

Using Cooling Blocks with the LHS for Continuous All-Day Cooling

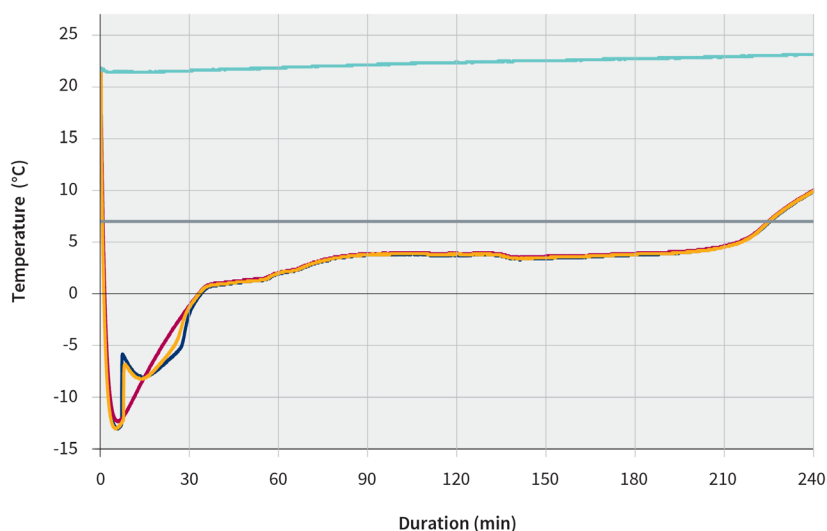
Introduction

Polymerase chain reaction (PCR) remains a foundational technique in molecular biology, genomics, diagnostics, and research, enabling the sensitive and specific amplification of targeted DNA or RNA sequences. However, the reliability and reproducibility of PCR assays depend critically on maintaining the integrity of temperature-sensitive reagents—such as enzymes, nucleotides, primers, and ready-to-use master mixes—throughout the workflow. Premature exposure to room temperature can trigger unwanted enzyme activity, promote non-specific primer binding, and degrade reagent performance, ultimately compromising reaction efficiency, specificity, yield, and overall assay consistency.

Many traditional automated liquid handling platforms address this challenge with expensive, integrated active (powered) cooling modules, which increase capital and operational costs and can introduce issues such as condensation. In contrast, the BRAND Liquid Handling Station (LHS) offers a practical, cost-effective alternative: up to five cooled positions on the standard deck, utilizing BRAND'S patented passive Cooling Blocks. These blocks reliably maintain reagents and plates at approximately 4–7°C for over 3 hours per unit. Through simple block exchanges, laboratories can achieve continuous, all-day cooling—typically 6–7 hours—without any active refrigeration, thermocycling components, or workflow interruptions.



96-well PCR Cooling Block



Cooling capacity of a BRAND 96-well PCR Cooling Block.

Shown are the temperature curves in wells A1 (blue), D6 (red), and H7 (yellow) in the BRAND 96-well PCR Cooling Block. All wells are filled with 50 µl of a 20 % glycerol solution. The ambient temperature in the Liquid Handling Station is light blue. The threshold temperature of 7 °C is shown in gray.



An example: The Crucial Role of Chilling in Master Mix and Assay Development

This white paper examines the strategic deployment of these cooled positions to optimize PCR master mix preparation, reagent storage, and multi-plate distribution workflows. By preserving low temperatures during extended pipetting steps and high-throughput protocols, the approach significantly reduces experimental variability, mitigates degradation risks, and enhances efficiency in demanding applications such as assay development, diagnostic scale-up, and large-scale screening. The solution presented here demonstrates how passive cooling technology delivers robust temperature control on a flexible, non-refrigerated platform, empowering laboratories to achieve consistent, high-quality results even in prolonged or complex automated workflows.

Temperature control is often important in PCR and other genomic or proteomic assays, especially for non-hot-start mixes and prolonged experiments, as elevated temperatures can lead to reagent instability. For instance, primer-dimer formation due to enzyme activity at room temperature can consume reactants needed for target amplification. Maintaining low temperatures prevents formation of non-specific products before the initial denaturation step and increases reproducibility.

Recommendations from multiple vendors of qPCR and NGS library prep kits mention the importance of a chilled setup to reduce variability and protect reagents. Passive cooling systems, as utilized in LHS, maintain ~4-7°C for hours, aligning with many manufacturer guidelines for reagent storage. This is particularly vital for workflows where delays in pipetting could otherwise compromise entire batches.

By maximizing cooled positions, laboratories can extend workflow durations without refrigeration, enhancing scalability and cost-effectiveness. Empirical data from assay optimization protocols confirm that consistent low-temperature handling improves reproducibility. It is important to note that passive cooling reduces condensation and overhead cost and simplifies automation setups, commonly associated with refrigerated decks, while still maintaining reagents within manufacturer-recommended handling temperatures.



Conclusion

Maximizing cooled positions on the BRAND LHS can represent a straightforward yet impactful strategy for optimizing PCR and related temperature sensitive assays. Optimizing your deck layout, using the available cooling options (up to 7 hours by swapping in an identical passive cooling block halfway through the protocol) afforded by the LHS will provide a platform for efficient, degradation-free workflows. Using ice for this purpose has many disadvantages, including contamination risks, melting and the need to replace regularly with new ice, and cleanliness. The emphasis on temperature control (specifically chilling in this case) draws from robust scientific evidence and is required in numerous workflows. Implementing these practices can elevate laboratory productivity, ensure data integrity, and support advancements in molecular diagnostics and research. For organizations adopting automated systems, prioritizing temperature control is one of the keys to unlocking the full potential of automated liquid handling technology.

References

1. Promega Corporation (2025) Promega provides detailed handling instructions in product-specific technical manuals and protocols (e.g., for GoTaq® series master mixes, qPCR systems). These emphasize cold handling for many reagents, but recommendations vary by product formulation—particularly between traditional and hot-start chemistries.
2. Bio-Rad Laboratories General Recommendations from Bio-Rad Sources on Automation and Temperature Control
 - Temperature-sensitive steps — For non-hot-start or sensitive reagents, Bio-Rad recommends keeping components on ice or using cold blocks during manual pipetting to minimize non-specific activity or degradation. In automated systems, cooled deck positions (if available on the liquid handler) help maintain consistency in multi-plate runs.