

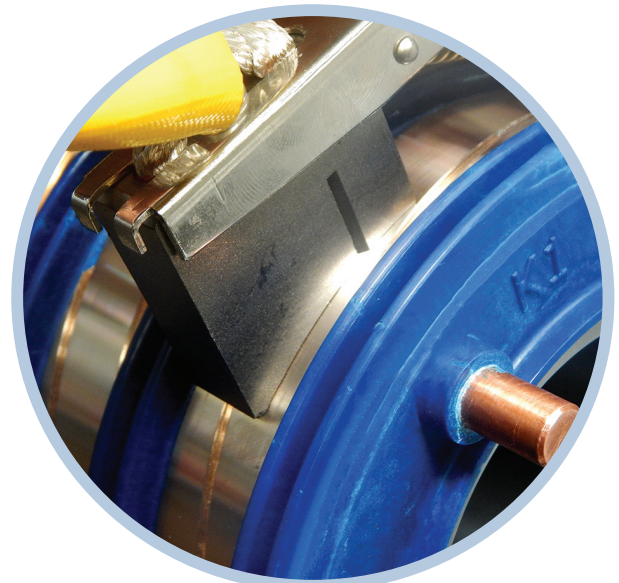
CARBON BRUSHES: **When Do They Need Replacing In Wind Turbines**

Carbon brushes are essential components in wind turbines, providing a means to transfer electrical power and signals between mixed and moving parts within the rotating systems.

They are used on slip rings within the turbine generator to conduct current between the generator's rotor and stationary electrical circuits. They also provide signal transfer and are used in protection systems, ensuring continuous electrical contact which is critical for the turbine's operation is maintained.

How often do carbon brushes need replacing?

It's broadly suggested to replace copper carbon brushes roughly every 1-2 years and silver carbon brushes every 3-5 years depending upon the application.



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However, you may need to replace them more or less frequently than this depending on certain individual factors. Factors that influence this include:

- > The specific turbine model
- > The generator manufacturer
- > Operating and environmental conditions
- > Utilisation and duty cycle
- > Maintenance standards (including slip ring condition, holder alignment and spring condition)
- > The quality and grade of carbon brush used

*Learn more from our blog article: [Silver or Copper: The Carbon Brush Debate](#)



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Signs that your carbon brushes need replacing

Visual indicators:

- > Wear marks or reduced length: Carbon brushes wear down over time, so a key indicator is their reduced length. If the brush length approaches the manufacturer's minimum recommended value, or it appears that they will likely do so ahead of the next planned service interval, it's time to replace them.
- > Signs of distress or damage: Physical cracks, chips, burning, overheated flexes or damage to the brush are clear signs it needs replacement.
- > Uneven wear patterns: If brushes are wearing unevenly, it can cause poor contact and indicates it should be replaced.

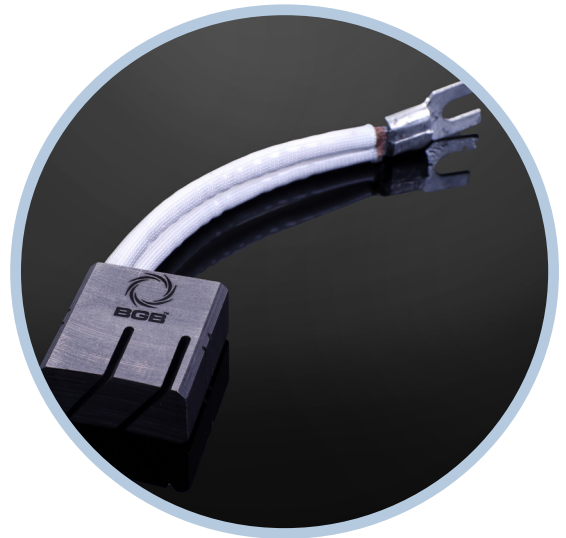
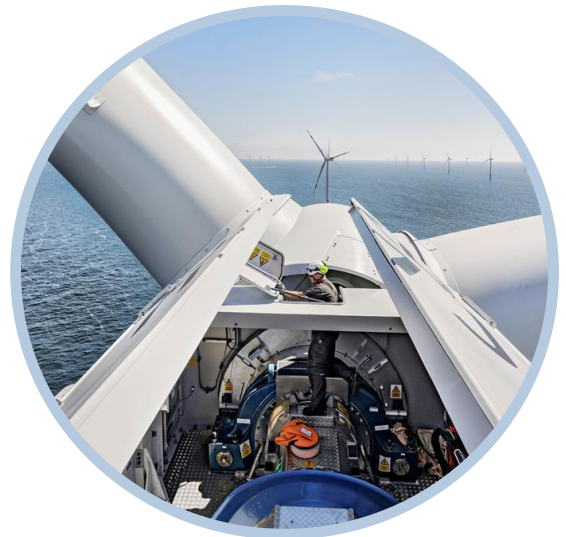


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Performance issues:

- > Poor current collection or sparking: Sparking or arc conduction between the brush and the slip ring is often a sign that the brush is not maintaining proper contact and needs replacing. There may also be other underlying reasons that may need to be addressed such as worn or damaged springs or poor slip-ring condition.
- > Noise or vibration: Unusual brush chatter noise or vibration coming from the slip ring or brush area can indicate poor brush contact or wear.
- > Poor turbine performance: A decrease in turbine performance or efficiency, especially in generating power, can often be traced back to worn or defective carbon brushes that are not conducting electricity effectively.



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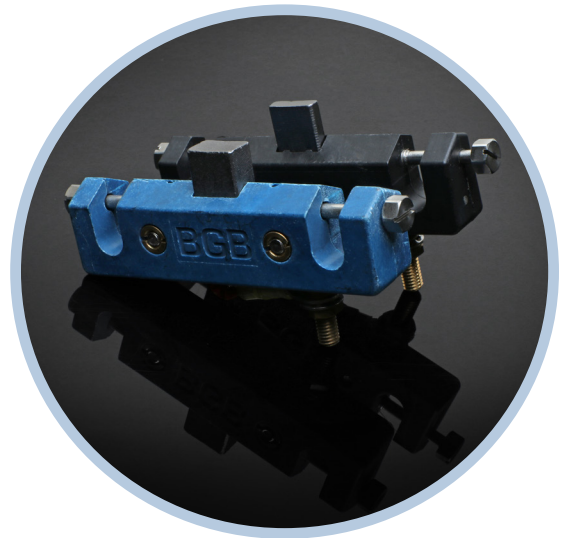
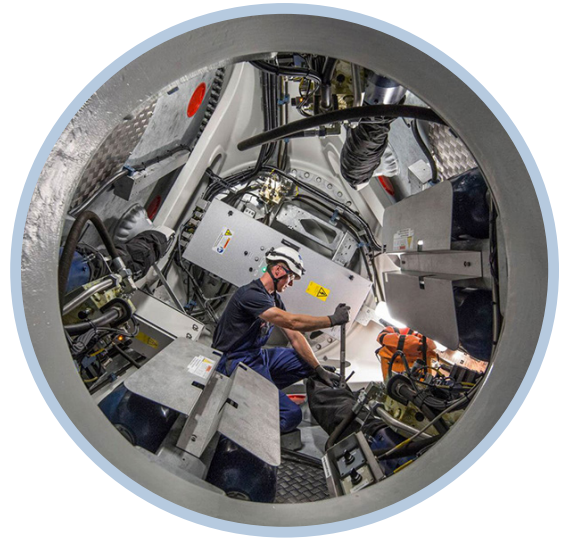
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Electrical symptoms:

- > Power fluctuations: If the wind turbine experiences fluctuating power output or electrical instability, it could be due to worn or degraded brushes, causing inconsistent electrical contact.
- > Increased resistance: A rise in electrical resistance at the brush-slips ring contact point which can manifest itself in high operating temperatures can also be a sign the brushes are wearing down.

Time-based factors:

- > Typical lifespan: In wind turbine applications, you can expect a carbon brush to last between 12 to 18 months under normal operating conditions. If a brush has been in use for this duration or longer, it should be closely monitored and likely the whole brush set replaced during routine maintenance.
- > Scheduled maintenance: Many operators replace brushes as part of a routine annual or biannual maintenance cycle to avoid unexpected downtime.



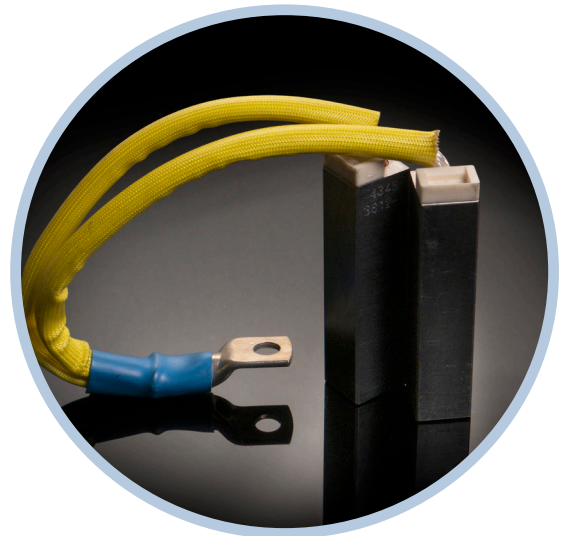
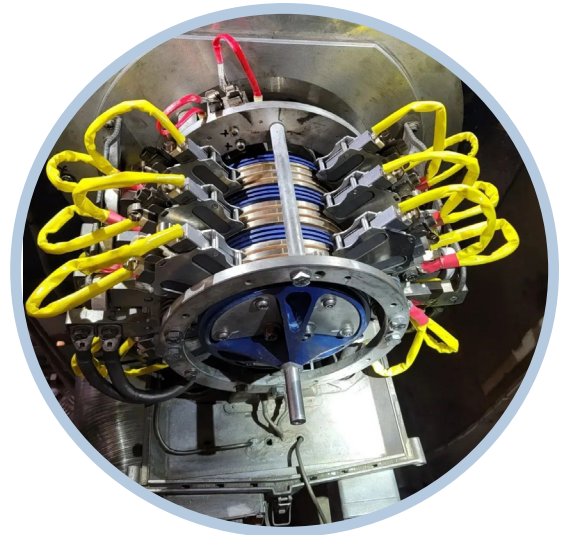
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Why maintenance and frequent replacement of carbon brushes is key

Frequent maintenance and timely replacement of carbon brushes are essential in wind turbine upkeep because downtime can be costly, with repairs requiring lengthy up tower trips to the top of turbines. Carbon brushes are relatively inexpensive, but worn brushes can cause damage to critical components like slip rings, resulting in power fluctuations and increased turbine downtime.

Proactively replacing them ensures smoother operation, reduces unexpected failures, and helps maintain high uptime, which is critical for optimising energy production. Thus, regular upkeep minimises both costs and risks.



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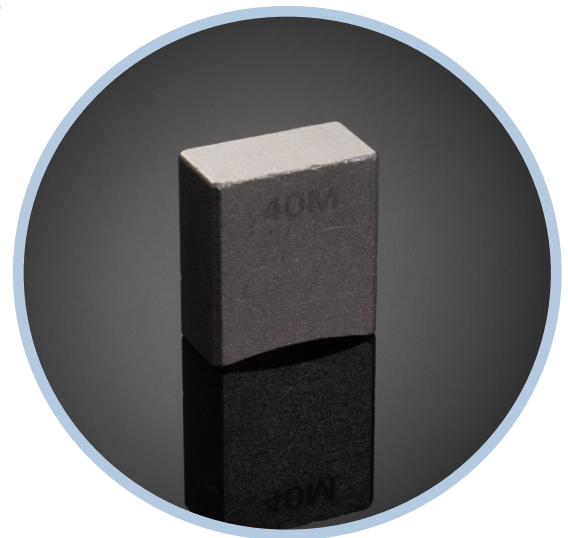
Choosing a high quality replacement carbon brush

Carbon brushes are one of the most frequently replaced consumable parts in a wind turbine; they are critical components yet they are often overlooked. So it pays in the long run to invest in high quality carbon brushes.

The brush material is typically made from graphite, which may contain varying amounts of metal such as silver or copper, depending on the application and manufacturer. A good carbon brush should offer a low coefficient of friction and excellent electrical and thermal conductivity.

However, using the wrong type of carbon brush or allowing brushes to wear beyond their recommended limits can cause significant problems. These issues are often worsened by sub-optimal conditions, such as low spring force from worn or damaged springs. Potential consequences include:

- Poor patina formation.
- Brush instability.
- Grooving, sparking, or pitting.
- Excessive track wear or selectivity issues.
- Slip-ring damage, including out-of-roundness.



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These problems can lead to premature wear and may require costly repairs, refurbishment, or even full replacement of the slip ring. Choosing the right brush type and grade is therefore essential for maintaining turbine performance and avoiding downtime.

With decades of experience in designing and manufacturing rotating solutions for the wind industry, combined with state-of-the-art testing facilities and insights from our expanding repairs business, we provide a wide range of replacement carbon brushes to meet our customers' needs.

Our portfolio includes popular brush types and sizes, along with comprehensive support services, such as new slip rings and repair solutions.

Our brush grades include both silver and copper graphites, which feature varying metal content and compositions. Some are impregnated or enhanced with special additives to extend their performance range and protect critical turbine components.

Not to be overlooked is the intimacy of contact between the brush and slip-ring, and the importance of maintaining the required spring force seen at the brushes. All our standard range of replacement spring clips are produced to OE recommended spring pressures and are date marked to provide indication of when they should be changed out in line with industry best practice.

View the *BGB After Market Brush Catalogue* [online](#)



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