

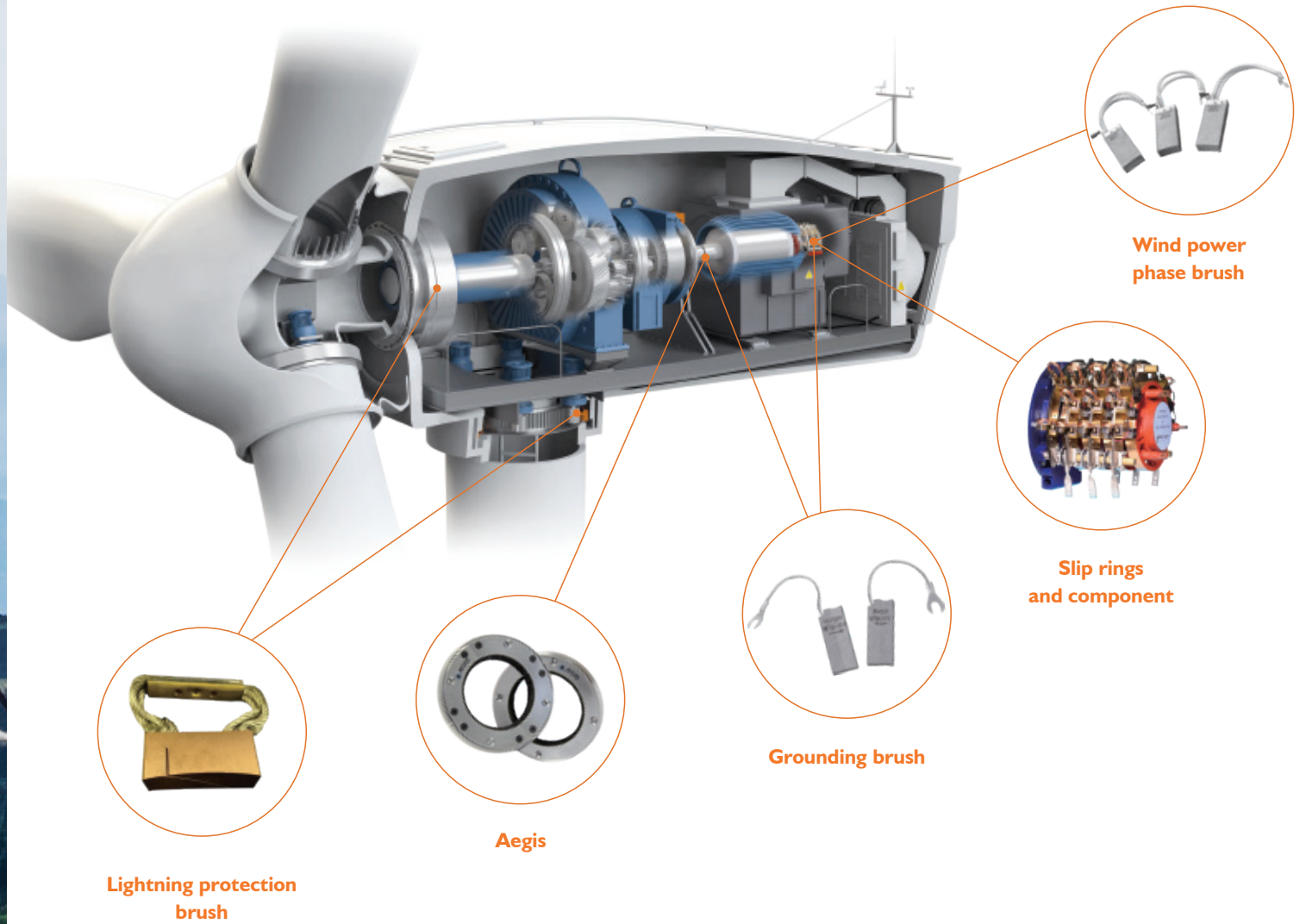


# Innovative and custom solutions for wind power



Performance Carbon





# Performance Solutions for Wind Power

As global demand for renewable energy continues to increase, the locations of new wind farm developments are becoming more remote and challenging from both a service and climatic perspective.

Morgan Advanced Materials has developed and continues to develop class leading products for all the environments. Our brush grades, slip ring and holder solutions offer optimum performance. Our focus is to reduce the cost of ownership of the systems we offer. Our carbon brushes provide class leading performance in terms of brush and slip ring life in all environments. Service times are reduced, offering significant savings to the operator. Morgan has tailored our carbon brush portfolio to give optimal performance on both stainless steel and bronze slip rings.



Our extensive range of products seamlessly integrates with the industry's most renowned Original Equipment Manufacturer (OEM) brands, ensuring reliability, compatibility, and peak performance.

Join the ranks of industry leaders who rely on the synergy between our products and leading OEM brands to drive success. Elevate your projects, streamline operations, and unlock new possibilities with Morgan.

Multibrand - Most Popular with Morgan			
OEM	Platform	Generator	Solution
Siemens Gamesa	G4X/G5X, G8X/G9X, G114/G126, G132/G145, SG4X MKI, SG4X MKII, SG5X, SG13 GE1X, GE2x, GE3X	Cantarey, Indar, ABB	Power & Earth Brushes, Brush Holders, Slip Rings, Lightning Brushes
GE	GE 1X, GE 2x, GE 3X	ABB, Winergy, VEM, Toshiba, Indar, GEPC, Gamak, Hitachi	Power & Earth Brushes, Brush Holders, Slip Rings
Nordex	N80, N90, AW1500, AW3000	Winergy, Indar, ABB, Cantarey, Elin, Siemens	Power & Earth Brushes
Vestas	V52, V66, V80, V90, V100, V110	Vestas	Power & Earth Brushes, Brush Holders, Slip Rings
Suzlon	S88, S97	Suzlon	Power & Earth Brushes
Senvion	MM82, MM92	VEM, Winergy	Power & Earth Brushes
Alstom	ECO122	Indar, Gevisa	Power & Earth Brushes
Inox	DF93.3, DF100, DF113	ABB, Shanghai Electric, Leroy Somer	Power & Earth Brushes
Shanghai Electric	W2000C-99-80, W2000C-105-80, W2000C-105-90	Shanghai Electric	Power & Earth Brushes, Brush Holders, Slip Rings, Lightning Brushes
DEC	FD77B	DEC	Power & Earth Brushes, Brush Holders, Slip Rings
UNITED POWER	DFWG1500,SKYFKK2500, DFWG2000,DFWG3100,SKYF3150, UP1500,UP2000	XEMC, UNITED POWER	Power & Earth Brushes, Brush Holders, Slip Rings
CRRC	FYKK07_B,FYKK03,FYKK17, FYKK07_D,FYKK06,	CRCC	Power & Earth Brushes, Brush Holders, Slip Rings
SANY	XSYPDJ2011-080	SANY	Power & Earth Brushes, Brush Holders, Slip Rings
SINOVEL	SL1500	SANY	Lightning Brushes
Windey	DFWG1500,SKYFKK2500, DFWG2000,DFWG3100,SKYF3150	XEMC	Power & Earth Brushes, Brush Holders, Slip Rings

# Carbon Brushes for Wind Turbines

Elevate the performance of your wind turbine generators with Morgan's carbon brushes. Our brushes routinely exceed industry standards, increasing current brush life without compromising slipping integrity and minimizing dust generation.

Our comprehensive range covers all essential applications, including Phase, Earth, Lightning Protection, and Pitch Control brushes. With a relentless commitment to innovation, Morgan continually enhances our materials to push the boundaries of reliability, component longevity, and maintenance reduction to unprecedented levels. Benefit from Morgan's unparalleled material expertise, with our versatile grade portfolio that deliver optimal performance, even in the harshest environments.



## Carbon Brushes

### Product Features

- Stable patina formation to minimize friction
- Tailored materials for slipping type if required
- UL and DIN specification accommodated

### Main Advantages

- Maximize brush life
- Minimize collector wear
- Minimize dust generation
- Global engineering support

### Customer Benefits

- Reduce maintenance requirements
- Less turbine downtime
- Significantly reduced cost of ownership





### Nominal Values of Carbon Brushes for Wind Turbine Applications

	Grade	Continuous Current Rating		Continuous Speed Rating		Resistivity		Bulk Density		Metal Content	Common Application
		A/cm <sup>2</sup>	A/in <sup>2</sup>	m/s	ft/s	μΩm	10 <sup>-4</sup> Ω in	g/cm <sup>3</sup>	lb/ft <sup>3</sup>	%	
Phase Brushes	MG1127	12	78	45	148	3.80	1.50	2.44	152	30	Low Load Bronze Rings <850kW
	MG1157	18	118	40	131	3.30	1.30	2.98	186	50	Steel Rings, Film Forming Cold Environments
	MG1147	18	118	40	131	3.20	1.26	2.95	184	50	Steel Rings, High Wind, Standard Environments
	CM9	18	118	35	115	2.00	0.79	2.90	181	50	Steel Rings, Standard Environments
	LL587	18	118	30	98	1.78	0.70	3.26	204	50	Optimal life, Steel Rings, All Environments
	M50BR	18	118	30	98	2.00	0.79	3.20	200	50	Optimal life, Bronze Rings, All Environments
	M50X	20	131	30	98	1.78	0.70	3.15	197	50	Optimal Life, Bronze and Steel Rings
Grounding Brushes	S4149	25	164	30	98	0.25	0.10	3.70	231	65	High Load Silver Grade, All Environments.
	S4189	16.5	108	50	164	18	7.09	1.68	105	8	High Speed Grounding, Stable Contact
	MA1127	-	-	40	131	-	-	-	-	20	Dual Grade Shaft Grounding
	MA399	15	96	30	98	17.8	7.01	1.66	103	-	Applicable to Various Environments
	MA1147	15	96	45	147	1.94	0.77	2.65	165	47	Normal Environment
	CM9	18	118	35	115	2.00	0.79	2.90	181	50	Standard Shaft Earthing Steel
	M50BR	18	118	30	98	2.00	0.79	3.20	200	50	Optimal Life, Shaft Earthing, Steel/Bronze
	538	18.6	122	30	98	6.9	2.72	2.86	179	58	Standard Shaft Earthing Steel
Lightning Protection Carbon Brush	S4165	20	131	30	98	0.6	0.24	3.5	219	64	Standard Shaft Earthing Steel/Bronze
	634/S4149	-	-	30	98	-	-	-	-	65	Dual Grade Shaft Grounding
	MG1165	20	131	30	98	0.65	0.26	4.00	250	68	Lightning Protection Carbon Brush
	MG1190	25	164	30	98	0.32	0.13	5.5	34	89	Lightning Protection Carbon Brushes, Higher Current Carrying Capacity
	CM5H	-	-	30	98	0.3	0.12	4	250	67	Hub and Yaw Lightning Protection

Note: Quoted figures are nominal values. For advice on your specific application and to discuss the full range of Morgan materials available please contact your local Morgan Application Engineer

Selecting the right materials is crucial for optimal performance, and Morgan's global team stands ready to provide tailored recommendations and solutions that meet your exact needs.



# Slip Rings and Brushgear for Wind Turbine Generators

Discover Morgan Advanced Materials' comprehensive wind solution offerings, providing complete brush, rocker, holder, and slip ring system in sizes ranging from 144mm to 450mm in diameter.

## Grounding Technology

### Product Features

- Bespoke holder conversions, improved multi-point radial contact, increased brush lengths
- AEGIS® high frequency shaft grounding technology, with split rings and segments

### Main Advantages

- Improved bearing protection
- Reduced collector wear
- Improved brush life and reduced dust generation

### Customer Benefits

- Less turbine downtime
- Reduced cost of ownership



## Springs

### Product Features & Benefits

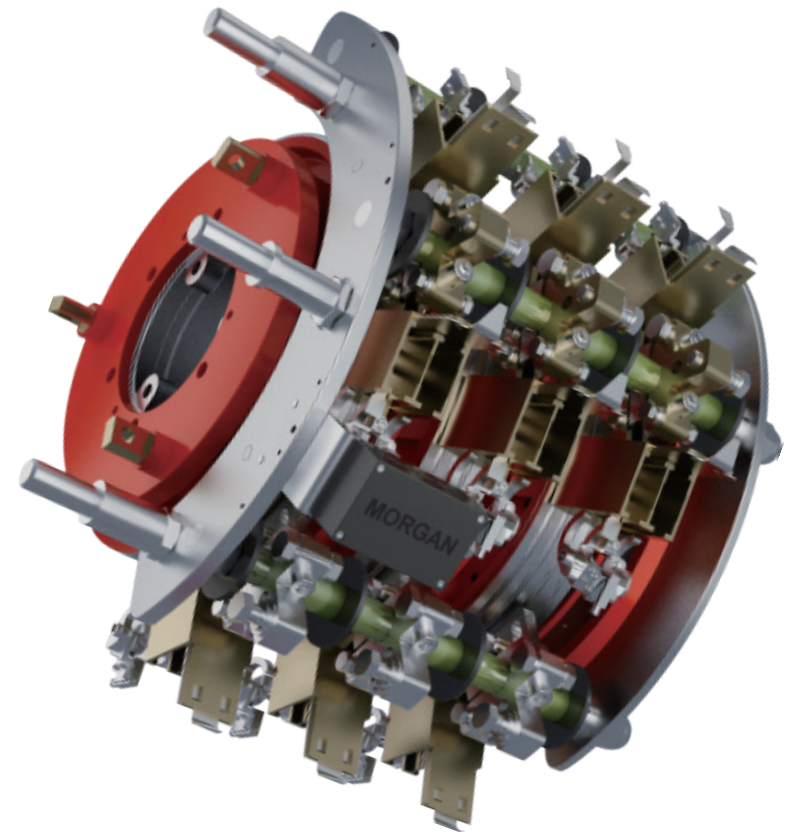
- Constant force springs provide proper contact pressure between brush and slipring for optimal system performance
- Available in kits for ease of ordering and maintenance



Our slip rings, available in Stainless Steel and Bronze, feature both molded and built-up solutions. To meet customer needs, Morgan can swiftly adapt generic designs, catering to power ranges from 850kW to 10MW, to precisely meet OEM requirements for new installations or retrofit applications in any environment.

Morgan Advanced Materials works closely with OEM's and end users to enhance generator performance with upgraded slipring and holder packages to significantly reduce downtime and servicing needs.

Contact Morgan to discuss your requirements with one of our knowledgeable global team members. Our team has field experience and certifications to climb, assisting you in inspections and troubleshooting.



## Slip Rings

### Product Features

- Versatile portfolio with various ring material, size and power range options

### Main Advantages

- High reliability
- Designed for optimized performance & operational efficiency

### Customer Benefits

- Low maintenance
- Higher utilization rate of wind turbine generator

## Brush Holder/Rocker

### Product Features

- Various holder applications including lightning, shaft grounding and phase brush holders

### Main Advantages

- Designed to provide reliable support and alignment for brushes
- Help maintain consistent contact with slip rings

### Customer Benefits

- Reduce the risk of downtime and performance-related issues

## ABOUT MORGAN ADVANCED MATERIALS



Morgan Advanced Materials is a global engineering company offering world-leading competencies in materials science, specialist manufacturing and applications engineering. We focus our resources on the delivery of products that help our customers to solve technically challenging problems, enabling them to address global trends such as energy demand, advances in healthcare and environmental sustainability.

### What differentiates us?

Advanced material science and processing capabilities. Extensive applications engineering experience  
A strong history of innovation and reinvention. Consistent and reliable performance.  
A truly global footprint. We find and invest in the best people.

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