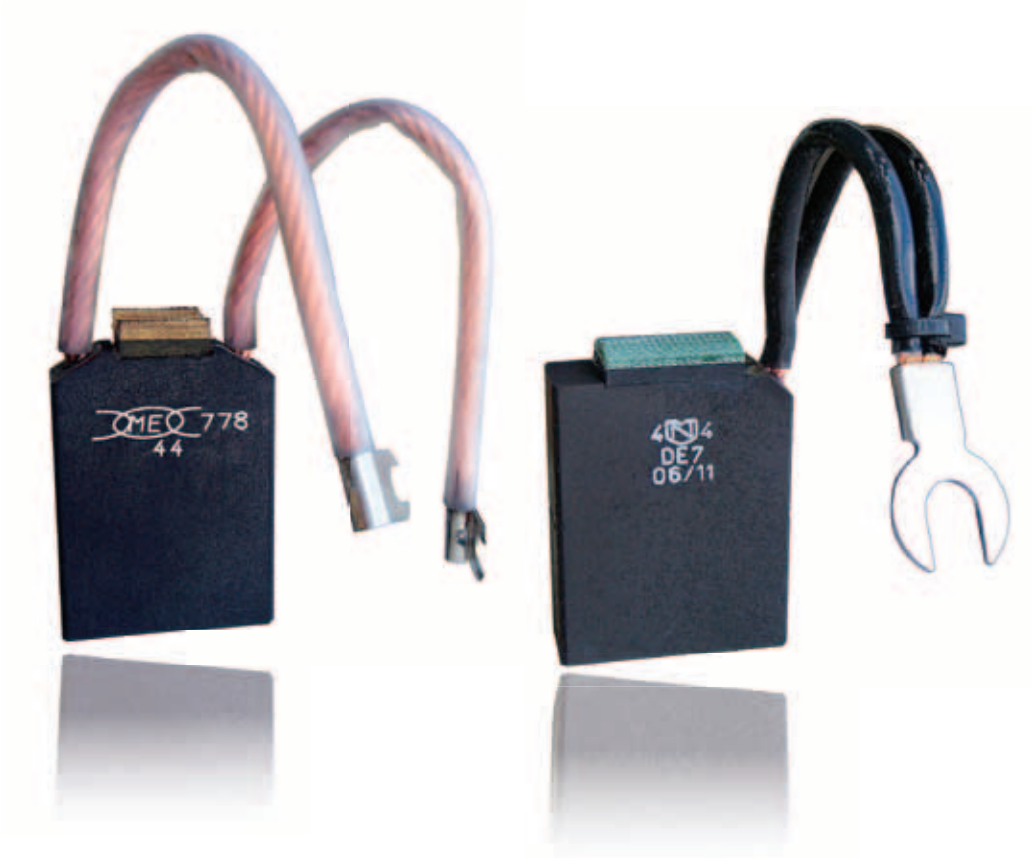
Morgan AM&T™

Traction Brush & Brush Gear

TriLAP® Carbon & Graphite

trilap.com.vn



Morgan Crucible

Morgan AM&T (Advanced Materials and Technology)
is a Business of The Morgan Crucible Company plc

Innovating tomorrow's solutions today

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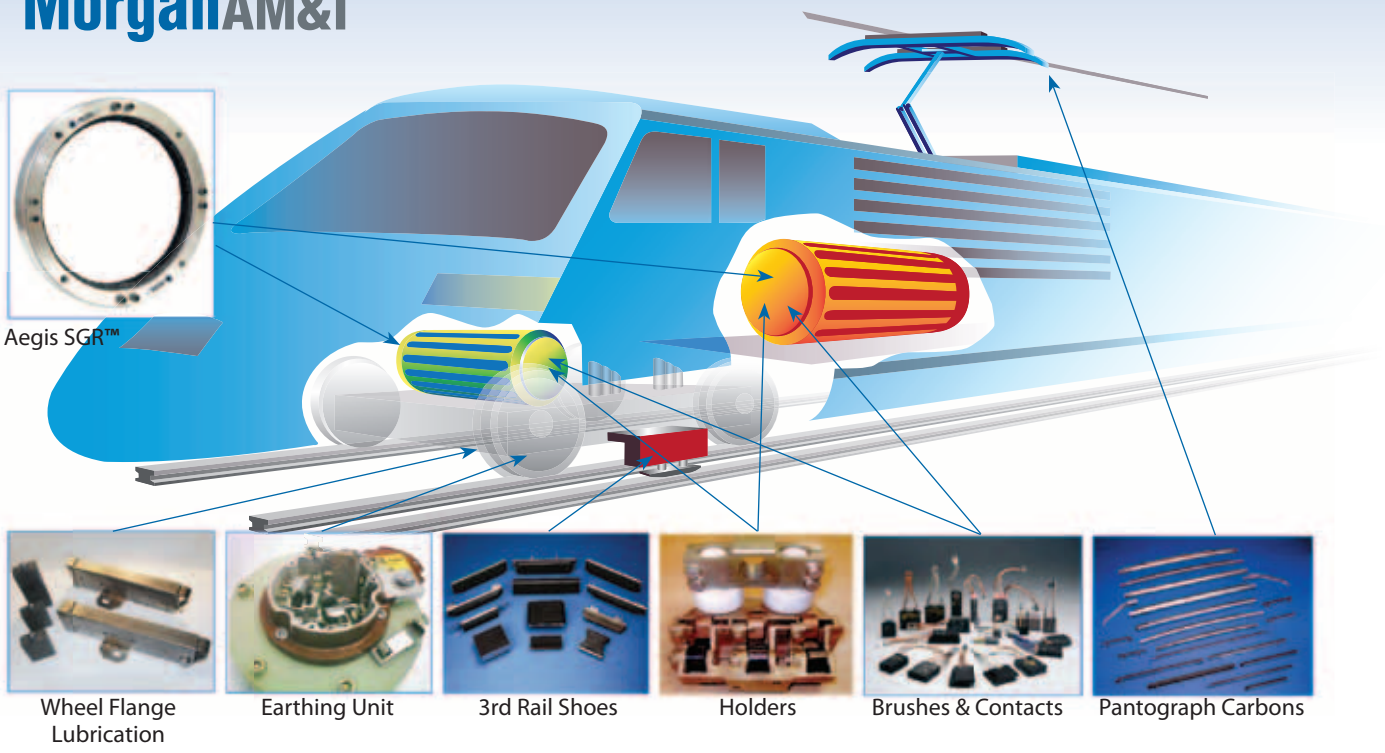


Morgan AM&T is a leading global supplier to the Railway Industry, providing products, services and solutions for electric motors and current collector systems.

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.

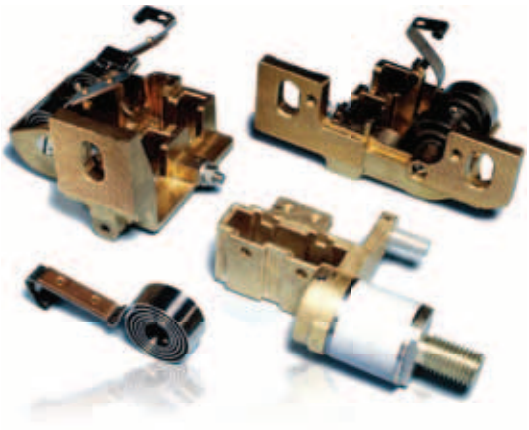
Typical design Features
Pressure systems employing clock springs for robust performance. Constant force Springs for compact designs. Copper based alloys have become established as optimum for the holder bodies.

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.

Traction Grade suggestions

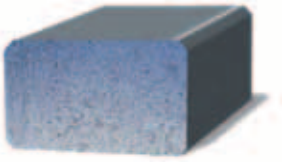
		GRADE	C12	CM1S	DE3	DE7	DE7000	DE8	DE9000	EG105	EG105S	EG114	EG116	EG14D/EG116S	EG236S	EG259	EG260	EG268	EG275/EG284/ME778	EG3	EG6749N	H100	IM9101/IM26	ME393/ME373/ME353	N19	N2000	N4	N48	N6000/ME377	PM50P	TA35R
DC Traction motors	Freight	DC				o	o		o		o			o		o		o	o					o							
		Rectified AC				o	o		o					o				o	o					o							
		Thyristor				o	o		o		o		o	o				o	o												
		Chopper				o	o		o		o		o	o				o	o					o							
	Passenger loco (high speed)	DC				o	o		o	o	o					o			o							o			o		
		Rectified AC				o	o		o	o	o					o			o							o			o		
		Thyristor				o	o		o	o	o					o			o							o			o		
		Chopper				o	o		o	o	o					o			o							o			o		
	Suburban EMU (passenger)	DC				o							o	o		o			o		o					o			o		
		Rectified AC				o							o	o		o			o		o					o			o		
		Thyristor				o							o	o					o		o					o			o		
		Chopper				o							o						o		o					o			o		
	Metro/rapid transit	DC			o								o	o		o			o					o	o	o	o				
		Rectified AC			o								o	o					o					o	o	o	o				
		Thyristor			o								o	o					o					o	o	o	o				
		Chopper			o								o						o					o	o	o	o				
	Trolley bus/tram	DC			o		o						o						o					o	o	o	o				
		Rectified AC			o		o						o						o					o	o	o	o				
		Thyristor			o		o						o						o					o	o	o	o				
		Chopper			o		o						o						o					o	o	o	o				
AC Traction	AC commutator drive																		o								o	o			o
Auxiliaries	Generators/exciters							o				o			o		o						o					o			
	Compressors		o																o				o							o	
	Blowers/vent fans													o								o	o							o	
	Pumps														o																
	MA sets																		o				o								
Earthing				o																											

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

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

S2

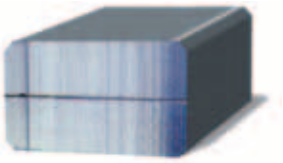


Finely Lined Surface
Another satisfactory condition. Fine lines indicate the presence of dust in the atmosphere.This may be overcome by the use of filters or ducting the machine's air supply from another area.

S3

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

S4

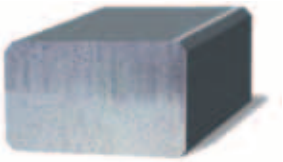


Heavy Serrated Surface
As (4) above, but problem is more severe or has been allowed to continue for longer.

S5

Ghost Marked Surface
This may be associated with difficul t commutation and can arise from incorrect neutral position, interpole problems or other causes of poor commutation.

S6

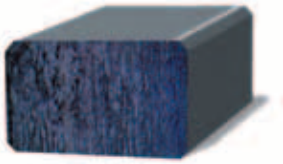


Burnt Edges
Normally occurs on the trailing edge of the brush. Caused by poor commutation and heavy sparking.

S7

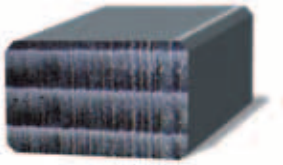
Pitted Surface
Indicates heavy under-brush sparking as a result of current overload or brush instability.

S8



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

S9



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

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

S11

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.

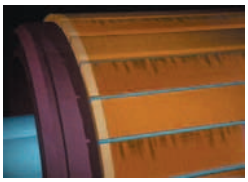
P2

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

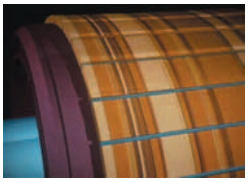
Slot Bar Filming
repeating light and dark filming patterns related to the number of armature coils per slot.This pattern is dependent on the machine design and usually not a function of the brush grade.

P4



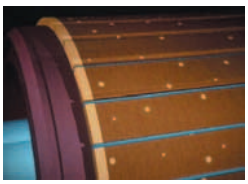
Streaking
of only the film is not detrimental to the commutator. Brush and commutator life are not at risk in this condition. If metal transfer develops, this condition will progress into threading.This type of filming can be dependent on current density or brush grade.

P5



Bright Spots
Bright spots in the film suggest poor contact or overloading. the resultant under-brush sparkling 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 ad justment 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 iltering 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

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

Morgan AM&T™

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(Morgan AM&T Vietnam)

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