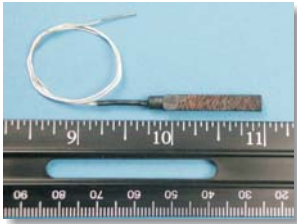


**Metal Fiber Brushes can be manufactured  
in many shapes and sizes:**



Small square



Large rectangle



80 amp Cantilever Assembly



Hexagonal

HiPerCon can retrofit your existing brush system to utilize metal fiber brushes or we can design a brush system to fully optimize your system for metal fiber brushes.

**Retrofit Installation of MFBs Into Existing  
UH-60 Slip Ring**



**Results:**

- Estimated brush life >15,000 hours @ 260 RPM
- Produced very little debris
- Maintained clean signal quality throughout testing and at higher current

**HiPerCon, LLC.®**

**North American Industry Classification System  
(NAICS) Codes**

- 541710** R&D in Physical, Engineering and Life Sciences
- 541380** Engineering Services, Technical Testing & Analysis, Physical, Chemical & Other Analytical Testing Services
- 541330** Engineering Services
- 335999** Manufacturing of Miscellaneous Electrical Equipment

**Who is HiPerCon, LLC.®?**

HiPerCon, LLC® is a dynamic small research and manufacturing business dedicated to introducing and deploying new dual-use electrical technologies.

The HiPerCon® staff enjoys a reputation earned over many years for high quality and technical and managerial excellence. We support our customers in a wide range of industry sectors and operating environments with reliable, efficient, and low-maintenance solutions to the complex problems of transmitting electric power and data across moving interfaces.

Customer questions or concerns can be addressed to:

**Marcel Piet**

VP, High Performance Brush Group  
(207) 651-3476  
E-mail: [mjp@hipercon-llc.com](mailto:mjp@hipercon-llc.com)

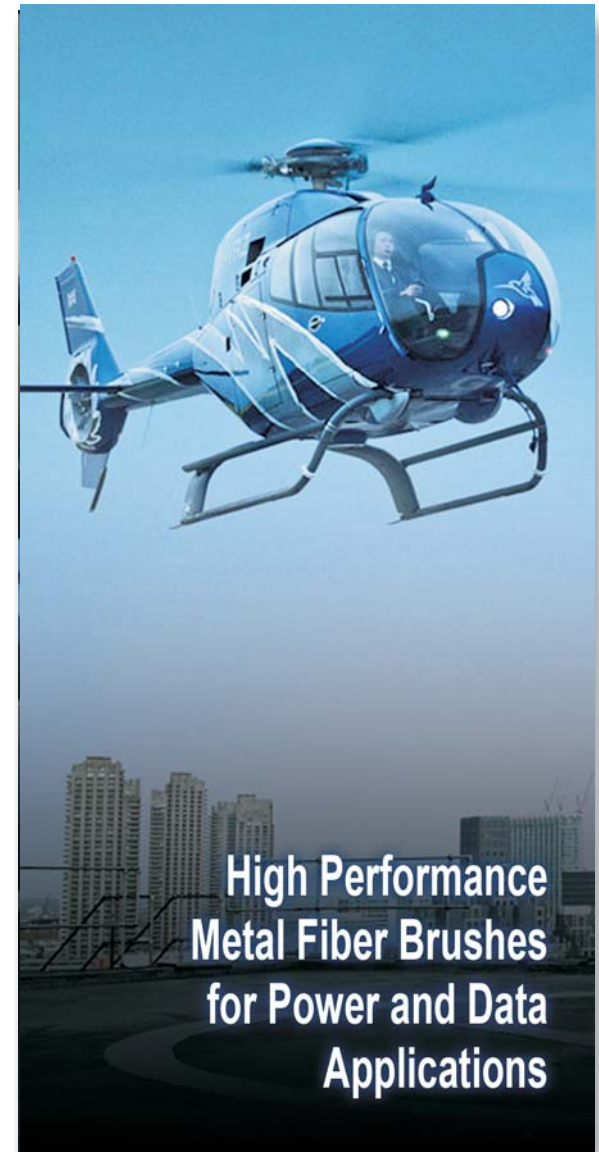
Visit us on the web at [www.hipercon-llc.com](http://www.hipercon-llc.com)

**Corporate Headquarters**

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Delaplane, VA 20144



**Presents**



## The problems of carbon brushes are well-known

For nearly 100 years, virtually all sliding electrical contacts have used monolithic carbon or metal carbon brushes to transfer energy across a moving surface like a motor rotor or slip ring. Unfortunately, carbon based brushes can damage the sliding surface, causing them to wear out quickly.

Carbon wear debris conducts electricity and can cause shorts, grounds or fires.

Carbon dust also mixes with oil vapors, which can cause electrical insulation softening, a chief cause of grounds and shorts.

Gold wire brushes are often used in highly sensitive data circuits but these brushes are extremely limited in their service life and sliding speed and are cost sensitive to gold's market price.



## Metal Fiber Brushes provide many benefits

HiPerCon's metal fiber brushes have unique performance characteristics and demonstrated advantages over carbon brushes now in use. Some key performance attributes of slip ring metal fiber brushes:

- Current densities of up to 250 Amps/sq inch are easily obtained.
- Current densities of up to 1000 Amps/sq-inch have been obtained under select conditions.
- Extremely rigid brushes for severe runout and vibration conditions such as propeller and helicopter de-icing applications.
- In all side by side testing, MFB's have achieved 2 to 10 times the service life of carbon brushes.
- Extremely high tolerance to atmosphere contaminants.
- Extremely low electrical noise across the brush slip ring interface.
- High data rate transfer across sliding surfaces above 50 Mbits/second.
- Less than 1/5 the wear debris volume of carbon brushes.

**HiPerCon Designed, Developed and Built a slip ring capable of supporting advanced helicopter rotor configurations**

### Requirements:

- 24 kW for power (~12 kW for de-icing, ~11 kW for active controls)
- 32 Mbps for data
- 4,500 hour service life

### Results:

- Estimated unit life – 5,000 to 10,000 hours @ 290 RPM
- Weight – 50 lbs.
- Each power ring capable of 24 kW; each data ring capable of 32 Mbps → REDUNDANCY
- Low data signal error, regardless of RPM, power, or transfer rate (~1% at 32 Mbps)



## High Performance Metal Fiber Brushes Technical Advances

Key technical developments have allowed the HiPerCon team to extend the scientific knowledge base and have broadened the range of applications that can be addressed by this technology. Some significant technological advances that have occurred in the past few years include:

- New techniques for brush manufacturing that promote far superior shape conformance and retention. These new techniques are instrumental for consistently manufacturing brushes to tight physical tolerances and ensuring that they retain their shape in severe mechanical, electrical, and magnetic environments. These new techniques allow us to manufacture a wide size range of brushes from <1cm to >10 cm width.
- New developments in brush lubrication strategies that extend brush and slip ring service life in severe environments where they are exposed to volatile contaminants and low humidity.
- Advancements in oxidation suppression additives allows for metal fiber brush use on various slip ring materials including copper and copper alloys without slip ring plating or the use of a cover gas.
- Significantly increased understanding on optimizing the complete brush system design to fully utilize the brush performance capabilities.
- Improved, quality-driven manufacturing processes providing first time quality to exacting standards. HiPerCon has instituted a rigorous ISO 9001 certified quality system.

There is little question that HiPerCon's metal fiber brushes are fully capable of satisfying the extreme performance requirements of power-dense motor and generator current collectors. Due to their very low electrical noise and high data rate capability, MFB's are also ideally suited for signal transfer current collectors.

HiPerCon's management team is eager to conduct open discussions and provide OEMs with solutions addressing the need for high performance current collectors.