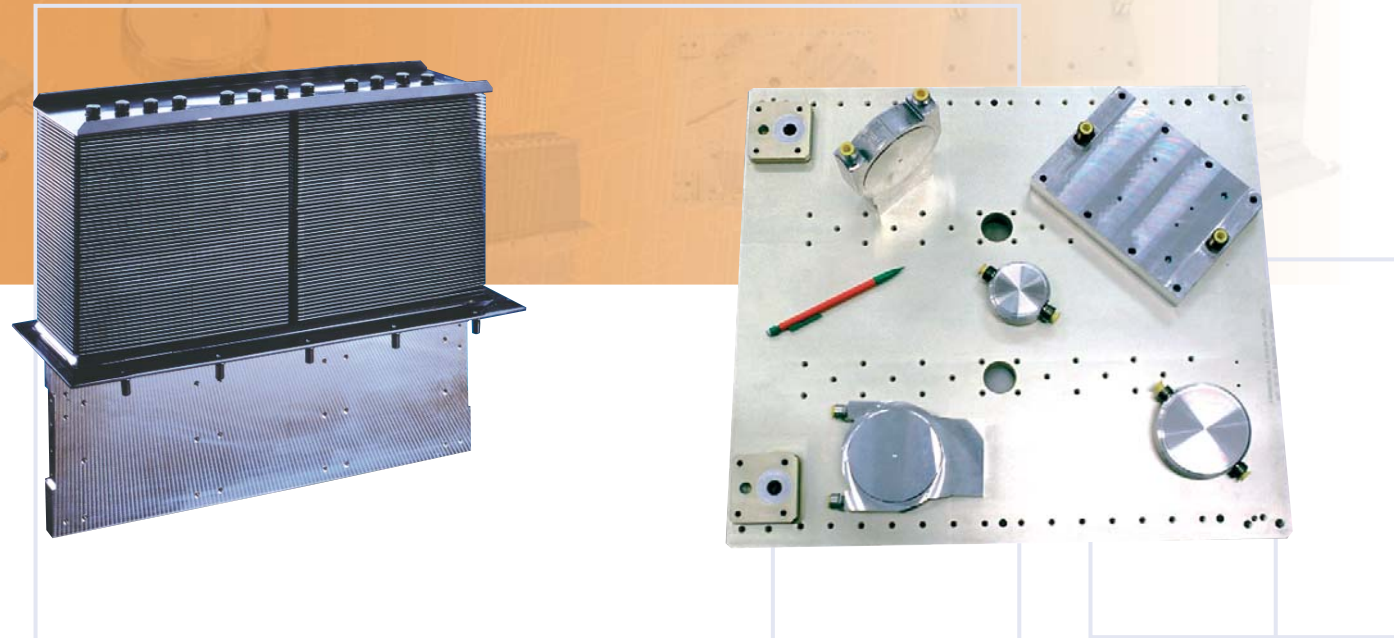
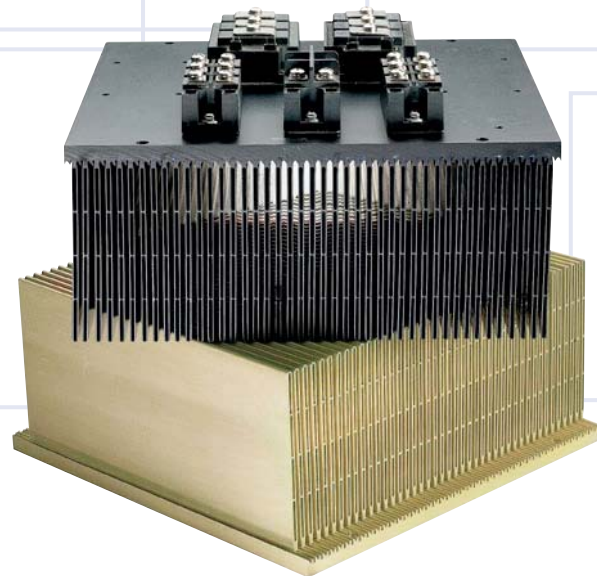


Thermal Management



Innovative Solutions Provider
for cooling Power Electronics
applications



Manufacturing plant



FERRAZ-SHAWMUT Thermal Management has been located in La Mure (30km south of Grenoble) since 1999 in a 6000m² plant. The Grenoble area is well known for its electronics industry, development center and skilled workforce.

This plant is the Ferraz Shawmut Thermal Management center of excellence with its own: R&D, Laboratory, Engineering, Production, Logistics, Sales & Marketing support, and Quality support. The information systems, Quality main system, Global Purchasing, Human resources and finances are supported by the central Ferraz Shawmut organisation in Lyon, just 100 km away.

Thermal and hydraulic design capability

FS Thermal Management's engineering team will help you find innovative solutions and can also simulate your application.

Our unique knowledge in air-, heat pipe- and water-cooling heat sinks as well as cooling unit groups gives FS Thermal Management the possibility to help you find the right solution for the thermal protection of our customers applications. Furthermore, the participation of FS Thermal Management in European thermal research groups and the designing work on several demanding thermal applications all over Europe means we can offer the widest variety of adapted competitive designs.



Beyond our thermal and hydraulic expertise our engineering team offers our customers global mechanical and system engineering capability. We then work close to our customer to solve their global functional needs.

Testing capability



- Thermal:** measurements of R_{th}, Z_{th} with air, water, de-ionised water or glycol water
- Hydraulic:** pressure drop, cycle pressure test, acoustics
- Mechanic:** clamping, hardness, flatness, Ra, Rz
- Electric:** dielectric, conductivity

Agreements with Grenoble research laboratories give even more testing capabilities

Quality and continuous improvement programs

In order to improve Quality and Service to our customers, FS Thermal Management has the following certification and continuous improvement programs:

- ISO 9001, since 2000
- 5S plant organisation
- KANBAN methods for logistics



Manufacturing capability

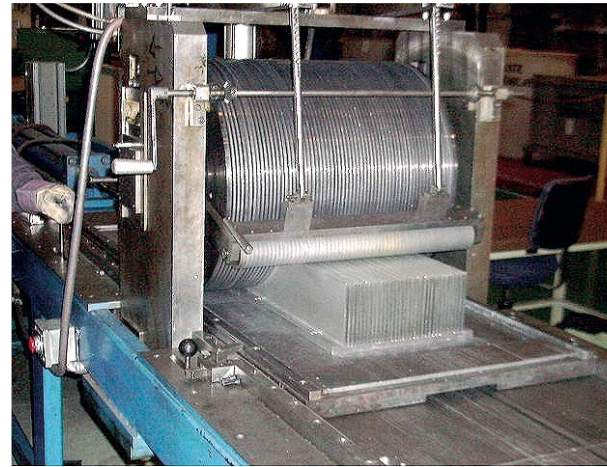


Vacuum brazing technology

Vacuum brazing technology allows FS Thermal Management to design high performance hydraulic circuits in order to meet the most demanding thermal, hydraulic and mechanical specifications imposed by our customers. Vacuum brazing ensures watertightness for decades and enables the heat sink to withstand internal pressure up to 50 bars without deformation.

Swaging technology

The metal displacement process developed and patented by R-Theta in Canada, licensed to FS Thermal Management and referred to as "swaging", creates an interface between the fin and a monolithic base plate, which has no measurable thermal resistance. Because there is no dependence on adhesives in the interface region, the FabFin principle provides outstanding performance in even the harshest environments. Performance of the patented swaged series of heat sinks is limited only by the amount of cooling air which can be delivered to the heat sink's high fin ratio architecture.



Machining and prototyping

FS Thermal Management's investment in a high speed machining center, brazing tooling and oven, and a heat pipe filling bench, allows us to provide our customers with manufacturing flexibility, short lead times and prototyping capability.



Assembly and testing capability

In order to answer increasing demands from our customers, FS Thermal Management is able to offer mechanical assembling of components on our heat sinks (nozzles, mechanical or electrical fittings, semiconductors, busbars, etc) FS Thermal Management has the possibility to do all requested tests for characterisation as well as for serial production.

APPLICATIONS



Industrial

speed variation drives, UPS, large industrial converters



Telecoms Broadcast



Traction



Windmills



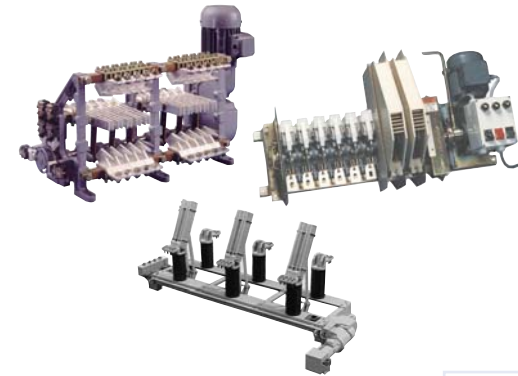
HVDC - SVDC



Medicals

OTHER FERRAZ SHAWMUT ACTIVITIES

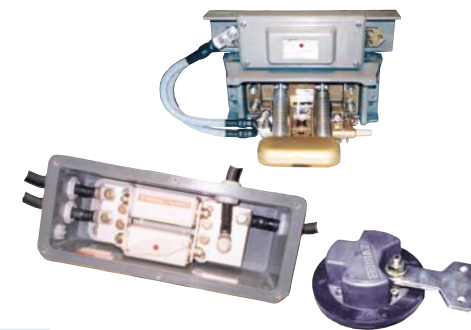
HIGH-POWER SWITCHGEAR



CIRCUIT PROTECTION



BOGIE PROTECTION



Your contact



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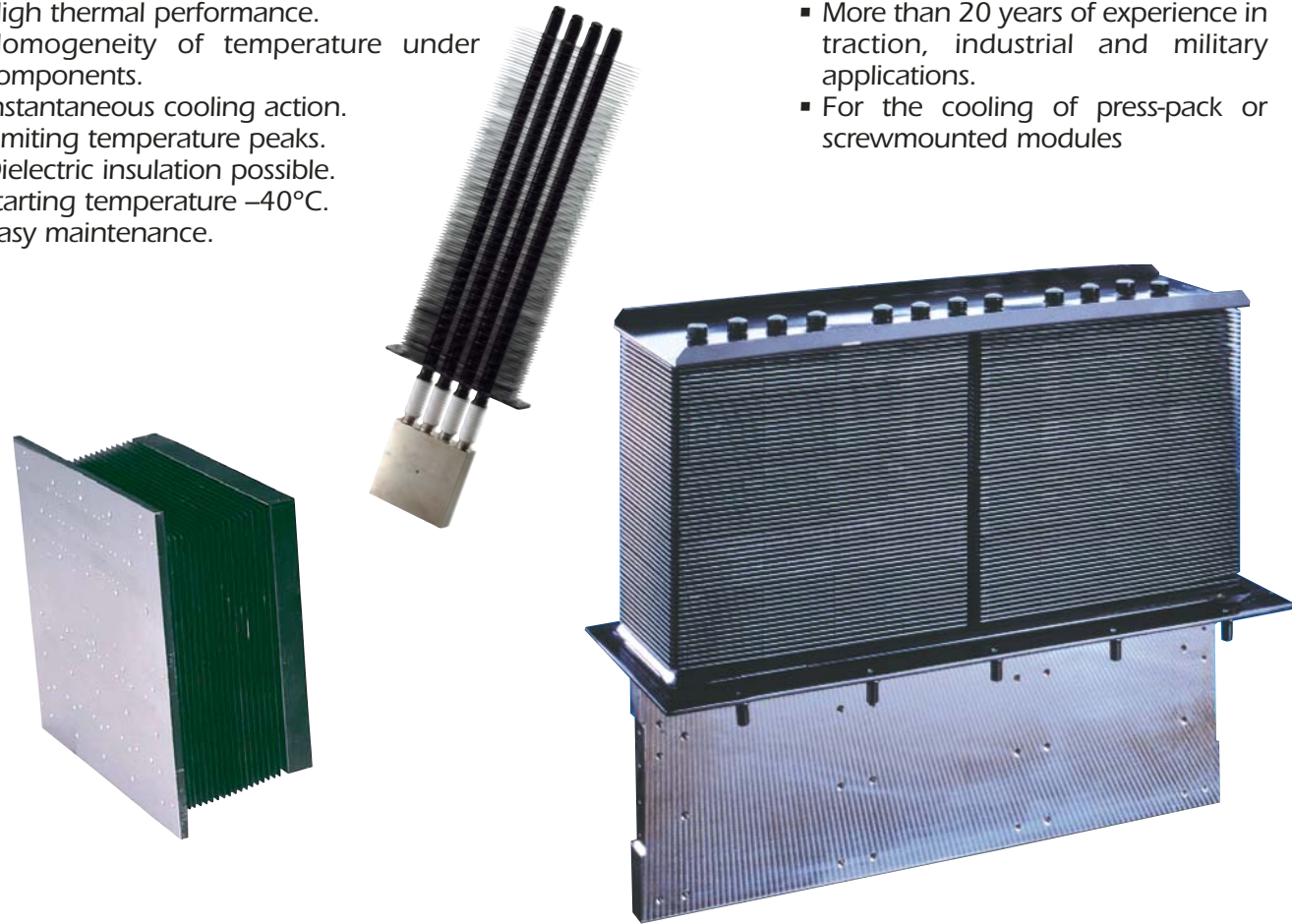
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E-mail: cooling@fr.ferrazshawmut.com
www.fs-thermalmanagement.com

AIR-COOLED HEAT SINKS

TRANSCAL®: Heat pipe heat sinks

Advantages

- High thermal performance.
- Homogeneity of temperature under components.
- Instantaneous cooling action.
- Limiting temperature peaks.
- Dielectric insulation possible.
- Starting temperature -40°C .
- Easy maintenance.



Applications

- More than 20 years of experience in traction, industrial and military applications.
- For the cooling of press-pack or screwmounted modules

FABFIN®: Air-cooled heat sinks

1 - Volumetric envelope

Available in any length, any width, any fin spacing, any fin thickness and any base thickness.

2 - High grade alloys

Aluminium 6063-T5 construction. Copper capability when needed.

3 - Swaging (cold forming) process

Patented cold forming process results in a finished heatsink that functions like a single piece extrusion, giving excellent thermal contact and mechanical characteristics.

4 - Computer modelling

Leading the industry in e-business is the first 24/7, on-line internet based thermal modelling and configuration of your application.

5 - Anodized and conversion coated finished

We offer a wide range of wet-processing techniques.

10 - Baseplate

Monolithic design with excellent thermal properties

9 - Fin height

Available in a wide range of heights up to 118 mm

8 - Fin styles

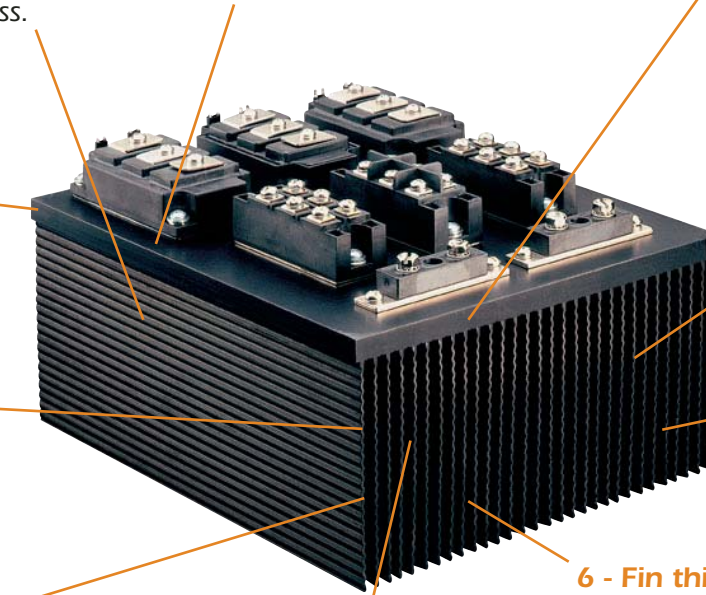
Corrugated for extra surface area in natural convection applications. Serrated for optimal air flow in forced air applications

6 - Fin thickness

Optimum fin thickness design for all applications.

7 - Fin spacing

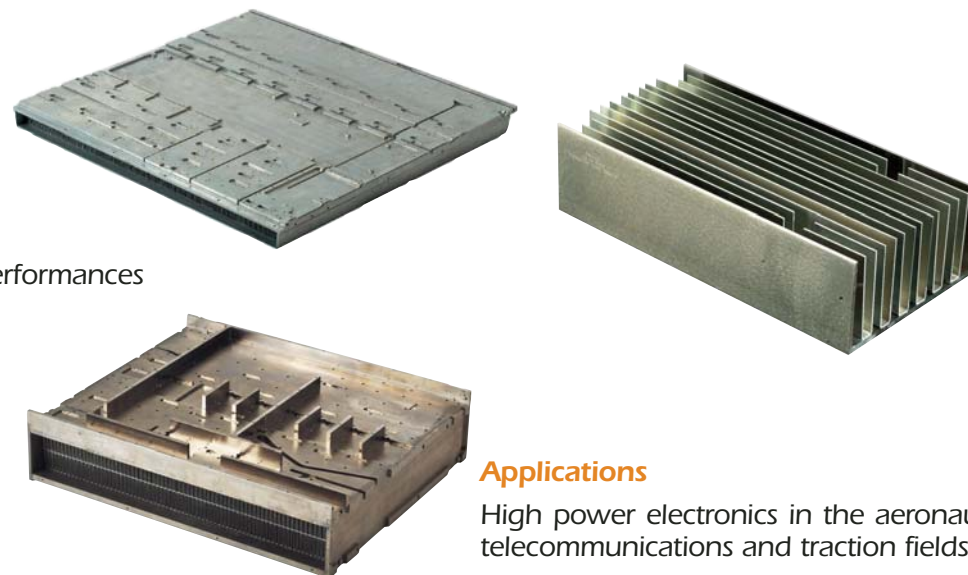
There are four standard families to choose from that suit most needs with custom spacing available on request. Ratio up to 46:1 available.



RADIACAL®: Fin forming heat sinks

Technology

- Straight or corrugated fins soldered or bonded onto a base plate
- Surpassing classical solutions by combining lightness and thermal performances



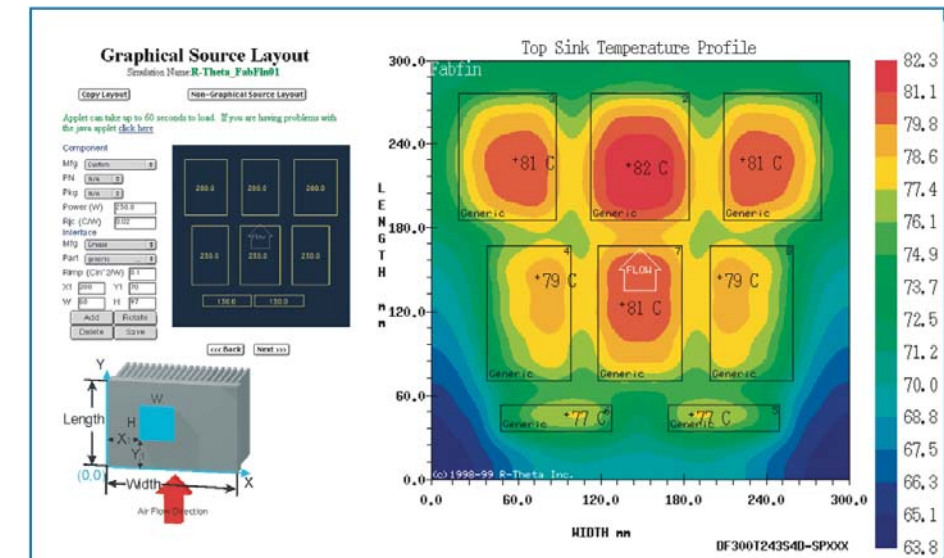
Applications

High power electronics in the aeronautics, telecommunications and traction fields.

R-Tools®: Simulation tools

Use the free on-line thermal simulation program on our website:

www.fs-thermalmanagement.com



WATER-COOLED HEAT SINKS

Moducal®: Single component heat sinks

Technology

(patented)
Vacuum brazing of colaminated aluminium grids enclosed between two covers.
Single or double side cooling.



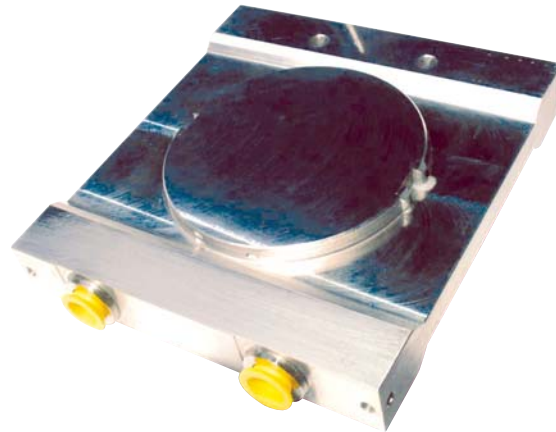
Advantages

- The optimized internal technology offers the highest thermal performance and a low pressure drop.
- The uniform flow distribution guarantees high reliability of your electronic device.

Calistor®: Press-pack heat sinks

Technology

(patented)
Vacuum brazing of colaminated aluminium grids enclosed between two covers.
The grids can be brazed on an aluminium profile.



Advantages

- Same as for the Moducal®
- The profile is used for the hydraulic fittings, for a tab for electrical connection and as a mounting plate for other components.



Multical: Mounting plates and heat sinks



Technology

- Vacuum brazing of a cover on machine tooled cooling circuits.
- Different cooling circuit geometries available.
- Single or double side cooling.
- All dimensions available.



Advantages

- Design able to meet highest technical specification.
- Thermal homogeneity over the entire surface available.
- Hydraulic connectors customized to our customer's design.



Calitube: Stainless-steel cooling circuit heat sinks

Technology

Over-moulding an aluminium block around a stainless-steel tube.

The tube is bent into several turns under the components.



Advantages

- Over-moulding ensures excellent contact between the two materials.
- Stainless-steel enables to use all types of cooling fluid.
- Single or double side cooling.

Syscal: Cooling unit groups

Expertise in dimensioning and manufacture of complete cooling loops.

