



Modern Thermoelectrics
Designed for **Rapid**
Point-of-Care Testing

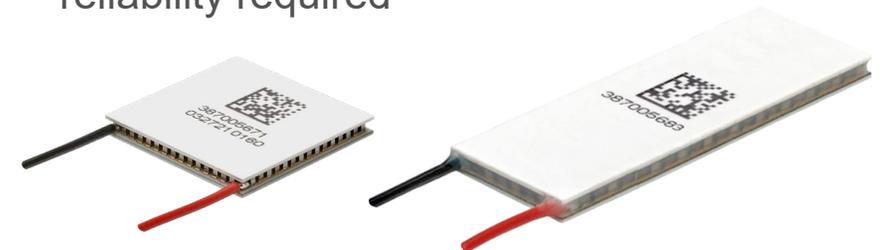
Introduction



Point of Care Testing enables accurate test results within an hour



Thermoelectric Coolers offer the precise temperature control and high reliability required



Application Overview



Point of Care Testing is accomplished through handheld instruments or portable devices.



POCT Applications

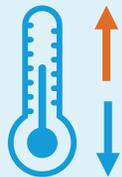
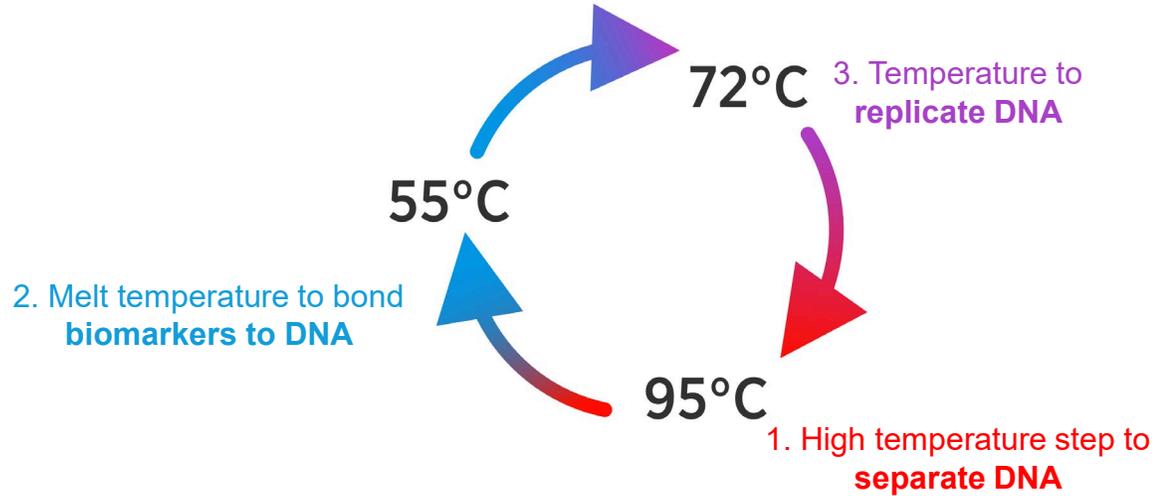
- Photometry
- Ion Selective Electrode (ISE)
- Automated cell counters
- Hematology analyzer
- Thermocyclers

Application Challenges



THERMAL CYCLING

PCR requires up to 40 cycles, which can be a harsh environment for thermoelectric coolers



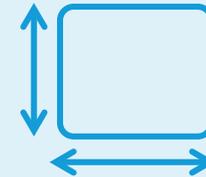
TEMPERATURE GRADIENT

Sample trays must maintain precise temperature control



VIBRATION

Components must withstand mechanical stresses



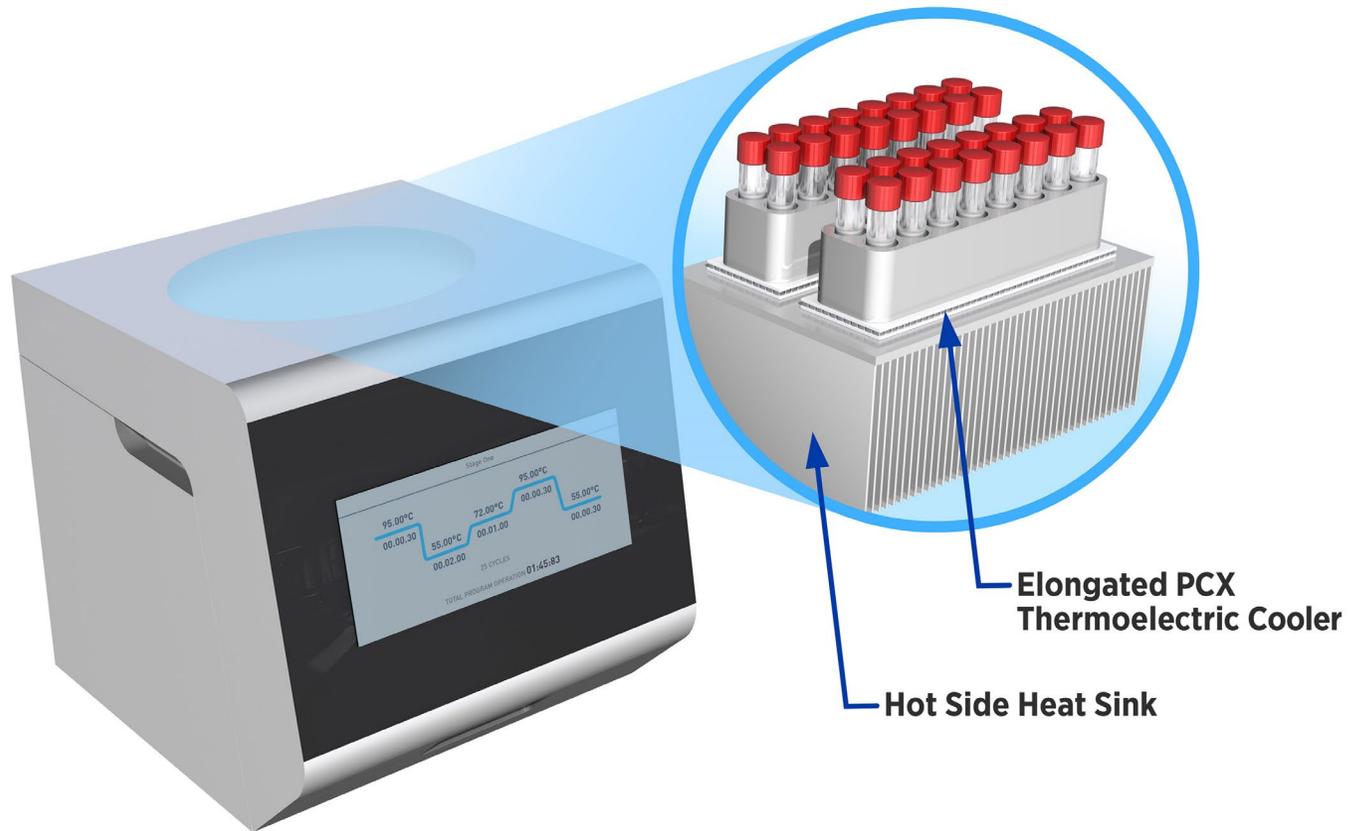
SWAP REQUIREMENTS

Packing more functionality in a smaller footprint increases the heat flux density

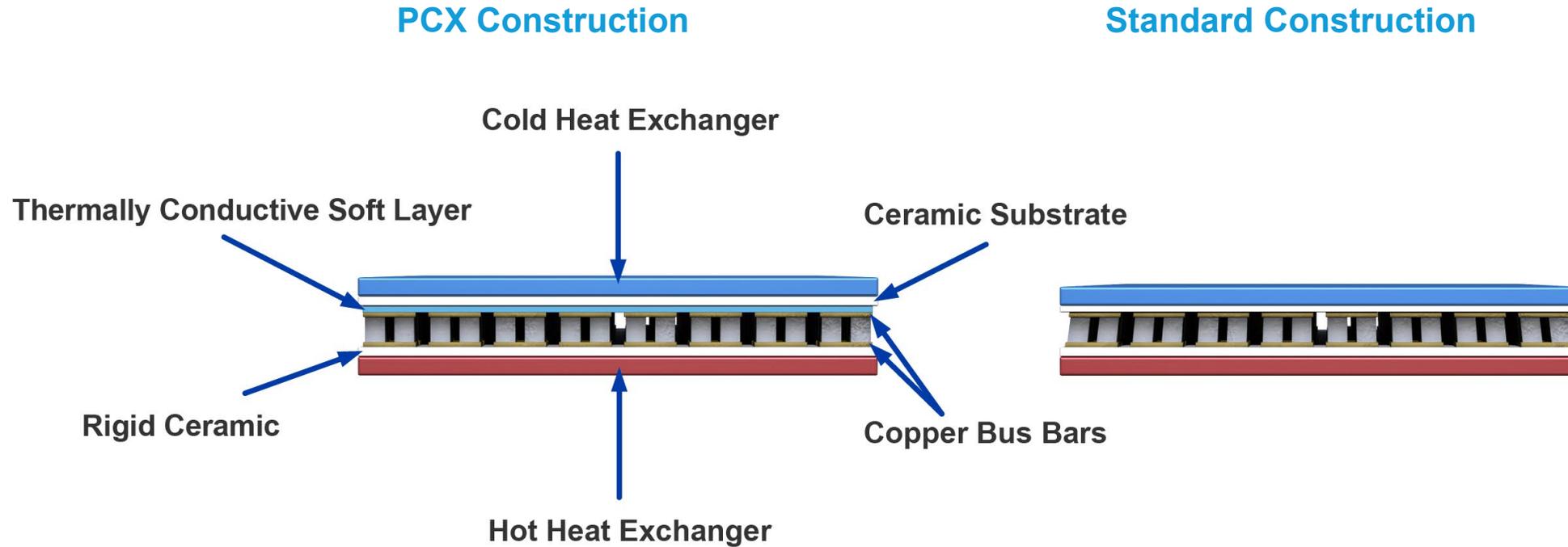
Thermoelectrics in POCT Equipment



Modern POCT equipment use thermoelectric coolers for **precise temperature control**



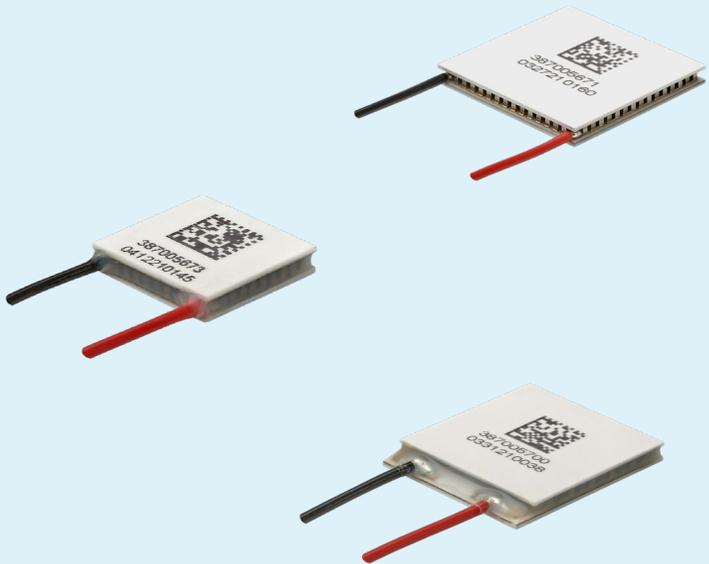
Standard vs PCX Thermoelectric Coolers



PowerCycling PCX Thermoelectric Coolers features a thermally conductive soft layer that absorbs mechanical stresses and **extends the operating life** of point of care testing devices.

PowerCycling PCX Series

High-Performance Thermoelectric Coolers



Next-Gen
Materials

Faster Ramp
Rates

Tested to
withstand
rigorous cycle
testing

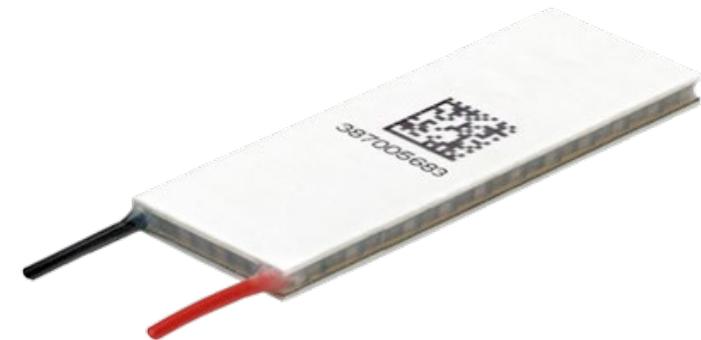
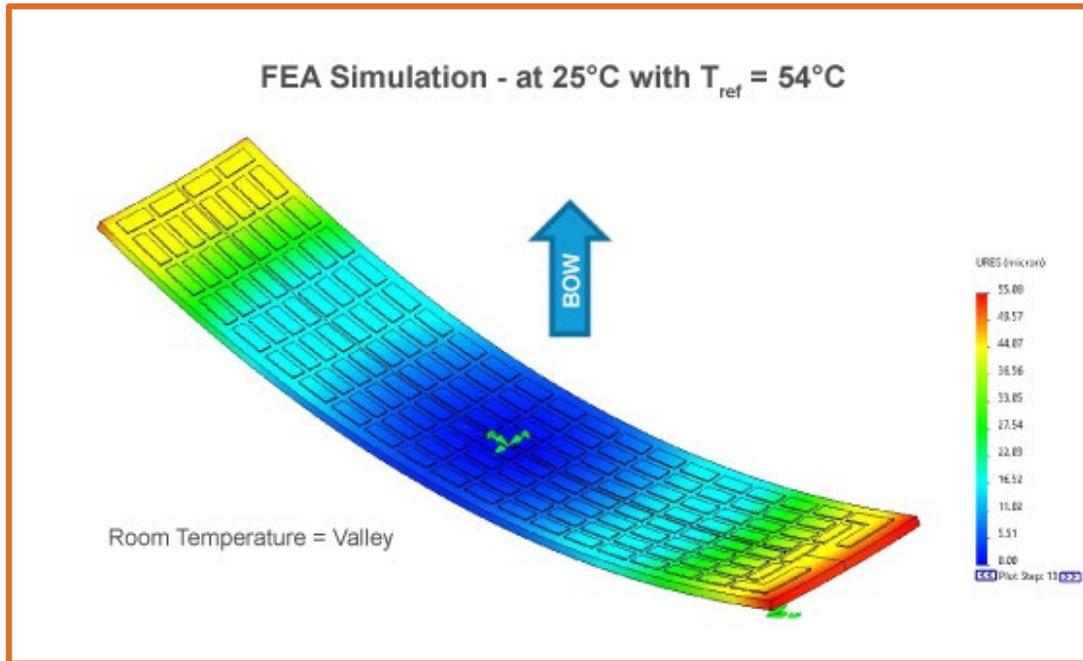
Vibration
Resistant

High Temperature
Operation

Cooling capacity
range
14 to 215 Watts

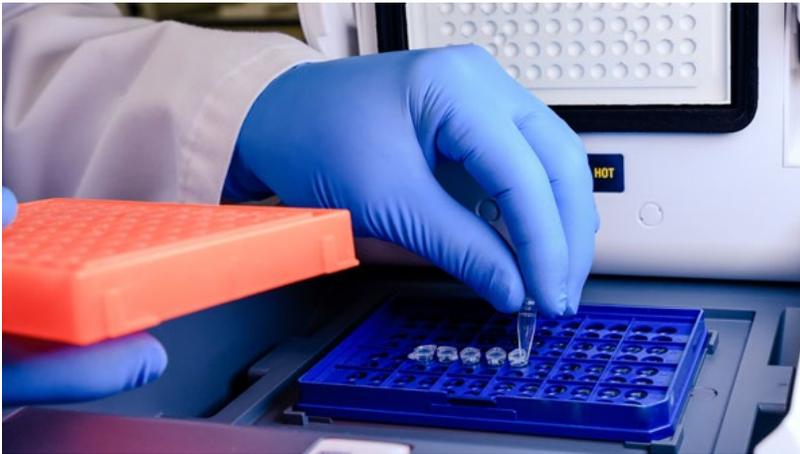
PCX Elongated Thermoelectric Coolers

High precision temperature control for faster test results



Our PCX Elongated Series eliminate the bowing effect that occurs with longer parts.

Conclusion



Point of care testing allows for **real-time diagnostic test results** within an hour.

To ensure accurate results and long-life operation, thermoelectric coolers are used **for temperature control** of medical devices.

PCR point of care testing requires **sophisticated thermal cycling** that can withstand rapid temperature changes

The PowerCycling PCX Series features a unique module construction and next generation materials to **speed up** PCR testing and **provide long-life operation.**

PCX7-159-F1-1466-TA-RT-W6
MFG Part Number 38705083

PowerCycling PCX Series Thermoelectric Cooler
The PCX7-159-F1-1466-TA-RT-W6 is a high-performance thermoelectric cooler designed for thermal cycling between multiple temperature set points and is ideal for applications in healthcare among others, where fast temperature changes are required. The thermoelectric module is specially constructed to reduce the amount of stress induced on the thermoelectric elements during operation. It has a maximum Qc of 73.0 Watts when $\Delta T = 0$ and a maximum ΔT of 73.6 °C at Qc = 0.

Features

- High thermal cycling reliability
- Precise temperature control
- Stable operation
- Excellent performance with nitrogen material
- RoHS-compliant

Applications

- Molecular Diagnostics (DNA-Amplification, POCT)
- Point of Care Testing Device
- Thermal Test Stacks

You can interact with the Performance Curves below to estimate the cooling performance by entering the thermal and electrical operating conditions for your application. Click the **Save Changes** button to create a Customized PDF Datasheet. Please Note: Actual application performance will vary from calculated values based on actual thermal design characteristics.

ELECTRICAL AND THERMAL PERFORMANCE

Use the sliders, input fields and **UPDATE** button below to enter your application's electrical and thermal conditions. Use the Graph Y and X Axis buttons to display a variety of performance curves and use the Voltage/Current slider to choose the electrical operating point to display performance. Click **Save Changes** button to save your results as a Customized PDF Datasheet.

Selected Operating Point

Cooling Power (Qc) = 51.55 Watts
Current = 6.86 Amperes
Voltage = 14.85 Volts
Power Supply = 50.01 Watts
COP = 0.68
Power Dissipated (Qh) = 151.5 Watts
Tset = 27.0 °C

Optimum COP

Cooling Power (Qc) = 8.85 Watts
Current = 0.96 Amperes
Voltage = 3 Volts
Power Supply = 2.87 Watts
COP = 3.08
Power Dissipated (Qh) = 11.73 Watts

Maximum Qc

Cooling Power (Qc) = 66.17 Watts
Current = 2.95 Amperes
Voltage = 19.54 Volts
Power Supply = 108.02 Watts
COP = 0.42
Power Dissipated (Qh) = 224.18 Watts

min: 0.4 A Vmax: 8.1 A
Vmin: 1.8 V Vmax: 19.5 V

Voltage: Volts Current: Amperes

Heat Pumped at Cold Side (Qc)
Tambient = 27 °C Tcold = 15 °C
Q hot side = 0 °C/W Q cold side = 0 °C/W

Electrical and Thermal Performance Graph

Operating Voltage (Volts) vs Qc (Watts)

CHOOSE AN EXAMPLE OR COMPLETE THE REQUIREMENTS...



DIMENSIONS

Length mm Width mm Height mm

TEMPERATURES

Ambient Temperature (Tamb) °C
Elongation Temperature (Telong) °C
Denaturation Temperature (Tden) °C
Annealing Temperature (Tann) °C

RAMP RATES

Maximum Heating Ramp Rate (Tden->Tann) °C/s
Maximum Cooling Ramp Rate (Tann->Tden) °C/s

SAMPLE VIALS

Number of Vials
Select Vial Size:

VIAL MATERIAL PROPERTIES

Density: kg/m³ Specific Heat: J/kg·K

BLOCK MATERIAL PROPERTIES

Density: kg/m³ Specific Heat: J/kg·K

CALCULATION RESULTS...

°C mm Watts
 °F in BTU/hr

Total Surface Area of PCR Block:

PCR Block Volume (Vblock):

Total Vial Volume (Vvial):

Total Sample Volume (Vsample):

Total Volume (Vblock + Vvial + Vsample):

Total Envelope Volume (L x W x H):

Passive Heat Loss (Annealing -> Ambient):

Passive Heat Loss (Elongation -> Ambient):

Passive Heat Loss (Denaturation -> Ambient):

Heat to Add: Elongation -> Denaturation

Heat to Remove: Denaturation -> Annealing

Heating Power Required (Qh):

Cooling Power Required (Qc):

PCX Thermoelectric Coolers enable faster point of care diagnostic testing

Modern Thermoelectrics Designed for Point of Care Testing (POCT)

Laird Thermal Systems Application Note



[Datasheets](#)

[PCR Calculator](#)

[Application Note](#)

About Laird Thermal Systems



Medical



Analytical



Industrial



Transportation



Telecom

- **DIVERSE PRODUCT PORTFOLIO**
Thermoelectric Coolers, Thermoelectric Cooler Assemblies, Temperature controllers and Liquid Cooling Systems
- **SOLVING COMPLEX ISSUES**
Our engineers use advanced thermal modeling and management techniques to solve complex heat and temperature control problems
- **ACCELERATING TIME-TO-MARKET**
We partner closely with our customers across the entire product development lifecycle.
- **MAXIMIZING PERFORMANCE**
Our global manufacturing and support resources help customers maximize productivity, uptime, performance and product quality

Need Help?
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www.lairdthermal.com





Have a question or need more information about
Laird Thermal Systems? Please contact us via the website at www.lairdthermal.com



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