

Performance Carbon

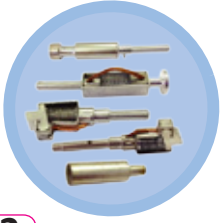
For Traction Current Collectors



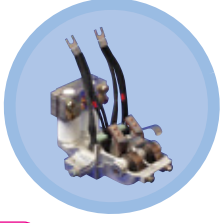
Traction Package



1 Pantograph Carbon Strips



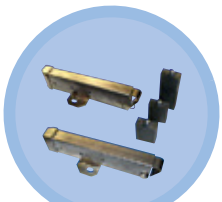
2 Coupler Contacts



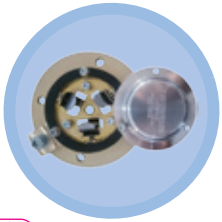
3 Traction Brushes and Brush Holders



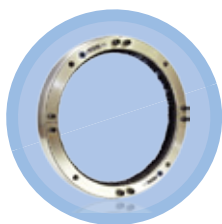
4 Third Rail Shoes



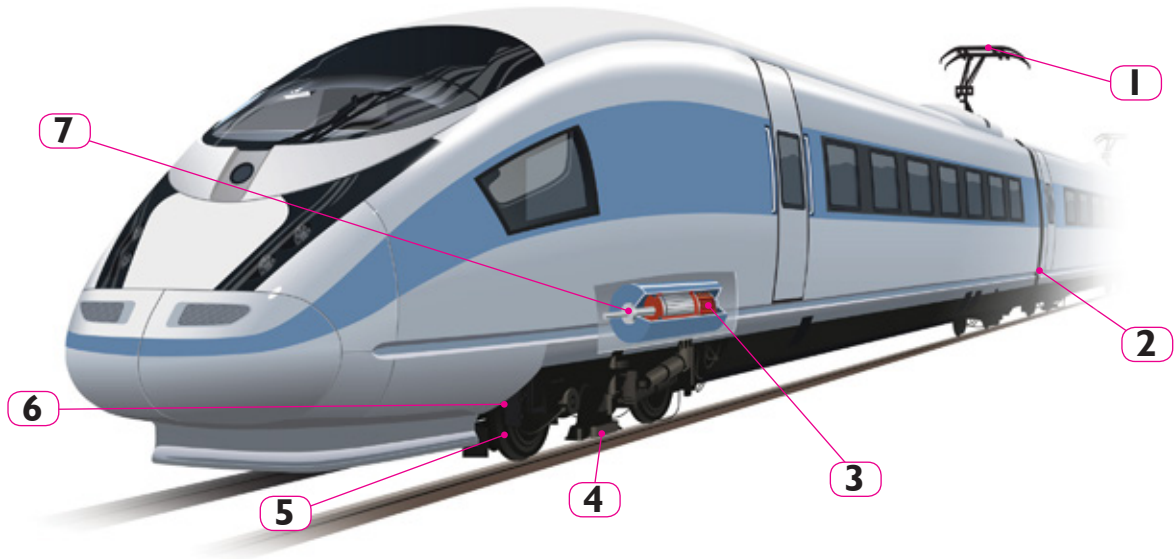
5 Wheel Flange Lubricators



6 Earthing Unit



7 Aegis SGR™

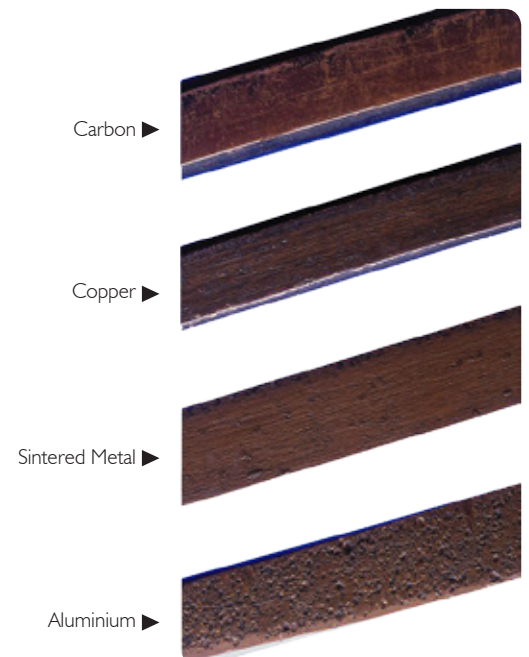
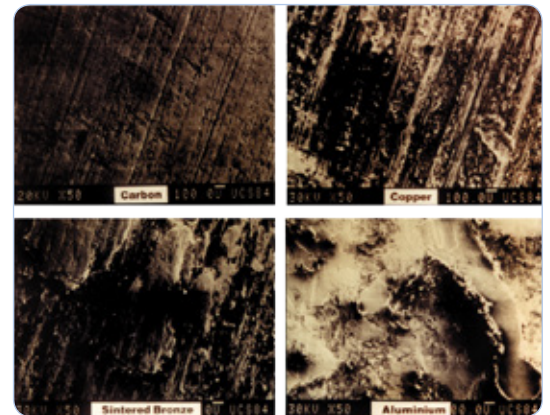


Carbon exhibits many operational and financial advantages over metallic materials as a linear current collector, and the benefits to user systems are becoming increasingly apparent as more of the world's railway, third rail and tram/trolleybus systems change to carbon.

Overhead current collection

On pantograph systems, the advantages of carbon include:

- Longer collector strip life, with lower maintenance costs and less frequent replacement
- Longer wire life, giving significant reductions in cost of maintenance for the overhead system
- Reduced mass for better current collection
- Carbon's inert qualities, which ensure that carbon will not weld to the conductor wire - even after long periods of static current loading
- The ability to operate at high speeds (300km/hour and more)
- The virtual elimination of electrical interference to telecommunications and signal circuits
- Negligible audible noise between rubbing surfaces.
- Laboratory and field comparisons between carbon and copper, sintered bronze or aluminium pantograph collector strips show many examples of up to tenfold increase in collector and wire life and recent studies in Japan show a projected 25% saving in total system operating costs.



Pantograph Strips

Morgan Offer a variety of collector strips to suit all your designs. Whatever your requirement Morgan Advanced Materials have the Pantograph strip for all applications that meet the requirements of the relevant international standards including:-

TSI EN50405/IEC64299 EN50367 EN50206 DIN6701

Morgan Advanced Materials supply:-

- Full length metal impregnated carbons
- Fitted and Integral end horns
- Kasperowski high current including auto drop in this design
- Light weight bonded Aluminium designs
- Auto-Drop collector strips
- Arc protected collectors
- Heated collectors
- Ice breaker collectors
- High current bonded collectors

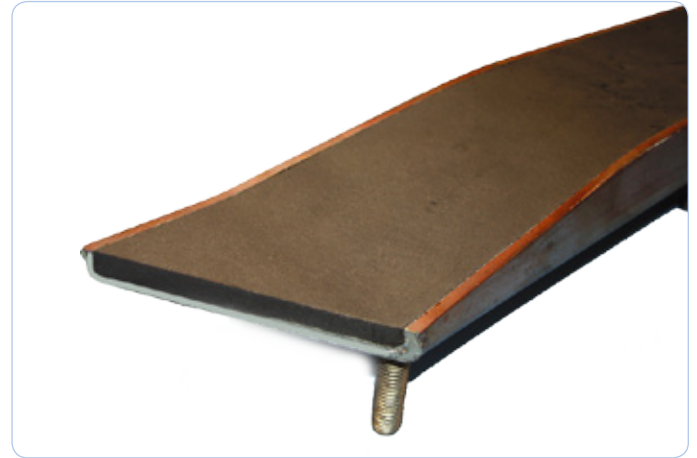
Whether it's crimped, rolled, tinned, soldered, or bonded Morgan Advanced Materials offers the best solution for retaining the carbon in the sheath.



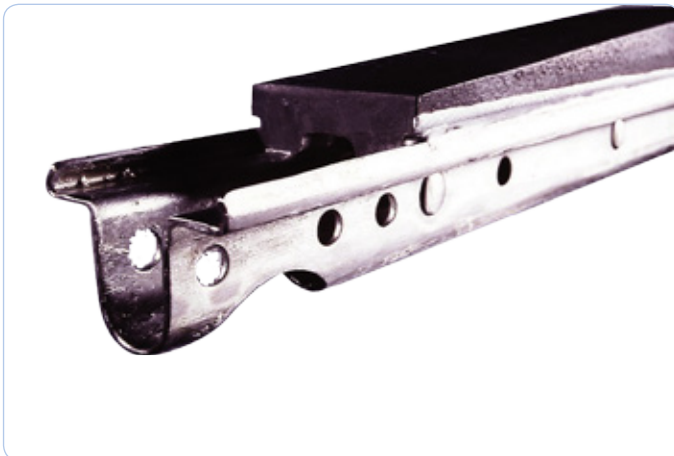
Integral end horn



Lightweight bonded aluminium



Kasperowski



Soldered



Fitted end horn

Self Supporting Collector Strips

Morgan Advanced Materials supply mainline railway systems with self supporting carbon collector strips including epoxy bonding of carbon to aluminium providing:

- Reduction in pan head mass
- Improved dynamic response
- Reduction in maintenance and service costs

Morgan Advanced Materials has a unique method of achieving high mechanical strength whilst maintaining low resistance between carbon and metal carrier.

Morgan Advanced Materials have also developed a unique method of transferring high currents to give a low resistance current path in bonded collectors, resulting in an innovative light weight solution for DC applications.

Please contact us for a complete 3rd party reference list. Morgan Advanced Materials offer a variety of designs to suit your applications including arc protection alternatives.

Morgan Arc Protection Systems

When there is a break in contact between the overhead wire and the collector strip an electric arc can strike the strips metal support carrier causing severe damage and the need to replace the strip before the carbon is fully worn. To reduce the effect of this problem Morgan can provide solutions from sacrificial side plates to the proven Morgan Arc Protection Coating.



Morgan is an approved supplier to many systems worldwide including:

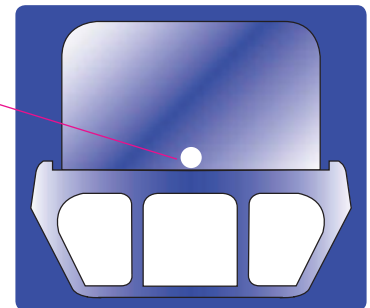
- | | |
|--------------------------|------------------|
| • Amtrak USA | • NEDTRAIN |
| • Austrian Rail | • PKP |
| • Deutsche Bahn AG | • Shanghai China |
| • Guangzhou China | • SNCF |
| • MAV Hungary | • Trenitalia |
| • MTRC | • UK Rail |
| • New Jersey Transit USA | |

Auto Drop Impact Detection System

Many high speed systems incorporate an impact detection system within the collector strip. This device enables the pantograph to be lowered if an impact was to occur severe enough to damage the pantograph head. The sensitivity of these systems varies according to the design, however the principle of all Auto-drop detection systems is the same.

The pantograph head is kept in place against the overhead wire by pneumatic pressure. When the carbon strip wears down to a particular level or is severely damaged, the air pressure is lost and the panhead drops away from the wire, preventing further damage. Morgan Advanced Materials have various designs which are running on many systems worldwide.

Responsive tube
for high & low
pressure systems



Materials for all Overhead Current Collection Systems

Morgan Advanced Materials is a leading global supplier to the Railway and Tramway Industry, providing products, services and solutions for current collector systems.

Morgan Advanced Materials offer technical support from our highly qualified engineers, who have experience and an in-depth understanding of collector systems.

Whether tramways, mail line or high speed applications our team have the material and design expertise to recommend the best solutions for your applications.



Material Grades for Overhead Current Collection

Grade	Description	Specific Resistance ($\mu\Omega\text{m}$)	Density (g/cm^3)	Transverse Bend Strength (MN/m^2)	Nominal Running Current (A/mm)	Nominal Static Current (A/mm)
CY280	Plain Carbon Graphite Lead Free	35	1.6	30	8	1
MY131	Metallised carbon, light weight Lead Free	8	2.2	60	10	2
MY7A2	Metallised carbon, low resistivity for general applications Lead Free	4	2.4	60	15	2.3
MT85A	Metallised carbon, low resistivity for general applications Lead Free.	3	2.4	65	15	2.3
MY258A2	Metallised carbon, low resistivity for high current applications Lead Free	2	2.7	60	18	2.7
MY258A4	Metallised carbon, low resistivity for high current applications Lead Free	1	2.8	60	22	3

The standard values for static current are based on the following criteria: 4kg contact force per strip (8.8 lbs). 107mm² single wire catenary, partly worn. 150°C max. catenary temperature (302°F).

Higher operating values are achievable under certain conditions. Please contact our engineers for further information, as typical running and static currents are for guidance only.

Materials for Third and Fourth Rail Applications

Third and Fourth Rail Systems

Steel, cast-iron, copper or bronze shoes on third and fourth rail collection systems inflict mechanical damage to the rail because of their relatively high mass. Their high co-efficients of friction also create excessive wear both to the collector and the rail. Once wear takes place, electrically conductive - and some times magnetic - debris is created, so motor windings and other systems must be protected. Inevitably sparking between damaged rail and collector also occurs, causing further problems of interference to telecommunications and signalling systems.

The use of carbon-based collector materials virtually eliminates all these problems. Carbon's relatively low mass (one third that of copper) minimises mechanical hammer damage to the rail, and its self-lubricating properties ensure a patina of carbon is deposited on the rail reducing friction and wear and almost completely eliminating sparking. As an added bonus, the carbon patina provides a degree of natural de-icing capability.

Carbon is particularly valuable as a collector material on systems using aluminium rails with stainless steel caps, where the margin for damage is greatly reduced.



Material Grades for Third and Fourth Rail Systems

Grade	Description	Specific Resistance	Density	Transverse Bend Strength	Nominal Running Current	Nominal Static Current
		($\mu\Omega\text{m}$)	(g/cm^3)	(MN/m^2)	(A/cm^2)	(A/cm^2)
CY280	Plain Carbon Graphite Lead Free	35	1.6	30	10	5
MY131	Metallised carbon, light weight Lead Free	8	2.2	60	12	7
MY7A	Metallised carbon Lead Free	8	2.3	55	12	7
MY7A2	Metallised carbon, low resistivity for general applications Lead Free	4	2.4	60	13	8
MT85A	Metallised carbon, low resistivity for general applications Lead Free.	3	2.4	65	13	8
MY258A2	Metallised carbon, low resistivity for high current applications Lead Free	2	2.7	60	14	9
MY258A4	Metallised carbon, low resistivity for high current applications. Lead Free	1	2.8	60	15	10
MY258P	Metallised pressed carbon, low resistivity for high current & charging applications Lead Free	<0.7	3.2	100	16	11

Higher operating values are achievable under certain conditions. Please contact our engineers for further information, as typical running and static currents are for guidance only.

Carbon Inserts for Trolley Bus Shoes

Morgan Advanced Materials have longstanding experience in the transport market providing a breadth of application knowledge built up over time ensuring the best materials and designs.

Leveraging on this experience we supply trolley bus inserts that are durable and the best fit for this application, such as double tapered for a safe fit.

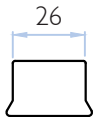
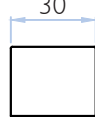
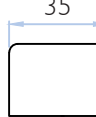
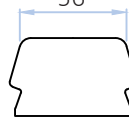
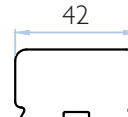
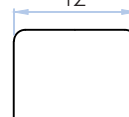
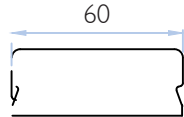
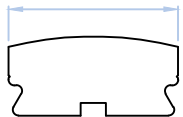
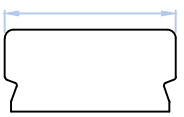
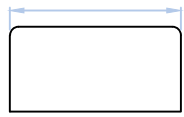
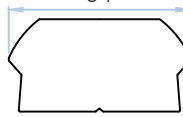
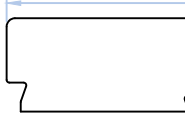


Material Grades for Trolley Bus Systems

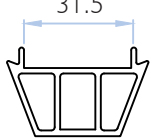
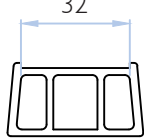
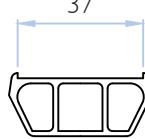
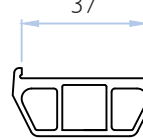
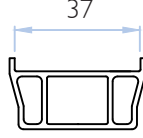
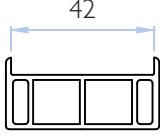
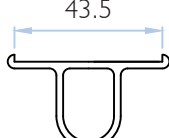
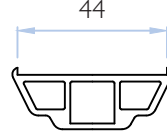
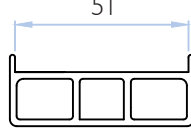
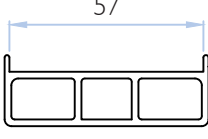
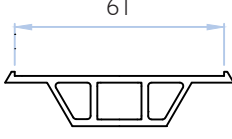
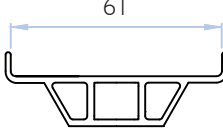
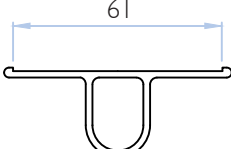
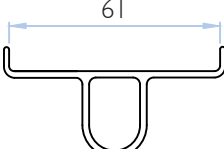
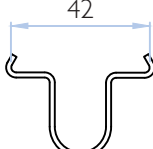
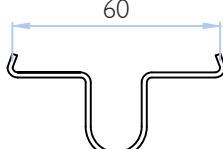
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MY7A2	Metallised carbon, low resistivity for general applications Lead Free	4	2.4	60	5
MT85A	Metallised carbon, low resistivity for general applications. Lead Free.	3	2.4	65	5
MY258A2	Metallised carbon, low resistivity for high current applications Lead Free	2	2.7	60	6
MY258A4	Metallised carbon, low resistivity for high current applications. Lead Free	1	2.8	60	7
MY258P	Metallised pressed carbon, low resistivity for high current & charging applications. Lead Free	<0.7	3.2	100	8

Higher operating values are achievable under certain conditions. Please contact our engineers for further information, as typical running and static currents are for guidance only.

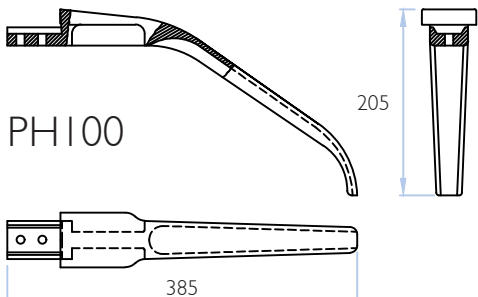
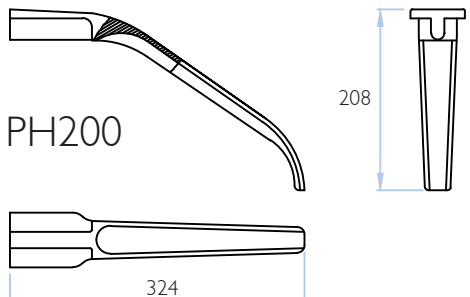
Examples of standard carbon sections:

 CS0054	 CSI275	 CSI252	 CSI280	 CSI216	 CSI239
 CSI268	 CSI264	 CSI307	 CSI257	 CS0026	 CSI297

Examples of standard carrier profiles:

 NB1047	 NB1061	 NB1006	 NB1046
 NB1042	 NB1040	 NB1010	 NB1030
 NB1044	 NB1065	 NB1012A	 NB1012S
 NB1007	 NB1007S	 GALV. STEEL 42mm	 GALV. STEEL 60mm

Examples of standard cast end horns:

 PH100	 PH200
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The above are standard carbon, carrier and end horn sections, however, Morgan have capability to design & manufacture to suit all applications as required.

Research and Development

We are constantly developing new materials and products and have forged many technical partnerships with customers and European Development Projects.

To ensure we maximise on our R&D, we have Machine Testing and Analytical laboratories, these facilities also provide a service for our customers.

Machine Test Laboratory

- Dynamic life testing
- Static Load Testing
- Impact Testing - High & Low Velocity
- Shear Strength Testing
- Deflection
- Contraction & Extension



Material Analysis

- Optical microscopy
- Atomic emission spectroscopy
- Atomic absorption spectroscopy
- FTIR spectroscopy
- Thermo gravimetric analysis
- Particle size analysis
- Mercury porosimetry
- Controlled stress rheology
- Thermal expansion
- X-Ray analysis

Sharing the Knowledge

Morgan offer:

- Local Sales Engineering Support
- Application Engineering
- Technical Support Team
- Technology
- Test & Development facilities
- Technical Training Courses either held at customers site, at a Morgan regional business unit or in our technical centre of excellence

Fault-finding reference chart

		M	L	K	J	H	G	F	E	D	C	B	A	Possible Remedy	
A	Burnt carbon surface														
B	Uneven wear along strip														
C	Uneven wear strip tp strip														
D	Grooving														
E	Edge chipping														
F	Cracked carbons														
G	Sparking damage on sheath														
H	Sheath overheating														
J	Short life														
K	Loose carbons														
L	Broken carbons														
M	Missing carbons														
1	Current overload	●		●	●	●	●			●			●	Reduce current load	1
2	Low contact force			●	●	●	●		●		●		●	Increase force if possible	2
3	Poor wire condition		●	●	●		●	●	●	●		●		Check overhead	3
4	Poor current path			●		●	●				●	●	●	Check current path	4
5	Wrong material	●	●		●	●		●	●				●	Check current loading	5
6	Poor wire stagger	●			●					●		●		Check stagger	6
7	Pantograph condition	●	●	●	●					●	●	●		Check mechanism	7
8	Wire suspension	●	●	●	●		●	●	●			●		Type of suspension	8
9	Sectional insulator setting	●	●	●			●	●	●	●		●		Check setting	9
10	Pivot angle				●						●			Correct angle	10
11	Head mass	●	●	●	●		●	●	●	●	●			Reduce mass	11
12	Mixed materials				●	●				●	●	●		Change to carbon	12
13	Mixed running				●		●							Fit all one grade	13
14	Weather conditions	●	●		●		●	●	●				●	Check weather pattern	14
15	Badly fitted carbons	●	●	●	●	●	●			●		●		Check fitting	15
16	Carbon section too small	●	●		●	●							●	Increase size carbon section	16
17	Carbon section too big				●									Reduce size carbon section	17
18	High contact force	●	●					●	●					Reduce force if possible	18
19	Panto speed	●	●		●		●		●		●		●	Check panto aerodynamics	19

To use the chart, first select the symptom displayed by your system.

Trace the appropriate column down the chart.

Stop at each line containing a dot.

The wording on the left of the line indicates a probable cause and the wording on the right a possible remedy.

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.

Facilities and Accreditations:

With the Machine Test Laboratory and The Analytical Laboratory, Morgan has in-house capability in accordance with EN50405, and associated requirements, to allow independent TSI Certification of our facilities and products.

We have the following accreditations with the following bodies:



For all enquiries, please contact our sales and manufacturing sites:

UK and Ireland

Morgan Advanced Materials
Upper Fforest Way
Swansea, SA6 8PP

T +441 792 763 112

F +44 1792 763 167

meclsales@morganplc.com

Hungary & Czech Republic

Morgan Advanced Materials
Morgan Hungary Ltd.
Csillagvirag Str. 7
H-11 06 Budapest

T +36 1 265 0302

F +36 1 505 6776

sales.hungary@morganplc.com

Italy

Morgan Advanced Materials
Morgan Carbon Italia S.r.l.
Via Roma, 338
64014 Martinsicuro (TE)

T +39 0861 798205

F +39 0861 760165

vendite.elettrico@morganplc.com

**Germany, Austria
& Switzerland**

Morgan Advanced Materials
Morgan Electrical Carbon
Deutschland GmbH
Zeppelinstr. 26
D-53424 Remagen

T +49 2642 9040-0

F +49 2642 9040-251

salesde@morganplc.com

China

Morgan Advanced Materials
4250 Long Wu Road
Min Hang District
Shanghai
China
200241

T +86 21 64343350

Poland

Morgan Advanced Materials
Morgan Carbon Polska sp. z o.o.
Ul. Topolowa 4, Blizne
Laszczynskiego
05-082 Stare Babice

T +48 22 722 0393

F +48 22 722 0238

biuro@morganplc.com

Spain & Portugal

Morgan Advanced Materials
Morganite Española S.A.
c/ Juan Pablo 11, num 6, 2º-A
12003 - Castellón

T +34 9366 22404

F +34 9366 26687

spainsales@morganplc.com

France

Morgan Advanced Materials
Morgan Carbon France
6, Rue du Reservoir
68420 Eguisheim

T +33 389 210960

F +33 389 412417

commercial-france@morganplc.com

BeNeLux & Scandinavia

Morgan Advanced Materials
Morgan AM&T B.V.
De Oude Veiling 3
1689 AA Zwaag

T +31 229 2555-55

F +31 229 2555-41

salesNL@morganplc.com

India

Morgan Advanced Materials
Morgan Advanced Materials India Private Ltd
C116, Sector 2, Noida - 201301,
Uttar Pradesh

T +91 120 497 3747

F +91 120 497 3740

morgan.india@morganplc.com

United States

Morgan Advanced Materials
251 Forrester Drive
Greenville
South Carolina
United States
29607

T +1 (864) 458 7700

Australia

Morgan Advanced Materials
Revesby
Sydney
New South Wales
Australia
2212

T +61 (2) 9772 5600