

Ferrotec

**Thermoelectric
Modules from
Ferrotec**



A World of Applications — They All Work Better with Ferrotec Thermoelectric Modules

From cooling medical instrumentation in the operating room to avionics in space, thermoelectric modules from Ferrotec control today's high power densities. Unlike a passive heat sink, a thermoelectric cooler maintains temperature control dynamically. It can lower the temperature of an object below ambient as well as stabilize the temperature when it is subject to widely varying ambient conditions. Typical applications include:

Medical instruments for

- DNA Research
- Blood Analysis
- Patient cold/heat packs

Aerospace

- Avionics
- Optics
- Engine Analysis

Optics

- Laser Diodes
- Infrared Detectors
- CCDs
- LEDs

Semiconductor

- Rapid Thermal Processing
- Microprocessor Cooling
- Wafer Probes

Telecommunications

- Repeater/Amplifier Coolers
- WDM Transceivers

Industrial

- Cold Plates
- Heat Exchangers
 - Air to Air
 - Air to Liquid
 - Liquid to Liquid

Scientific/Laboratory

- Solidification-Point References
- Environmental Analyzers
- Dewpoint Hygrometers
- Calorimeters

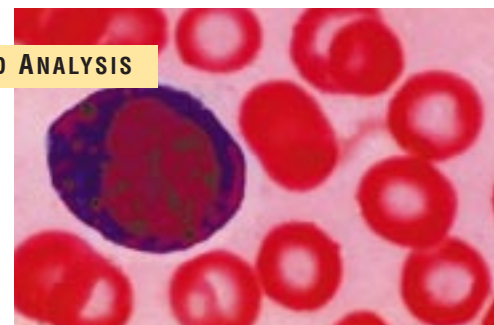
AEROSPACE



WAFER PROCESSING



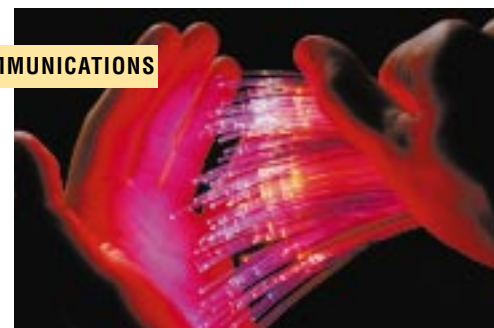
BLOOD ANALYSIS



DNA RESEARCH



TELECOMMUNICATIONS



The Advantage of Thermoelectric Modules over Mechanical Refrigeration Units

Thermoelectric modules are solid-state electronic components that cool a system by drawing heat from one side of the module to the other through the application of a small electrical charge. In contrast, mechanical refrigeration units use a compressor to circulate a refrigerant that absorbs heat throughout a system. While both systems function according to the same thermodynamic principles, thermoelectric modules are small, lightweight solid state devices with no moving parts to wear out. Thus, they can often be included within the equipment or even become an integral part of cooled components. In addition, reversing the polarity of the applied DC voltage reverses the direction of the heating and cooling, a feature that makes them ideal for controlling temperature or in processes which require both heating and cooling of a medium.

Better Thermal Management

- Precise Temperature Control within 0.1 degree Centigrade
- Heat and Cool with the Same Module
- Cool Below Ambient
- Spot Cooling
- Wide Operating Temperature range

Advanced Physical State

- No Moving Parts
- Small Size and Weight
- Low Power Requirements
- Electrically Quiet Operation
- Operation in Any Orientation
- Zero Gravity and High G Level
- Ability to Generate Electrical Power

Environmentally Friendly, no ozone-depleting materials

THE PELTIER EFFECT

When a low voltage DC power source is applied to a thermoelectric module, heat can be moved through the module from one side to the other. One module face is therefore cooled while the opposite face is simultaneously heated. This phenomenon can also be reversed. That is, a change in the polarity of the voltage causes heat to move in the opposite direction. This thermal energy process was first observed in 1834 by Jean Peltier, a French watchmaker and part-time physicist, who was investigating thermal energy flows between dissimilar metal junctions. Today's thermoelectric modules, first introduced in about 1960, make use of modern semiconductor technology substituting doped semiconductor material for the dissimilar metals used in early thermoelectric experiments.

Standard or Customized— All Ferrotec Modules Offer High Quality Thermal Management

Standard Modules

Ferrotec produces an extensive array of standard modules that meet the needs of most applications and are available for rapid delivery. All modules are available with two different maximum temperature ratings:

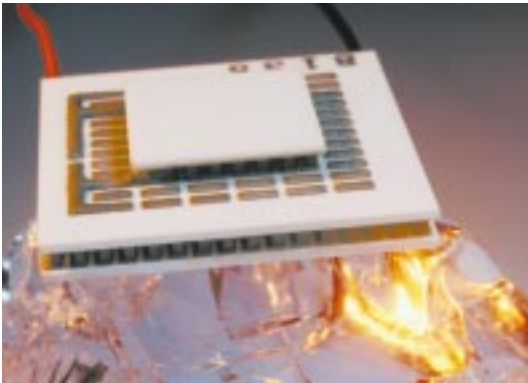
- ValueTEC™ modules are suitable for general cooling and stabilization applications and are rated for continuous operation at up to 150 degrees C.
- SuperTEC™ modules will operate continuously up to 200 degrees C.

Customized Modules

Many applications require customized thermoelectric modules. To meet proprietary requirements, Ferrotec engineers will develop modules to customer specifications. These special units may be nearly any size or shape to meet the most stringent application requirements. In some cases, the thermoelectric module may need to be an intrinsic part of the design. For example, in optical applications, the module may be part of the detector or diode; in semiconductor devices, it may be an integral portion of the ceramic package. The possibilities are almost limitless and Ferrotec is ready to assist with any phase of the design project.



Ferrotec Thermoelectric Modules Deliver . . .



World Class Quality, ISO 9002 Certified

Applications that require precise thermal management call for high-quality thermoelectric modules made by Ferrotec. The current generation of Ferrotec modules is the product of continuing research and development, which started in the late 1980s, and a rigorous ISO 9002 Certified manufacturing process.

World Wide Customer Service

Ferrotec engineers work with customers to understand their thermal management applications. When necessary, we create new designs to meet specialized needs, including custom modules and assemblies. These Ferrotec customers may be situated anywhere in the world. Because we are a global company, our service extends across all national borders. Ferrotec customers get fast delivery and comprehensive service.

Precise Thermal Management

Ferrotec thermoelectric modules are compact, efficient heat pumps that can add or remove heat from virtually any environment. Combined with heat exchanger assemblies of various types, they can be used to cool and/or heat liquids, gasses, and solid materials. As a precise temperature control device, a thermoelectric module can maintain temperatures to within 0.1 degree C.

Ferrotec Corporation and Ferrotec America Corporation

Ferrotec Corporation, founded in 1980 to import and sell ferrofluid and its applied products, is a public company headquartered in Tokyo, Japan, with manufacturing plants around the world. Ferrotec demonstrated its commitment to the design of thermoelectric modules when it acquired U.S.-based International Thermoelectric Incorporated. (ITI). All thermoelectric research and development is conducted by the skilled engineering staff of ITI based in Manchester, New Hampshire. Ferrotec America, also based in Manchester, is the sales and distribution division of Ferrotec serving customers around the world. This division trains and assists independent representatives throughout North America, South America, and Europe who sell Ferrotec thermoelectric modules to a broad range of customers.

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Ferrotec manufacturing facilities and processes meet the exacting requirements of ISO 9002.

The Ferrotec Corporation headquarters in the Sumitomo Ueno Building, Tokyo. (Photo below)

