

## Innovating Medical Devices Through Integrated Component Design

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In the heavily regulated medical field—where accuracy, reliability, and patient safety are non-negotiable—successful device development depends on more than selecting high-quality individual components. True innovation comes from integrating critical technologies into a unified, optimized system. From diagnostics and laboratory analysis to imaging and surgical equipment, medical devices must perform consistently while meeting stringent regulatory and space constraints. Minco partners with medical device developers to solve this challenge by integrating temperature sensors, flexible heaters, and flex PCBs into compact, reliable designs.

### Integration in Practice: Large vs. Compact Medical Analyzers

The floor-standing medical analyzer shown in the first image represents a traditional approach to clinical diagnostics, combining multiple discrete subsystems to manage sample handling, temperature control, and data processing. While effective, this architecture requires a large physical footprint and longer processing times.

By contrast, the compact countertop analyzer shown in the second image performs the same medical analysis with equivalent accuracy and reliability, but does so faster and within a smaller footprint. This reduction in size and improvement in speed are made possible through intentional integration of Minco technologies—combining heaters, sensors, and flex circuits into tightly coordinated assemblies that eliminate unnecessary components, reduce interconnects, and improve thermal responsiveness.

*Floor-standing  
medical analyzer*



*Compact countertop  
analyzer*



## **Integrated Thermal Management: Flexible Heaters and Sensors**

Precise temperature control is essential in medical analyzers, particularly in fluid handling and sample processing. In the floor-standing analyzer, the sample carousel relies on a coordinated combination of a heater, temperature sensor, and controller to maintain accurate fluid temperatures.

In the countertop analyzer, this same thermal performance is achieved through custom flexible heaters integrated directly with temperature sensors, allowing heat to be applied exactly where needed while minimizing thermal mass. Minco's Thermofoil™ and SmartHeat SLT™ flexible heaters provide uniform, reliable heating, while embedded or closely coupled sensors deliver fast, accurate temperature feedback—enabling tighter control loops and faster stabilization times.

## **Advanced Temperature Sensing for Integrated Designs**

Minco's temperature sensor portfolio is designed specifically for integrating RTDs, thermocouples, and thermistors into compact medical devices. Minco recently introduced a rotating bolt temperature sensor that offers unique advantages for integrated medical systems. Their rotating lead design prevents wire twist during installation, improving long-term reliability and simplifying assembly in space-constrained devices. Rugged stainless-steel construction, configurable sensing elements, and high insulation resistance make these sensors well suited for both laboratory analyzers and clinical instruments where durability and precision are critical.

## **Flex PCBs: The Backbone of Compact Medical Systems**

Flex PCBs play a central role in enabling the compact countertop analyzer's reduced footprint. By replacing bulky wiring harnesses and rigid boards, Minco's flex circuits allow sensors, heaters, and electronics to be routed in three dimensions, conforming to the device's mechanical design rather than dictating it. This approach reduces assembly complexity, improves signal integrity, and supports tighter integration between thermal and electronic subsystems.

## **One Partner, One Integrated Solution**

Integration of temperature sensors, flexible heaters, and flex PCBs is one of the most significant challenges in modern medical device development. Component placement, interaction, manufacturability, and long-term support must all be considered together—not

in isolation. Minco helps medical device developers address these challenges by serving as both component supplier and integration partner, offering engineering support from concept through production.

By sourcing and integrating multiple critical technologies from a single expert provider, medical device manufacturers can simplify their supply chains, reduce risk, and accelerate time to market. Minco doesn't just deliver components—we engineer integrated solutions that enable faster, smaller, and more reliable medical devices.

Contact Minco to learn how integrated sensors, heaters, and flex circuitry can transform your next medical design.