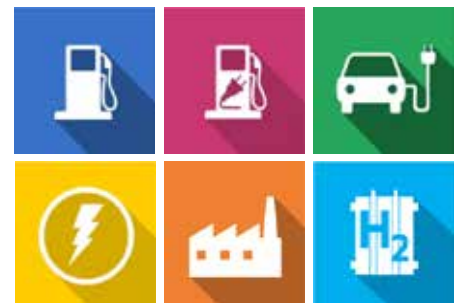




# HEAT SINKS FOR COOLING ELECTRONICS

Electric / Hybrid Vehicle & Charging Station Solutions



[www.seniorflexionicsUSA.com](http://www.seniorflexionicsUSA.com)



Senior Flexonics engineers, validates, and manufactures Heat Sinks and thermal management components for electric, hybrid vehicles, power and energy markets.

Senior Flexonics offers unparalleled product design, development, testing and manufacturing capabilities. Bartlett is the primary North American design and development center for thermal management, fluid conveyance, heat exchangers and flexible connectors. Housed in a dedicated sales, research, development and prototyping site Senior Flexonics' program of continuous improvement and innovation has enabled the delivery of cost effective, high performance products for the rapidly developing marketplace.



## HEAT SINKS - EV / HYBRID & CHARGING STATIONS

Heat Sinks are required to keep the IGBT chips cool in the inverter/Power Module. The inverters are a key component in EV / Hybrid Vehicle technology to convert AC to DC or the inverse to power the propulsion system of the vehicle. Traditional air cooled heat sinks are inadequate for the higher voltage requirements in automotive applications. Most automotive Heat Sinks are liquid cooled, allowing the IGBTs to be smaller and carry more voltage. Liquid cooled Heat Sinks allow the manufacturer to increase the voltage/current without re-designing the inverter.

Choice of materials is determined by customers specific performance requirements, boundary conditions, manufacturability, and cost effectiveness. We have extensive experience with Copper, Plated Copper, and Aluminum.

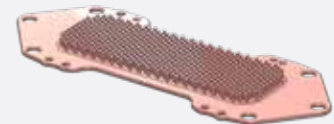
### Omega Fin

These fully customizable inserts can be fitted to the Heat Sink housing to optimize performance and pressure drop. As voltage and amperage in drive systems increase, the Omega Fin reduces development costs and lead-time to production.



### Pin Fin

Pin Fin Heat Sinks are widely used today. We have the capability to design a solution for your application. We can also take your current design and work with your team to shorten validation and prototype timelines.

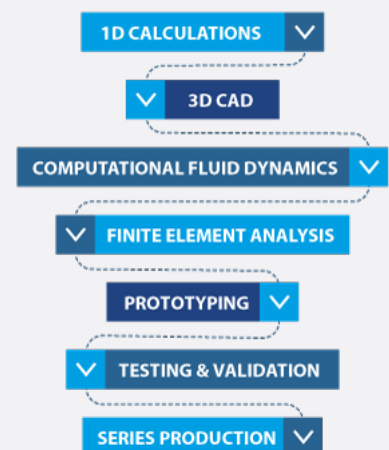


## OUR CAPABILITIES

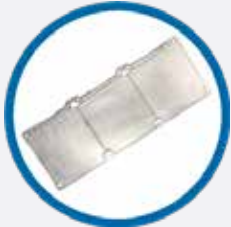
We pride ourselves on our innovative approach to solving technical problems, which we have used to develop trusted partnerships with customers and suppliers around the world.

### Product Validation Capabilities:

- » CFD for performance and boiling
- » FEA for vibration NRFs
- » Rig performance measurement
- » Gas side and coolant side pressure pulsation
- » Thermal shock
- » Shaker vibration durability
- » Acceleration data acquisition on vehicle



**Whether it's combustion, hybrid or electric drive-trains, battery cooling or fuel cell applications, we use our knowledge and expertise to meet our customers requirements.**



### **Battery Thermal Management**

Manufactured in a range of materials including stainless steel, aluminum, copper, and plastics, our systems are designed to maximize power density, while minimizing package space, weight, coolant pressure drop, and cost.



### **Heat Sinks (Electronics Cooling Plates)**

The main component inside the inverter is the IGBT (Insulated Gate Bipolar Transistor), and it generates heat. An effective method of cooling the IGBT is through a liquid cooled heat sink.



### **EGR Cooler**

Senior Flexonics provides a wide range of EGR Heat Exchangers, including Shell & Tube, Plate & Fin and our patented Co-axial Cooler. Our heat exchangers are used in HEV engine systems and have up to 95% efficiency, are highly resistant to fouling and are scalable to match performance requirements.



### **Flexible Connectors**

We are an industry leading supplier of flexible connectors. We design, engineer and manufacture both long/soft and shorter self-supporting flex design options to meet customers unique platform requirements.



### **Hydrogen Thermal Management**

Senior has developed high-efficiency condensers, recuperators, and cathode air pre-heaters capable of operating at extreme temperatures for prolonged periods of time.



### **Fluid Conveyance**

Senior Flexonics has a long history of manufacturing tubing for a variety of fluid transfer applications. Used in isolation such as for an oil drain or fuel lines, or combined with our heat exchange plates, we offer expertly balanced and optimized systems to ensure customer needs are met.

## **KEY BENEFITS**

- » Full service supplier.
- » Full collaboration with customers to provide products.
- » A fully engineered solution, from design concept through to high volume manufacture.
- » Global production facilities, 26 operations in 12 countries.
- » Extensive range of thermal management solutions.
- » Programs managed using APQP framework.
- » Comprehensive fleet of FEA and CFD software.
- » Fully equipped test lab for validation testing.
- » Performance and durability test equipment.
- » ISO 9001 / 14001 and IATF 16949 certification.



## LOCATIONS

- » **Bartlett USA:** Sales, Engineering & Manufacturing
- » **Cape Town SA:** Manufacturing
- » **Crumlin UK:** Sales, Engineering & Manufacturing
- » **Kassel GERMANY:** Sales, Engineering & Manufacturing
- » **New Delhi INDIA:** Sales, Engineering & Manufacturing
- » **Olomouc CZE:** Sales & Manufacturing
- » **Saltillo MEXICO:** Manufacturing
- » **Tokyo JAPAN:** Sales
- » **Wuhan & Tianjin CHINA:** Sales & Manufacturing

**senior**  
**Flexonics**

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