







DC traction systems have inherent differences to their industrial counterparts having to cope with increased levels of vibration and thermal shock as a result of rapidly changing load currents. The advent of fast switching thyristor control and regenerative braking have added to the harsh conditions already experienced by the carbon brush which is a vital part of the current carrying chain, so it is imperative that the correct grade of brush is chosen to optimise the performance and reliability of the equipment.

Morgan AM&T the World's number one traction brush supplier offers a wide range of materials and design expertise to minimise the effects of harsh running conditions.

Morgan is an established, experienced high performance brush manufacturer with over 100 years experience in serving the traction industry. Optimum brush grades are developed in the global centres of excellence, using our own testing facilities for in house development and customer support.

Sharing knowledge and experience, Morgan will give local technical support backed up by a global team of application engineers.

By specifying a Morgan brush holder and brush our customers are safe in the knowledge that they are optimising the reliability and operation of their equipment and they have added advantage of the ease of access to Morgan's world wide technical support.



## Morgan AM&T Traction Grade

### Traction Grade suggestions

			GRADE		C12	CM1S	DE3	DE7	DE7000	DE8	DE9000	EG105	EG105S	EG114	EG116	EG14D/EG116S	EG236S	EG259	EG260	EG268	EG275/EG284/ME776	EG3	EG6749N	H100	IM9101/IM26	ME393/ME373/ME353	N19	N2000	N4	N48	N6000/ME377	PM50P	TA35R
DC Traction motors	Freight	DC																															
		Rectified AC																															
		Thyristor																															
		Chopper																															
	Passenger loco (high speed)	DC																															
		Rectified AC																															
		Thyristor																															
		Chopper																															
	Suburban EMU (passenger)	DC																															
		Rectified AC																															
		Thyristor																															
		Chopper																															
	Metro/rapid transit	DC																															
		Rectified AC																															
		Thyristor																															
		Chopper																															
Trolley bus/tram	DC																																
	Rectified AC																																
	Thyristor																																
	Chopper																																
AC Traction	AC commutator drive																																
Auxiliaries	Generators/excilers																																
	Compressors																																
	Blowers/vent fans																																
	Pumps																																
	MA sets																																
Earthing																																	



#### 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.

S1



#### Burnt Edges

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

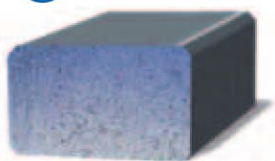
S7



#### Open Textured Surface

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

S2



#### Pitted Surface

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

S8



#### 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.

S3



#### Laminated Surface

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

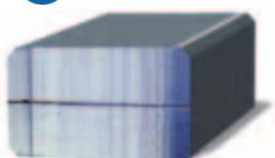
S9



#### Finely Serrated Surface

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

S4



#### 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.

S10



#### Heavy Serrated Surface

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

S5



#### Copper Particles

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

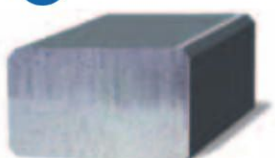
S11



#### 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.

S6



#### Chipped Edges

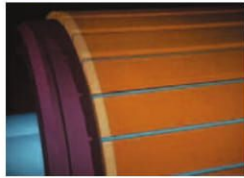
Normally occurs on the leading (entering) edge of the brush. Breakage can result from poor commutator profile, high micas and severe brush instability.

S12

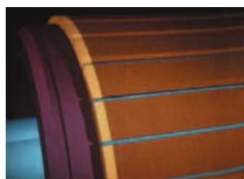


**Light Film**

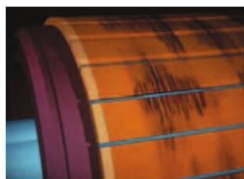
over the entire commutator surface is one of the many normal conditions often seen on a well functioning machine. Film tone is dependent on the brush grade and current density.

**P1****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.

**P2****Blotchy Film**

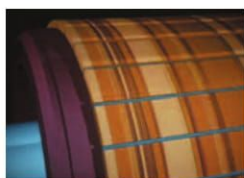
this nonuniform filming condition is the most common appearance. The accumulated tolerances in the machine such as commutator roundness, brush contact pressure, unequal magnetic fields and chemical vapors all contribute to this type of film development.

**P3****Slot Bar Filming**

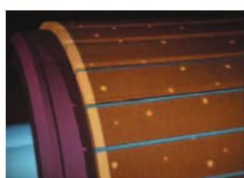
repeating light and dark filming patterns related to the number of armature coils per slot. This pattern is dependent on the machine design and usually not a function of the brush grade.

**P4****Streaking**

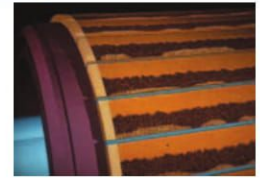
if only the film is not detrimental to the commutator. Brush and commutator life are not at risk in this condition. If metal transfer develops, this condition will progress into threading. This type of filming can be dependent on current density or brush grade.

**P5****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.

**P6****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.

**P7****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 adjustment of the machine can cause this condition. This condition severely damages the commutator and reduces brush life.

**P8****Patina Streaked with Collector Wear**

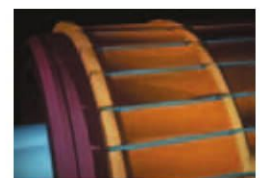
A streaky film with no commutator wear, tracks can vary in width and colour. Caused by atmospheric conditions (humidity, oil vapour or other gases) or insufficient load.

**P9****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.

**P10****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.

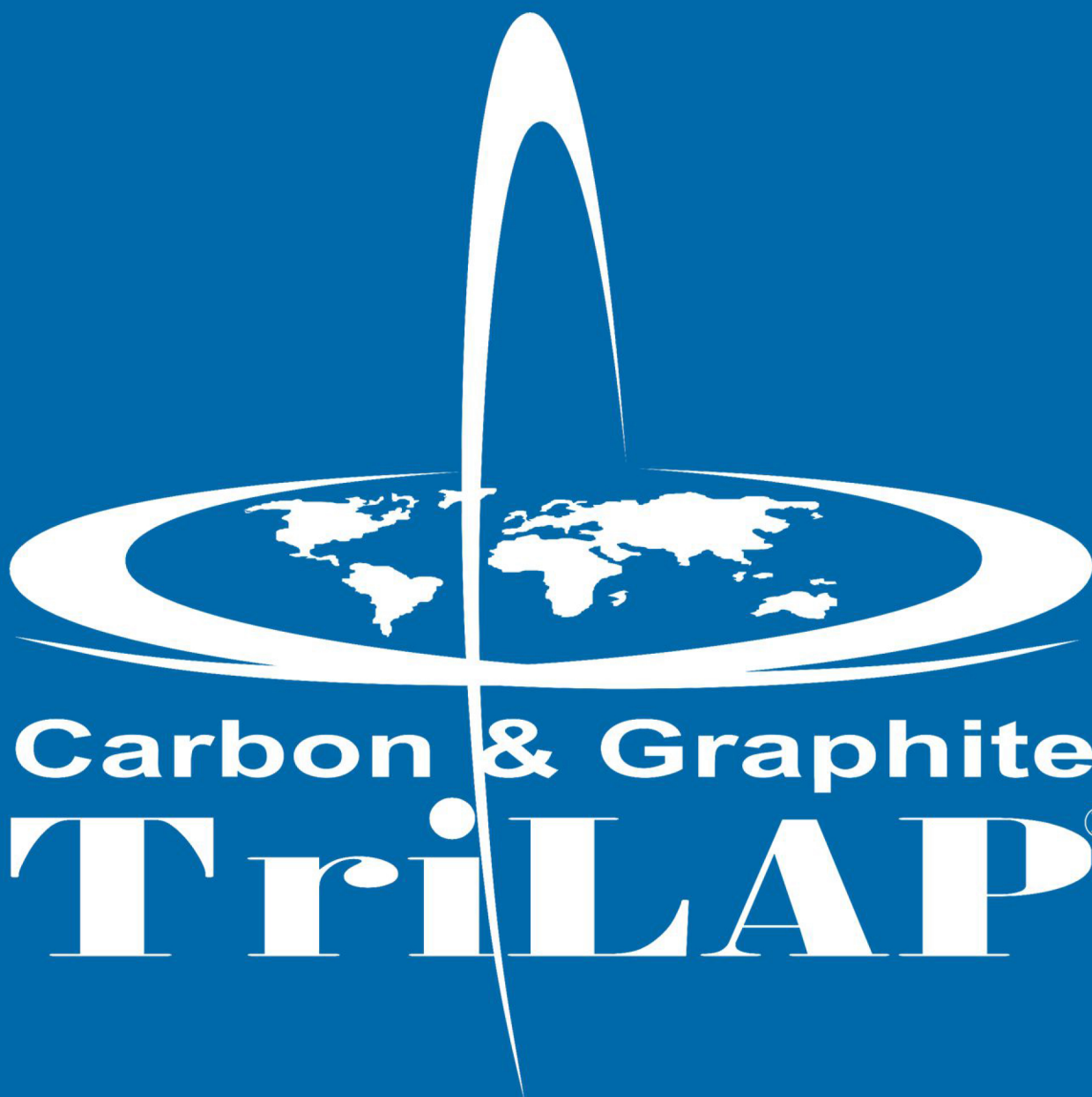
**P11****Copper Drag**

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.

**P12**



	M	N
Serration and grooving of commutator or slip ring		Wear of slip ring on one polarity
Excessive commutator wear		Copper picking in brush face
Copper dragging		Brush chatter
Excessive commutator wear or slip ring wear-bright surface		Commutator surface streaky
Unequal brush wear		Commutator has unsymmetrical burn marks
Rapid brush wear		Commutator has symmetrical burn marks
Flexible burnt out or discoloured		Commutator has wavy pattern
Brushes and brush holders too hot		Ghost marks on steel slip rings
Commutator-slip ring-too hot		Glazed contact surface of brush
parking vicious and trailing around commutator		Pitted contact surface of brush
Green in sparks		Chipping of brush edges or brush breakage
Sparking at entering edge		Failure to develop a protective skin
Sparking at leaving edge		Insufficient voltage on self exciting machines
PROBABLE CAUSE OF TROUBLE	A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	REMEDY
Interpole Field too strong	x x	1 Weaken interpole by divert or by increase gap
Interpole field too weak	x x	2 Strengthen interpole fields by reducing air gap
Interpole air gap too small	x x	3 Enlarge air gap to decrease effective interpole flux
Interpole air gap too large	x x	4 Reduce air gap to increase effective interpole gap
Air gaps uneven?(bearings worn)	x x	5 Renew bearings and realign machine
Overload machine	x x x	6 Reduce and limit load on machine
Vibration from external causes, i.e. Prime mover,nearby forge hammer etc.	x x x	7 Locate and remove cause of vibration or mount machine on shock absorbers
Vibration from internal causes, i.e. out of balance, poor alignment etc	x x x	8 Balance armature and check for bearing wear
Quasi electrolytic wear of slip ring	x	9 Reverse the polarity of rings periodically
Oil and dirt on commutator or slip ring	x x	10 Clean commutator or slip ring
Resistance between brushes and brush arms not uniform	x x	11 Clean and tighten the connections
Grains of abrasive in brush contact face	x x	12 Re bed and clean the brush face
Faults in armature winding or equaliser connections	x x x	13 Locate and cure fault or consult manufacturer
Mica proud	x x	14 Recess mica, or use more abrasive brush
Commutator or slip ring eccentric	x x x	15 Turn or re grind preferably at near rated speed
Commutator riser connections open circuited	x x x	16 Re-solder connections
High or low commutator segments	x x	17 Tighten commutator, turn, or re-grind
Commutator loose	x x	18 Tighten commutator, re-mica if necessary,turn or re-grind
Flats on commutator or slip ring	x x x	19 Locate and remove cause of flattening, turn or re-grind
Spring pressure too low	x x x x x x x x x x x x x x	20 Adjust spring pressure to that recommended for brush grade
Spring pressure too high	x x x x x x x	21 Adjust spring pressure to that recommended for brush grade
Spring pressure unequal	x x x x x x x	22 Adjust spring pressure uniformly to that recommended for brush grade
Brush grade unsuitable for machine duty	x x x x x x x x x x x	23 Select one of our alternative grades or ask for our recommendation
Brush arc of contact excessive	x x x x x x x x x x x	24 Reduce the effective thickness of brush, preferably consult manufacturer
Brush arc of contact insufficient	x x x x x x x x x x	25 Apply suitable circumferential stagger, preferably consult manufacturer
Brush flexible connection faulty	x x x x x x x	26 Fit a new brush with a sound flexible connection
Brush flexible too short or too stiff	x x x x x x	27 Use brushes with flexible of correct length & flexibility
imperfect brush bedding in	x x x x x x	28 Bed brushes by our recommended method
Radial brush holders mounted at small reaction angle	x x x x x x x x x x x	29 Adjust holders to a radial position, & correct distance from comm
Reaction type holder mounted trailing	x x x x x x x x x x x	30 Reverse holders or direction of rotation
Brush sticking or sluggish in brush holder	x x x x x x x x x x x	31 Check that brush size is correct, clean brushes and holders, remove any burrs
Brushes too loose in brush holder?(holders worn)	x x x x x x x	32 Replace holders ,or order brushes of correct dimension
Terminal connections loose or dirty	x x x x x x	33 Clean terminals and terminal block. Tighten screws
Brush holder mounted too far from commutator or slip ring	x x x x x x x x x x	34 Adjust holder to be 2mm from commutator
Incorrect brush position	x x x x x x x x x x	35 Adjust holders to correct position
Unequal brush holder spacing or alignment	x x x x x x x x x x	36 Correct spacing and alignment of holders
Humidity of atmosphere low	x x x x x x	37 Humidify the cooling air or draw air from normal humidity source
Humidity of atmosphere excessive	x x x x x x	38 Enclose machine or draw cooling air from normal humidity source
Dusty atmosphere	x x x x x x	39 Remove cause if possible or install filter
Gas or acid fumes in atmosphere	x x x x x x	40 Arrange clean air cooling
Long periods of low or steady loads.	x x x x x x	41 Change brush grade, ask for recommendation



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