

Medical Applications Guide



INDUSTRY GUIDE

Solutions for Medical Diagnostic and Implant Applications

MINCO

Minco provides critical design and manufacturing expertise for critical applications

From In Vivo to In Vitro diagnostic devices (IVDs), to surgical applications, to electronic implants – Minco flex circuits, heaters, sensors and control electronics prove themselves when accuracy, repeatability, reliability and compact size are vital.

Focused on your success

Original Equipment Manufacturers (OEMs) are faced with increasing demands for:

- Smaller and more portable diagnostic devices with uncompromising accuracy.
- Devices with increased throughput and highly complex interconnect requirements.

To help OEMs meet these challenges, Minco relies on state-of-the-art design technology and innovative manufacturing techniques. Our unique capabilities mean we can create solutions that meet your exacting performance requirements.

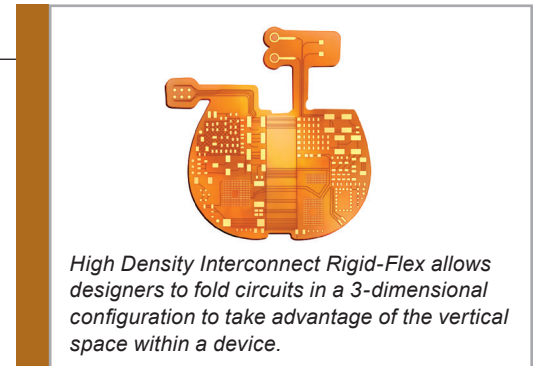
A history of growing with medical OEMs

Medical breakthroughs are occurring faster than ever before. That's why leading OEMs rely on Minco's more than 50 years of experience to sharpen their competitive edge. Minco is a direct supplier to the top cardiac device companies and serves as a Tier One supplier to over half of the leading medical IVD companies in the world.

▶ Flex Circuits

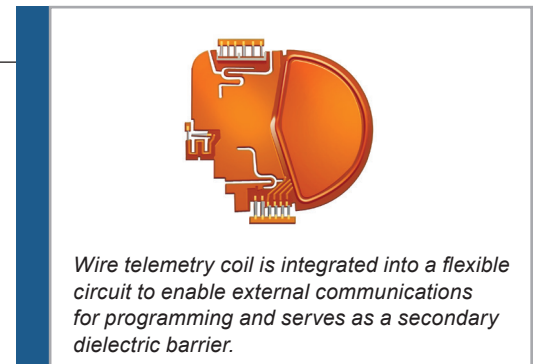
Minco's precision flex circuit technology allows us to specialize in fine lines, fine pitch, tight tolerances, small holes, lamination, and handling of fine diameter wire.

- Flexible 3-dimensional packaging – Flex circuits offer unlimited freedom of packing geometry while retaining the precision, density and repeatability of printed circuits.
- Compact and low mass – Reduce space and weight for optimal packaging and efficiency.
- Improved reliability – Compliant flex circuit materials minimize stress at solder joints and reduce the number of connection interfaces.



▶ Inductive Coils

- Inductive coils enable communications telemetry and recharging in medical implants.
- Flex-Coils™ and their connections are typically encapsulated inside the laminated flex circuit body, making them less prone to breakage than discrete coils.



▶ Thermofoil™ Heaters

Thin, flexible heaters consist of an etched-foil (Thermofoil™) or wire-wound resistive element laminated between layers of insulation material such as polyimide, silicone rubber, mica, polyester or PTFE.

- Superior thermal performance – Thermally efficient foil elements transfer heat for greater accuracy, faster warm-up, and increased throughput.
- Temperature uniformity – Heating elements can be profiled to offset variations in heat loss, ensuring a precise and consistent thermal system which achieves maximum yield.
- Compact and low mass – Thin profile reduces heater space requirements to improve medical device portability while optimizing efficiency.
- Flexible geometry – A wide variety of shape, termination and sensor options offer countless design alternatives for any application.
- Maximum reliability – Minco's industry leading use of thin, high temperature materials maximize heater capability and device reliability.

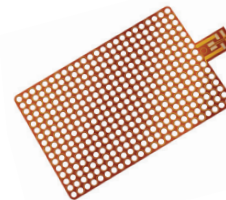
▶ Sensors

Minco manufactures custom and standard resistance temperature detectors (RTDs), thermocouples, and thermistors in a variety of packages and assemblies.

- Fast time response – Time constants as low as 0.10 second allow immediate situational analysis and efficient thermal control or condition reporting.
- Compact and low mass – Sensors can be packaged in small configurations for space savings.
- Versatile geometry – Minco sensors can be custom designed and manufactured to fit any shape and simplify installation.

▶ Integrated Solutions

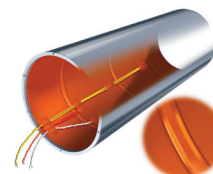
Minco's unsurpassed capabilities allow us to integrate any combination of our high quality flex circuits, heaters, sensors and control electronics to provide innovative solutions. Integrating components also creates a simplified supply chain which enables our customers to get to market faster and reduce their direct costs.



Minco uses a proprietary trimming method for the thin, flexible 384-hole Heater to achieve a tight hole-to-hole tolerance. This allows for almost perfect registration to the microtiter plate.



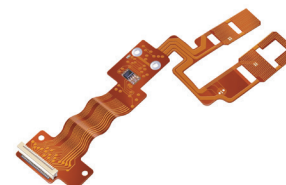
The Thermofoil heater in an IV fluid warmer puts the heat where it's needed, ensuring consistent and accurate media warming. Factory lamination provides a highly reliable, trouble-free heating solution.



Averaging temperature sensors embedded in a vulcanized Thermofoil heater with profiled wattage distribution provide optimal surface area temperature control for maximum image resolution.



The Thermal Vial™ Temperature Sensing System encompasses a wire-wound RTD element capable of -200°C operation to provide accurate measurement and documentation of freezing, process and storage methodology.



Minco leads the market in component integration and 3-dimensional packaging. This medical diagnostic circuit assembly integrates flex circuitry with a heater and five sensors.

▶ Laboratory Applications

• *Integrated flex circuit with control electronics links to the heater and sensor for a compact system package in this point-of-care analyzer.*

• *Wire-wound resistance thermometers accurately average temperature across critical surfaces for precise control.*

• *Minco manufactures a combination heater/sensor/controller/flex circuit and assembles the sample carousel that maintains accurate fluid temperature in this floor standing analyzer.*

• *Etched-foil heaters warm fluid samples and keep them at a constant temperature.*

• *Thin and lightweight etched-foil heaters allow the robotics in analyzers to seamlessly move without slowing down transfer time.*

• *Heater wraps entirely around pipettes for intimate coupling and tight temperature control.*

• *Flex circuits in a urological probe locate important nerves so they can be avoided during prostate surgery, lowering the instance of nerve damage during surgery, and resulting in improved patient recovery without negative side effects.*

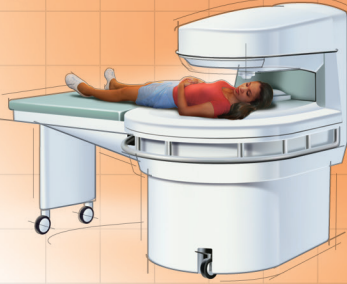
Minco solutions for medical diagnostic applications

- In Vitro diagnostics
- In Vivo diagnostics
- Patient monitoring
- Surgical equipment
- Respiratory devices

▶ Imaging Applications



- Polyimide Thermofoil heaters maintain the structure of the scanner at a constant temperature to eliminate expansion/contraction registration errors.



- High-density flex circuits offer highly reliable interconnect circuitry between imaging modules rotating within MRI and PET/CT scanning devices.



- Thermofoil heaters factory mounted to heat sinks and integrated with RTD temperature sensors process output from imaging systems onto dry silver film substrates for highly detailed hard copy used by doctors for analysis.

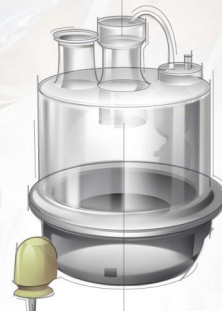
- Flex circuits within the motor controls of surgical drills used in bone surgeries allow for flexible configuration and space savings to keep the device compact and easy to handle.

▶ Surgical Applications

- All-Polyimide heater in this dental surgery instrument provides high watt density heating of polymer cones to fuse and seal the tooth during root canals. The component assembly integrates a surface mount LED, control switches, and an RTD temperature sensor.



- Thermofoil heater in post-surgery respiratory device reliably warms and humidifies air, offering therapeutic value as well as improved patient comfort level.



- Thermofoil heaters in this IV fluid delivery system feature low mass and total surface coverage to meet the customer's need for reliability and safety.
- RTD temperature sensor maintains IV fluids at a consistent 37°C for patient comfort and prevention of thermal shock .
- Temperature controllers and Thermofoil heaters operate from low voltage DC to eliminate current leakage for added patient safety.

Minco solutions for medical implant applications

- Pacemakers
- Defibrillators (ICD)
- Cardiac resynchronization therapy (CRT)
- Heart assist/artificial heart (LVAD)
- Neurological stimulation implants
- Hearing implants
- Infusion drug pumps

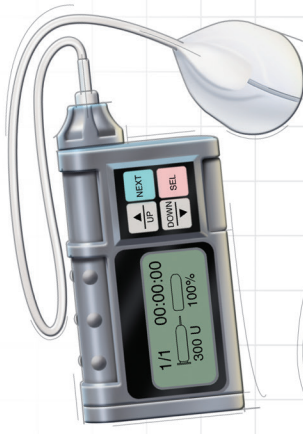
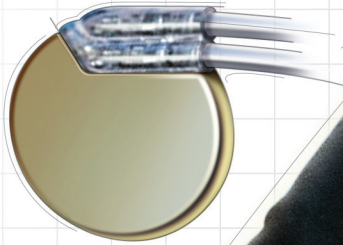


• *Flex-Coils communicate from the external component to the internal component of a middle-ear or cochlear hearing device.*

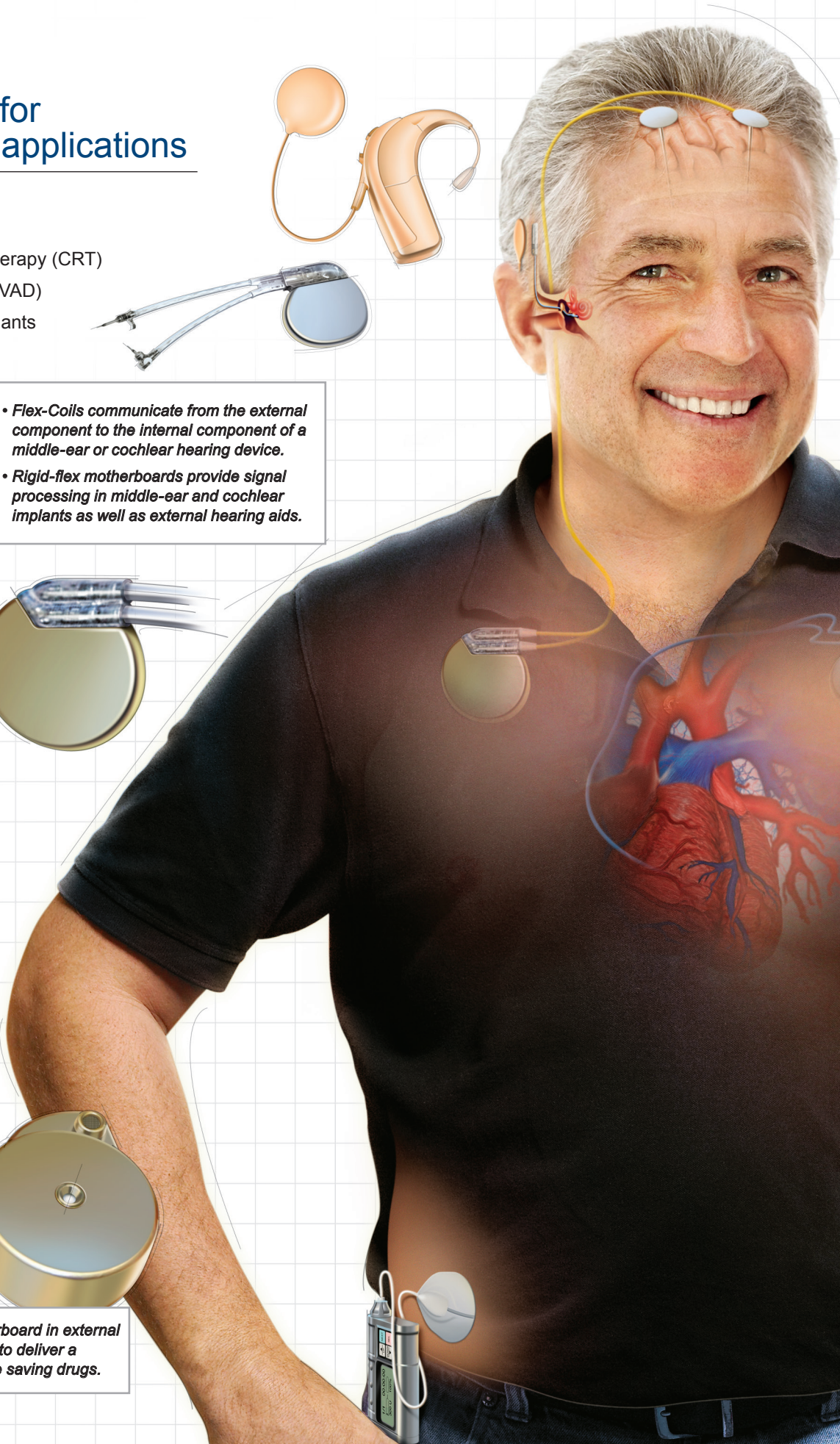
• *Rigid-flex motherboards provide signal processing in middle-ear and cochlear implants as well as external hearing aids.*


• *Multi-layer flex circuits allow for the miniaturization of the motherboards for implantable neurostimulators in the brain.*

• *Flex circuit inductive coil is used to recharge the power source.*



• *Flex circuits form the motherboard in external and internal infusion pumps to deliver a precise, regulated flow of life saving drugs.*



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- *Flex-Coils are wire-wound inductors that Minco integrates with flex circuits to enable magnetic flux telemetry communication in cardiac devices.*
 - *Flex-Coils combine telemetry coils with flexible or Rigid-Flex circuits including optional piezoelectric annunciators for audible alarms.*

Let Minco's value added solutions make the difference in your critical application

Reduce Total Cost of Ownership

Minco believes in considering all costs associated with our solutions. That's why we design and manufacture with Total Cost of Ownership (TCO) in mind. Minco's ability to integrate our components and provide turnkey assemblies with other components of your application can save you time and money. Whether you're looking for a ready-to-install sub-assembly, or a single component, Minco is the perfect fit to help manage costs.

Discovery and solutions through collaboration

Minco's Engineer to Engineer (E2E) program helps our design and manufacturing engineers join forces with our customer engineers – leveraging the power of collaboration to solve problems and discover new opportunities. Minco offers a full range of expertise: from a command of electronic and thermal principles needed to develop design specifications, to production and manufacturing expertise needed to construct unique solutions for your challenging specifications.

Let's Talk
E2E

Engineer to Engineer

www.minco.com/E2E

Minco's commitment to quality

Minco complies with Good Manufacturing Practices (GMP) and is ISO 9001:2008 (Registrar: TÜV) certified. We have the capabilities to meet many other quality assurance, process and product specifications per your requirements.

- Company: AS9100: 2009(rev.C)/EN9100/SJCA9100
- Heaters: UL, TÜV, CENELEC
- Flex circuits: IPC 6013, NADCAP accredited

For more information on Minco's custom design and manufacturing capabilities, please visit www.minco.com.