

High Performance PCR from Finnzymes



Speed • Fidelity • Yield • Specificity

High Performance PCR

A Winning Combination

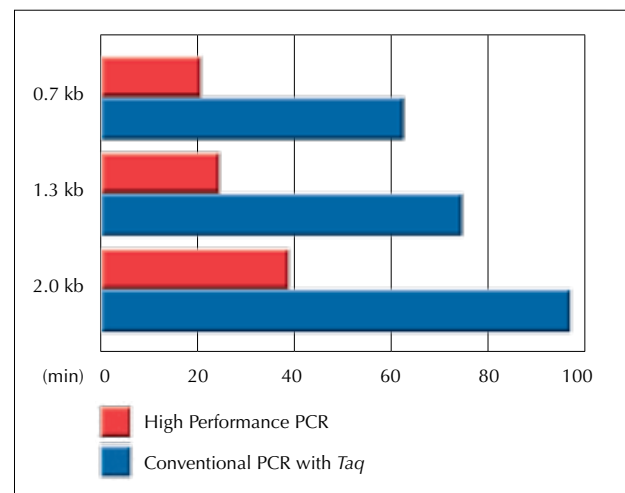
We deconstructed the PCR process and created a tripartite solution that improves nearly every measurable aspect of PCR. It combines highly processive proofreading Phusion™ DNA Polymerases, high-speed Piko™ Thermal Cyclers, and ultra-thin walled UTW™ tubes and plates. Each component, alone, is best in class. Together they offer synergies that propel PCR to unbeatable performance.

♠ Speed - Fastest enzyme, fastest instrument, fastest tubes

To save valuable research time, each component of the High Performance PCR solution is designed to expedite PCR protocols. Phusion™ DNA Polymerases are highly processive, due to a DNA-binding domain fused to the polymerase. The result is extreme reaction speed and robustness. The Phusion Flash PCR Master Mix requires only 15 seconds or less to extend a kilobase target. Clever designing enables the Piko™ Thermal Cycler to complete a 25-cycle PCR protocol in as little as 10 minutes. This speed improvement is based upon the fast ramp rate and an incredible settling time of less than 1 second, which allows for 0 second holds at annealing and denaturing steps. The vessels (UTW™ tubes and plates), have extremely thin walls where the tubes contact the cycler block. This results in less thermal resistance and rapid heat transfer from the block to the reaction mixture.

Advantages of High Performance PCR

- **Speed** – Significantly faster than any other combination
- **Fidelity** – Superior accuracy over *Taq* and *Pfu* based systems
- **Yield** – Higher efficiency amplification results in more product
- **Specificity** – Reduced levels of primer-dimers and false-primed products



Comparison of total cycling times in amplification of genomic DNA fragments between 0.7-2.0 kb. The increased processivity of Phusion DNA Polymerases allows extremely short cycling times. Additionally, annealing temperatures used are 5°–8°C above conventional PCR. Both of these shave valuable seconds off of each cycle and make 2-step protocols easily achievable. The extraordinary short hold times are due to the temperature stabilizing effect of the Piko Thermal Cyclers and UTW vessels, minimizing the time required to achieve the target temperature.

♥ Yield – Amplify with confidence

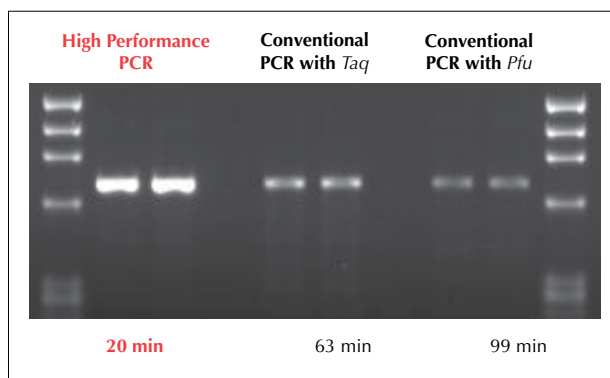
High speed PCR is often fickle – variable yields depend upon the purity of template and the need for tedious reaction optimization. This is not true for our integrated solution. Phusion technology offers several distinct advantages. First, we allow for high efficiency amplification under the most demanding conditions. Phusion DNA Polymerases have a very broad window for optimization that allows them to work robustly with common inhibitors of PCR (such as blood) and in varying reaction conditions. Second, the extreme stability of our Phusion DNA Polymerases at high temperatures, combined with the ultra-quick settling time of the Piko Thermal Cyclers, results in consistently abundant yields of specific product – even with prolonged PCR protocols.

♣ Fidelity – We challenge you to find an error

At the core of our unique polymerases is a cleverly engineered proofreading enzyme with enhanced DNA-binding activity and processivity. The Phusion technology improves the fidelity of the polymerase, such that Phusion High-Fidelity DNA Polymerases have the lowest error rates of any polymerases available. The error rate of Phusion DNA Polymerases is as low as 4.4×10^{-7} , which is more than 50-fold better than that of *Taq* DNA polymerase. High Performance PCR may be used in routine applications or with protocols requiring the highest accuracy.

♦ Specificity – One lane, one band

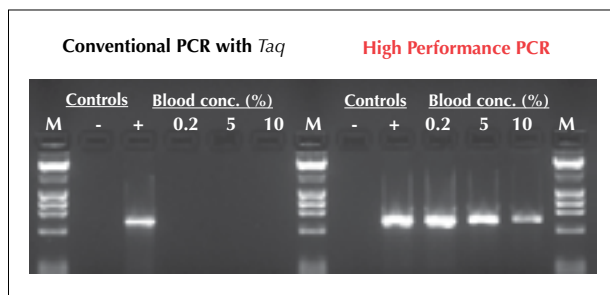
Primer-dimers and false-primed products are not only a nuisance, but may mask the correct target amplicon. Our integrated solution combats this by speeding and heating the reaction. The Piko Thermal Cycler uses fast ramping and short annealing times to reduce the effects of spurious amplification by minimizing false priming. These unwanted products are diminished by Phusion DNA Polymerases' ability to dramatically raise annealing temperatures as compared with conventional PCR. To further improve specificity in PCR, Phusion DNA Polymerases are also available as hot start enzymes utilizing "zero-time reactivation."



High Performance PCR - higher yields in shorter time. Amplification of a 0.7 kb fragment from human β -glucuronidase gene with Finnzymes' High Performance PCR versus conventional PCR protocols with *Taq* or *Pfu* DNA polymerases. After PCR, equal aliquots of samples (duplicates of each) were run on a 1.5 % agarose gel.

DNA Polymerase	Fidelity value	Products with errors (%)
Phusion High-Fidelity DNA Polymerase	4.40 E -07	1.32 %
<i>Pfu</i> DNA polymerase	2.80 E -06	8.40 %
DNA polymerase from <i>T. kodakaraensis</i>	3.32 E -06	9.96 %
<i>Taq</i> DNA polymerase	2.28 E -05	68.4 %

High Performance PCR guarantees extreme fidelity. Calculated percentage (%) of PCR products (1 kb) having an error after a 30-cycle PCR reaction. 99 out of 100 fragments amplified with High Performance PCR have no errors, whereas *Taq* DNA polymerase produces only 32 error-free fragments out of 100.



Amplifying in the presence of raw blood. Blood, a well documented inhibitor of *Taq*-based PCR, completely blocked amplification of a 0.7 kb fragment from endogenous genomic DNA. To the contrary, High Performance PCR overcame the inhibitory effects of even high concentrations of blood and provided abundant yields of specific product. The High Performance PCR protocol time was under 30 minutes – less than half of that of conventional PCR. Positive control reactions contained purified genomic DNA in the absence of whole blood.

High Performance PCR – The Integrated Solution



Phusion™ High-Fidelity DNA Polymerases*

Phusion DNA Polymerases, with a combination of extreme fidelity, unparalleled speed and robustness, guarantee PCR performance that no other enzyme can match.

Phusion™ Technology

Our technology fuses a novel *pyrococcus*-like proofreading polymerase with a DNA binding domain. The Phusion technology delivers the highest fidelity with shorter extension times and minimal optimization.

Advantages

Accuracy – DNA Polymerases with the highest fidelity

Speed – Extremely short extension times (as little as 15 s/kb or less)

Robustness – Minimized reaction failures and optimization

High yields – Increased product levels

Specificity – Reduced levels of non-specific amplification



Piko™ Thermal Cyclers

Piko Thermal Cyclers offer high thermal performance in a tiny footprint.

Piko™ Technology

At the heart of the Piko Thermal Cycler lies our unique heat pump. Designed to deliver bridled power, it results in industry-leading thermal uniformity, accuracy, ramp rates and settling times. This not only allows for PCR protocols in as little as 10 minutes, but also assures consistent results from well-to-well and instrument-to-instrument.

Advantages

Half the size – Smallest footprint at 16 cm x 17 cm

Twice the speed – PCR protocols in as little as 10 minutes

Superior thermal uniformity – Robust and consistent results



UTW™ Tubes and Plates

Finzymes' ultra-thin walled (UTW) vessels are designed for High Performance PCR applications. Their unique features allow for extremely short protocol times with consistent performance.

UTW™ Technology

Ultra-thin walled PCR tubes and plates are manufactured utilizing a patent-pending process for molding polypropylene vessels with walls that are a mere 150 microns thick. Thinner walls offer less thermal resistance to heat transfer from the cycler block to the sample within the tube. This allows for much greater cycling speeds.

Advantages

High thermal conductivity – Half the thickness of conventional tubes

Uniform thinness – Equal performance in every well

Reagent savings – Reaction volumes down to 5 µl

Phusion and Piko are trademarks of Finzymes Oy or its affiliates. UTW is a trademark of BioInnovations Oy.

Notice to Purchaser of Phusion DNA Polymerases: Limited license (proofreading DNA polymerases). The purchase price of this product includes a limited, non-transferable license under U.S. and foreign patents (5,500,363 and 5,352,778) owned by New England Biolabs, Inc. to use this product. Notice to Purchaser of Piko Thermal Cyclers: Purchase of this instrument conveys a limited non-transferable immunity from suit for the purchaser's own internal research and development and applied fields other than human in vitro diagnostics under non-real-time thermal cycler patents of Applied Biosystems Corporation. The quality system of Finzymes Oy is certified according to standard SFS-EN ISO9001:2000.

* Phusion DNA Polymerases are available from New England Biolabs in the US, Canada, UK, Germany, China and Japan.

Find out more at www.highperformancepcr.com

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