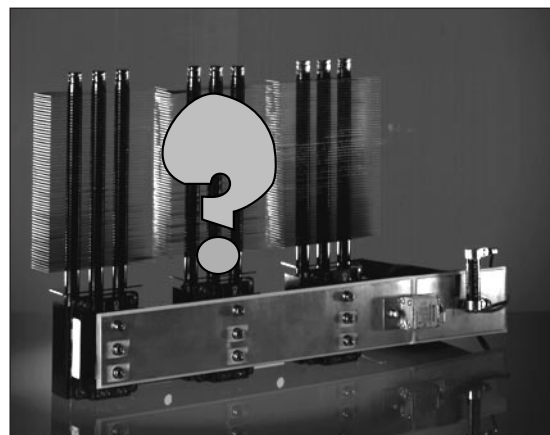




BASICS FOR FERRAZ COOLING DEVICES

IN RESPONSE TO ALL YOUR QUESTIONS ABOUT
FERRAZ NEW COOLING DEVICES.

A SET OF QUESTIONS - ANSWERS FOR BECOMING
A KNOWLEDGEABLE SOURCE



Answers

Who will be interested ?

Designers of standardized modular converters in the 300kVA up to 2MVA range for industrial and electrical traction applications.

What to be cooled ?

The complete electrotechnical function, using the latest IGBTs techniques (3 to 12 components).

WATTS to be dissipated ?

Total inverter losses over 500W up to 10kW.
IGBT module losses ranging from 100W up to 2kW.

What is usually the recommended semiconductors case temperature or temperature increase above ambient for safe operation ?

For safe operation and high reliability, IGBTs users will target 80°C case temperature and about 50% of full current rating to prevent junction melting and fast ageing. With industrial ambient at 40°C maximum recommended IGBTs temperature increase is about 40°C.



Answers

What is usually the recommended IGBT case temperature for optimized design ?

- 1 Simple design
- 2 Low cost design
- 3 Compact design

How to select the right cooling device ?

The lower the case temperature.

- 1 The higher the voltage rating, the smallest the number of IGBTs in series.
- 2 The higher the current rating, the smallest the number of paralleled IGBTs.
- 3 The higher the switching frequency, the smallest the size of capacitors.

Thermal resistance is a commonly used selection criterion expressed in °C/W or °C/kW. It is the temperature increase per dissipated watt. It values the device resistance to heatflow or to heat dissipation.



Answers

What is the heatsink thermal resistance order of magnitude needed to cool the inverter function made of 6 IGBT modules dissipating 500W through an area as big as an A4 size sheet of paper ?

About 80°C/kW, i.e. 40°C heatsink temperature increase when dissipating 0.5kW. An assembly of two TRANSCAL® SC55 modules meets the requirement. In the same volume, and for roughly the same price than an extruded profile (natural convection), weight is halved and allows maintenance on site.

What is the heatsink thermal resistance order of magnitude needed to cool the inverter function made of 3 IGBT dual power modules dissipating 5kW through an area as big as 3 halves of an A4 size sheet of paper ?

8°C/kW, i.e. 40°C heatsink temperature increase when dissipating 5kW. A serial assembly made of 3 water-cooled MODUCAL® will meet the requirement, at 12l/mn flow rate, with the same pressure drop than machined cold plate (about 1 bar), and for a lower price. MODUCAL® offers modularity and design flexibility.

Does Ferraz have any reference regarding significant cooling applications ?

All presented technologies and products have been validated by sales for very demanding applications. Reliability over 35 years in traction and industrial application : high speed trains, heavy freight locos, subways, tramways, medical equipment, AC drives, static var compensators... With the following products : TRANSCAL® (air cooling) for GTOs, CALISTOR® (water cooling) for GTOs, TRANSCAL® (air cooling) for IGBTs, MODUCAL® (water cooling) for IGBTs.

Are Ferraz cooling devices standardized products ?

Ferraz has an extensive experience in product industrialization and focuses on marketing standardized products and on lowering costs to the customer.



Answers

Can Ferraz help solving a thermal problem related to a specific semiconductor environment ?

Ferraz is a specialist and worldwide leader in power semiconductor protection : fusing and thermal protection. Ferraz shares the same electrotechnical culture with its customers. Its Applications Department is dedicated to help customer for selecting IGBTs protections and for preventing IGBT module overheating or case explosion. Its R&D Department tests products upon customer request in specific operating conditions and customizes products.

Can Ferraz handle active partnership in developments over a long period of time ?

Ferraz has the right size for financial backup of mid to long term ambitious projects in semiconductor cooling.

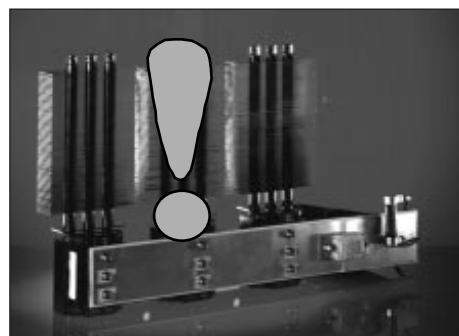
Does Ferraz complies with ISO Quality Standards ?

Ferraz is ISO 9001-certified and ensures product quality by mastering conception and processes. Customer benefits from control and administrative cost savings.

Where to buy Ferraz for semiconductor cooling devices... and other protection devices ?

Ferraz has representatives worldwide in more than 70 countries providing local assistance. Ferraz markets a complete range of products and services in the IGBT protection.

Contact your local rep.



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