# HotStarTaq® DNA Polymerase and QIAGEN® *Taq* DNA Polymerase

## For high PCR specificity with minimal PCR optimization

HotStarTaq® DNA Polymerase provides high specificity in hot-start PCR and QIAGEN® *Taq* DNA Polymerase provides optimal results in a wide range of PCR applications.

HotStarTaq DNA Polymerase offers:

- High PCR specificity — due to the combination of enzyme with unique QIAGEN PCR Buffer
- Reduced nonspecific amplification — provided by the stringent built-in hot start
- Minimal optimization — saving time and money
- Easy handling — simple reaction setup at room temperature

## Increased PCR specificity

HotStarTaq DNA Polymerase, together with unique QIAGEN PCR Buffer, provides high specificity in hot-start PCR. Amplification of nonspecific products, primer–dimer formation, and background are minimized in every PCR cycle (Figure 1).

## HotStarTaq DNA Polymerase

HotStarTaq DNA Polymerase, a modified form of QIAGEN *Taq* DNA Polymerase, is supplied in an inactive state that has no polymerase activity at ambient temperatures. This prevents extension of nonspecifically annealed primers and primer–dimers formed at low temperatures during PCR setup and the initial PCR cycle. HotStarTaq DNA Polymerase is activated by a 15-minute incubation at 95°C that can be incorporated into any existing thermal-cycler program. The stringent hot start provided by HotStarTaq DNA Polymerase in combination with unique QIAGEN PCR Buffer results in the highest PCR specificity compared with other hot-start enzymes (Figure 2).

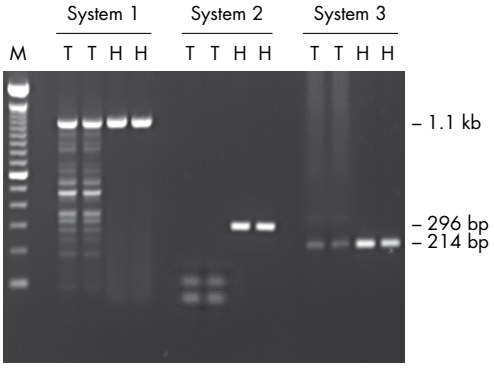


**Figure 1. Higher specificity with HotStarTaq DNA Polymerase.** Three different primer–template systems were amplified under the same conditions with either *Taq* DNA polymerase from Supplier C (**T**) or with HotStarTaq DNA Polymerase (**H**). **System 1**: A 1.1 kb fragment of a *D-IgI* homolog was amplified from human genomic DNA. **System 2**: A 296 bp fragment from the chromosomal region correlated with X-linked juvenile retinoschisis was amplified from human genomic DNA. **System 3**: A 214 bp fragment of the β-actin gene was amplified from cDNA synthesized from total RNA. **M**: markers.

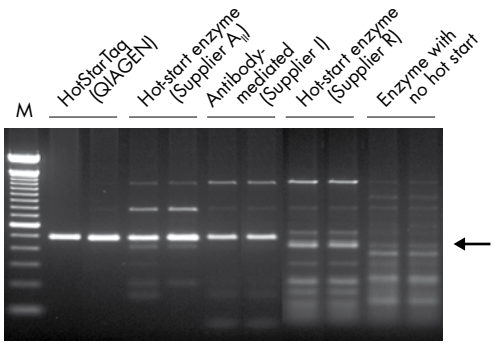


**Figure 2. Different hot-start methods.** A 497 bp fragment was amplified from 50 copies of an HIV-*pol*-gene construct which had been added to 1 µg human genomic DNA. Different hot-start enzymes were employed: HotStarTaq DNA Polymerase from QIAGEN; hot-start enzymes from Suppliers $A_{II}$ and R; *Taq*–antibody mixture from Supplier I; or an enzyme with no hot start. Arrow indicates the specific PCR product. Equal volumes of the reaction were analyzed on a 2% agarose gel. **M**: markers.

## Minimal PCR optimization with unique PCR Buffer

QIAGEN PCR Buffer, supplied with both HotStarTaq DNA Polymerase and *Taq* DNA Polymerase, has been developed to eliminate the need for optimization of individual primer–template systems, saving time and money. The balanced combination of KCl and $(NH_4)_2SO_4$ in the buffer promotes specific primer–template annealing. Simultaneously, nonspecific annealing is reduced, maximizing yields of specific PCR product. Specific amplification is maintained over a wide range of temperatures and $Mg^{2+}$ concentrations, without the need for time-consuming optimization (Figure 3).

## Optimal results with QIAGEN *Taq* DNA Polymerase

Recombinant QIAGEN *Taq* DNA Polymerase in combination with the unique PCR Buffer has been successfully used in a variety of applications, including standard amplification, differential display, and RT-PCR.

## Q-Solution® for amplification of difficult templates

HotStarTaq DNA Polymerase and *Taq* DNA Polymerase are provided with Q-Solution — an innovative PCR additive. Q-Solution facilitates the amplification of templates that are GC-rich or have extensive secondary structures by modifying the melting behavior of DNA. Use of this unique reagent will often enable or improve PCR of difficult sequences (Figure 5).

**Table 1. Features and benefits of QIAGEN enzymes for PCR***

| Enzyme | Hot start for high specificity | Unique buffer system for minimal optimization | Amplification of GC-rich templates |
|---|---|---|---|
| HotStarTaq DNA Polymerase | ✓ | ✓ | ✓ |
| *Taq* DNA Polymerase | – | ✓ | ✓ |

* ProofStart® DNA Polymerase provides high-fidelity amplification. Visit **www.qiagen.com** for further information on high-fidelity PCR.

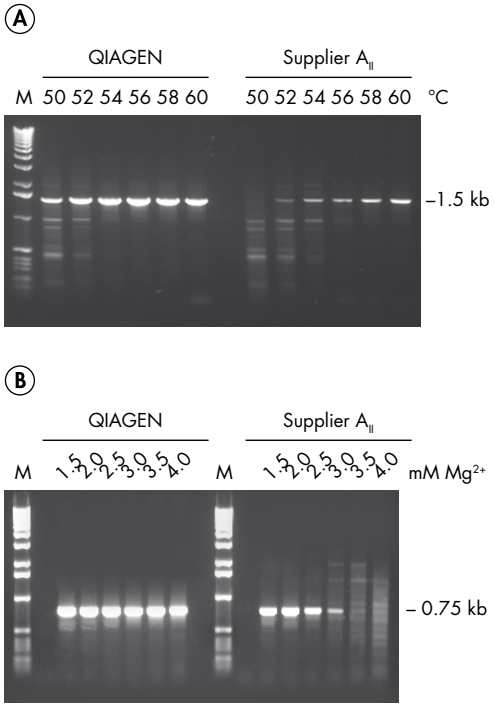


**Figure 3. Tolerance to wide annealing temperatures and variable $Mg^{2+}$ concentrations.** PCR amplification at the indicated annealing temperatures **A** and $Mg^{2+}$ concentrations **B** using QIAGEN PCR Buffer and QIAGEN *Taq* DNA Polymerase (similar results are obtained using HotStarTaq DNA Polymerase). The same PCR was performed in parallel using PCR buffer and *Taq* DNA polymerase from another supplier (**Supplier $A_{II}$**). **A** Amplification of the single-copy human cystic fibrosis gene and **B** the single-copy human prion protein gene. **M**: markers.

## Convenient master-mix format

The HotStarTaq Master Mix Kit and *Taq* PCR Master Mix Kit provide:

- Easy reaction setup — convenient master-mix format
- Less pipetting — with minimal risk of contamination
- Time-savings — eliminates tedious handling steps
- Minimal optimization — due to unique QIAGEN PCR buffer

## Fast, easy, and convenient PCR setup

With the HotStarTaq Master Mix Kit and the *Taq* PCR Master Mix Kit, there is no need for separate pipetting of individual components, minimizing the risk of contamination. Lengthy calculations are avoided and setting up amplification reactions is fast and easy (Figure 6). Since errors due to pipetting variabilities and miscalculation are reduced, PCR results are highly reproducible. In addition, the hot start provided by HotStarTaq DNA Polymerase in the HotStarTaq Master Mix Kit leads to increased PCR specificity and amplification reactions can be set up at room temperature. To choose which enzyme is right for your application, see Table 1. Specifications for HotStarTaq DNA Polymerase and *Taq* DNA Polymerase are given in Table 2.

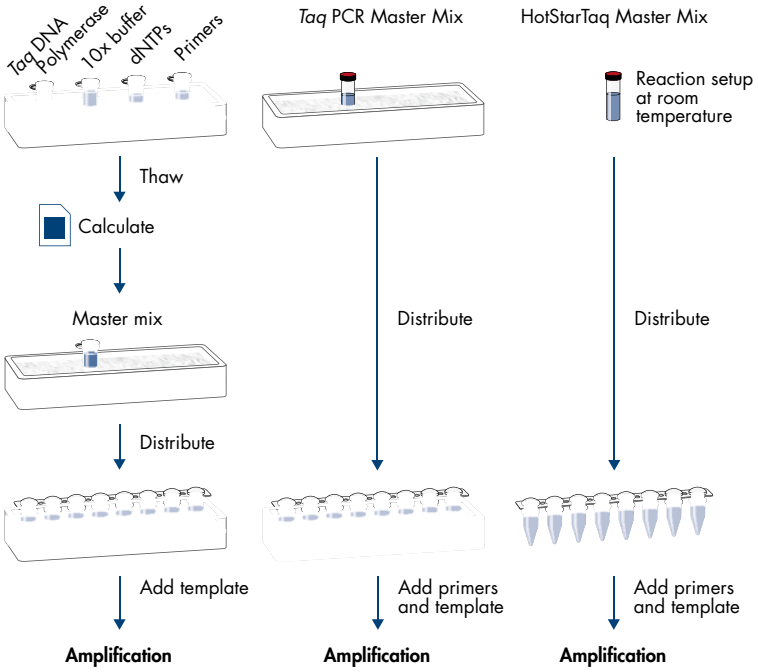


**Figure 6. Comparison of standard PCR setup, and PCR setup using *Taq* PCR Master Mix and HotStarTaq Master Mix from QIAGEN.**

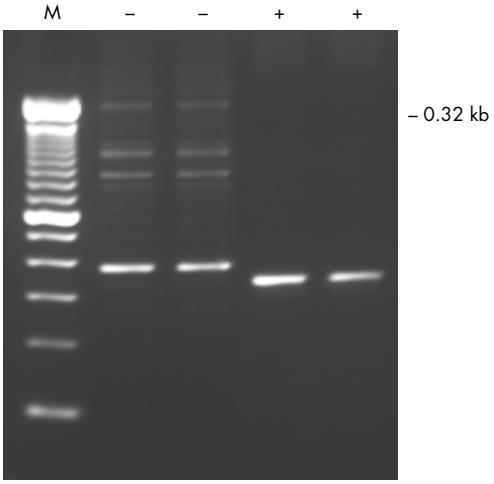


**Figure 5. Effects of Q-Solution with GC-rich templates.** A 0.32 kb fragment of the human angiotensin receptor II gene with 74% GC content was amplified using QIAGEN PCR Buffer and QIAGEN *Taq* DNA Polymerase in the absence (**–**) or presence (**+**) of 1x Q-Solution **M**: markers.

**Table 2. Specifications for *Taq* DNA Polymerase and HotStarTaq DNA Polymerase**

| | |
|---|---|
| Concentration: | 5 units/µl |
| Recombinant enzyme: | Yes |
| Substrate analogues: | dNTP, ddNTP, dUTP, biotin-11-dUTP, DIG-11-dUTP, fluorescent dNTP/ddNTP |
| Extension rate: | 2–4 kb/min at 72°C |
| Half-life: | 10 min at 97°C<br>60 min at 94°C |
| Amplification efficiency: | $\geq 10^5$ fold |
| 5'→3' exonuclease activity: | Yes |
| Extra A addition: | Yes |
| 3'→5' exonuclease activity: | No |
| Contaminating nucleases: | No |
| Contaminating RNases: | No |
| Self-priming activity: | No |

## Ordering Information

| Product | Contents | Cat. no. |
|---|---|---|
| **HotStarTaq DNA Polymerase – for high PCR specificity** | | |
| HotStarTaq DNA Polymerase* (250 U) | 250 units HotStarTaq DNA Polymerase, 10x PCR Buffer,† 5x Q-Solution, 25 mM $MgCl_2$ | 203203 |
| HotStarTaq DNA Polymerase* (1000 U) | 4 x 250 units HotStarTaq DNA Polymerase, 10x PCR Buffer,† 5x Q-Solution, 25 mM $MgCl_2$ | 203205 |
| **HotStarTaq Master Mix Kit – premixed solution for high PCR specificity** | | |
| HotStarTaq Master Mix Kit (250 U) | 3 x 0.85 ml HotStarTaq Master Mix‡ containing 250 units HotStarTaq DNA Polymerase total, 2 x 1.7 ml distilled water | 203443 |
| ***Taq* DNA Polymerase – for standard and specialized PCR applications** | | |
| *Taq* DNA Polymerase (250 U)* | 250 units *Taq* DNA Polymerase, 10x PCR Buffer,† 5x Q-Solution, 25 mM $MgCl_2$ | 201203 |
| *Taq* DNA Polymerase (1000 U) | 1000 units *Taq* DNA Polymerase, 10x PCR Buffer,† 5x Q-Solution, 25 mM $MgCl_2$ | 201205 |
| *Taq* PCR Core Kit (250 U) | 250 units *Taq* DNA Polymerase, 10x PCR Buffer,† 5x Q-Solution, 25 mM $MgCl_2$, dNTP Mix§ | 201223 |
| ***Taq* PCR Master Mix Kit — premixed solution for covenient PCR setup** | | |
| *Taq* PCR Master Mix Kit (250 U) | 3 x 1.7 ml *Taq* PCR Master Mix‡ containing 250 units *Taq* DNA Polymerase total, 3 x 1.7 ml distilled water | 201443 |

* Kits containing up to 25,000 units HotStarTaq DNA Polymerase or *Taq* DNA Polymerase are available; please inquire.

† Contains 15 mM $MgCl_2$

‡ Provides a final concentration of 1.5 mM $MgCl_2$ and 200 µM each dNTP

§ Contains 10 mM each dNTP

For up-to-date licensing information and product-specific disclaimers, see the respective QIAGEN kit handbook or user manual. QIAGEN kit handbooks and user manuals are available at **www.qiagen.com** or can be requested from QIAGEN Technical Services or your local distributor.

Visit **www.qiagen.com/goto/PCR** or contact QIAGEN today to discover how easy and specific your PCR can be!