Q5® High-Fidelity DNA Polymerase

FIDELITY AT ITS FINEST

be INSPIRED
drive DISCOVERY
stay GENUINE
Q5 and Q5 Hot Start High-Fidelity DNA Polymerases

Q5 High-Fidelity DNA Polymerase sets a new standard for both fidelity and performance. With the highest fidelity amplification available (~280X higher than Taq and > 5X higher than Thermo Scientific® Phusion®), Q5 DNA Polymerase results in ultra-low error rates. Q5 DNA Polymerase is composed of a novel polymerase that is fused to the processivity-enhancing Sso7d DNA binding domain, improving speed, fidelity and reliability of performance.

Five quality features of Q5:
1. Fidelity – the highest fidelity amplification available (~280X higher than Taq and > 5X higher than Phusion)
2. Robustness – high specificity and yield with minimal optimization
3. Coverage – superior performance for a broad range of amplicons (from high AT to high GC)
4. Speed – short extension times
5. Amplicon length – robust amplifications up to 20 kb for simple template, and 10 kb for complex

“Q5 works great. It was able to amplify a very difficult product, one I honestly didn't think would work. I am extremely happy with the Q5 enzyme.”

SCIENTIST – VANDERBILT UNIVERSITY

Visit Q5PCR.com to request a sample and to view the latest video tutorials on Q5 DNA Polymerase from NEB scientists.
The five quality features of Q5 High Fidelity DNA Polymerase

1. Highest fidelity DNA amplification available
At ~280X higher than Taq, Q5 offers unparalleled fidelity for your most important samples, but with a protocol and price point that makes it accessible for routine amplifications.

2. Robust amplification with minimal optimization
High specificity and yield are absolute requirements for today’s molecular biology techniques. Q5 delivers both for a wide range of templates.

3. Superior coverage for a broad range of amplicons, regardless of GC content
While other DNA polymerases can have difficulty amplifying high-GC or high-AT amplicons, Q5 DNA Polymerase displays superior performance for a wide range of templates.

4. Shorter PCR protocols
Achieve precision without sacrificing speed. Q5's unique design incorporating the SSo7d processivity-enhancing domain enables shorter extension times, as low as 10 seconds per kb. Additionally, aptamer-based hot start requires no initial denaturation step.

“Q5 DNA Polymerase gave me wonderful results on the first shot.”
Research Technologist – University of Nebraska Medical Center

1 We continue to investigate improved assays to characterize Q5’s very low error rate to ensure that we present the most accurate fidelity data possible (Potapov, V. and Ong, J.L. (2017) PLoS ONE. 12(1): e0169774).
2 PCR-based mutation screening in lacI (Agilent) or rpsL (Life).
The five quality features of Q5 High Fidelity DNA Polymerase:

1. **Templates up to 20 kb**
   - With Q5, you can reliably amplify simple templates up to 20 kb. Complex templates up to 10 kb can also be amplified with a high degree of confidence.

2. **Superior coverage for a broad range of amplicons, regardless of GC content**
   - While other DNA polymerases can have difficulty amplifying high-GC or high-AT amplicons, Q5 DNA Polymerase displays superior performance for a wide range of templates.

3. **Shorter PCR protocols**
   - Achieve precision without sacrificing speed. Q5's unique design incorporating the SSo7d processivity-enhancing domain enables shorter extension times, as low as 10 seconds per kb. Additionally, aptamer-based hot start requires no initial denaturation step.
   - "Q5 DNA Polymerase gave me wonderful results on the first shot." - Research technologist, University of Nebraska Medical Center

4. **4,960 bp Amplification of a variety of human genomic amplicons from low to high GC content demonstrates the broad performance of Q5 High-Fidelity DNA Polymerase. All reactions were conducted using 20 ng of input template and included 30 cycles of amplification. Results were visualized by microfluidic LabChip® analysis. Competitor polymerases were cycled according to manufacturer's recommendations. For the 67%, 72% and 78% GC amplicons, GC Buffers or enhancers were used when supplied with the polymerase.

5. **5. Templates up to 20 kb**
   - With Q5, you can reliably amplify simple templates up to 20 kb. Complex templates up to 10 kb can also be amplified with a high degree of confidence.

   The stand-alone enzyme comes with a reaction buffer that supports robust amplification of high AT to routine targets. Addition of the High GC Enhancer allows amplification of GC rich and difficult targets. For added convenience, the master mix formats allow robust amplification of a broad range of targets with a single formulation.

For more information, visit Q5PCR.com
Choose Q5 High-Fidelity DNA Polymerase for ALL your high-fidelity PCR needs.

Comparison of high-fidelity polymerases

<table>
<thead>
<tr>
<th>PRODUCT NAME (SUPPLIER)</th>
<th>POLYMERASE FIDELITY (Reported by supplier)</th>
<th>MAXIMUM AMPICLON LENGTH</th>
<th>EXTENSION TIME*</th>
<th>EXTENSION TIME*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q5 High-Fidelity DNA Polymerase (NEB)</td>
<td>~280X Taq&lt;sup&gt;*&lt;/sup&gt;</td>
<td>20 kb simple; 10 kb complex</td>
<td>10 s/kb</td>
<td>10 s/kb (&lt; 1 kb)</td>
</tr>
<tr>
<td>Phusion High-Fidelity DNA Polymerase (NEB)</td>
<td>39X Taq&lt;sup&gt;2&lt;/sup&gt;</td>
<td>20 kb simple; 10 kb complex</td>
<td>15 s/kb</td>
<td>30 s/kb</td>
</tr>
<tr>
<td>Accuprime Pfx (Life)</td>
<td>26X Taq&lt;sup&gt;2&lt;/sup&gt;</td>
<td>12 kb&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td>60 s/kb&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>PhuUltra II Fusion HS (Agilent)</td>
<td>20X Taq&lt;sup&gt;2&lt;/sup&gt;</td>
<td>19 kb&lt;sup&gt;3&lt;/sup&gt;</td>
<td>15 s/kb (&lt; 1 kb)&lt;sup&gt;3&lt;/sup&gt;</td>
<td>30 s/kb (&gt; 1 kb)&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>PhuUltra High-Fidelity DNA Polymerase (Agilent)</td>
<td>19X Taq&lt;sup&gt;2&lt;/sup&gt;</td>
<td>17 kb simple; 6 kb complex</td>
<td>60 s/kb (&lt; 10 kb)</td>
<td>120 s/kb (&gt; 10 kb)</td>
</tr>
<tr>
<td>KOD DNA Polymerase (EMD)</td>
<td>12X Taq&lt;sup&gt;1&lt;/sup&gt;</td>
<td>6 kb simple; 2 kb complex</td>
<td>10–20 s/kb</td>
<td>30–60 s/kb</td>
</tr>
<tr>
<td>Platinum Taq HiFi (Life)</td>
<td>6X Taq&lt;sup&gt;2&lt;/sup&gt;</td>
<td>20 kb&lt;sup&gt;3&lt;/sup&gt;</td>
<td></td>
<td>60 s/kb&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>1</sup> We continue to investigate improved assays to characterize Q5's very low error rate to ensure that we present the most accurate fidelity data possible (Potapov, V. and Ong, J.L. (2017) PLoS ONE. 12(1): e0169774).

<sup>2</sup> PCR-based mutation screening in lacZ (NEB), lacI (Agilent) or rpsL (Life).

<sup>3</sup> Template not specified.

<sup>4</sup> Values provided by individual manufacturers.

Q5 provides superior amplification performance across a wide range of genomic targets

PCR was performed with a variety of amplicons, with GC content ranging from high AT to high GC, with Q5 and several other commercially available polymerases. All polymerases were cycled according to manufacturers’ recommendations, including use of GC Buffers and enhancers when recommended. Yield and purity of reaction products were quantitated and represented, as shown in the figure key, by dot color and size. A large dark green dot represents the most successful performance. Q5 provides superior performance across the range of GC content.
Choose from a Selection of Standalone Enzymes, Master Mixes and Kits

For your high-fidelity PCR needs.

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>NEB #</th>
<th>SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q5 High-Fidelity DNA Polymerase</td>
<td>M0491S/L</td>
<td>100/500 units</td>
</tr>
<tr>
<td>Q5 High-Fidelity 2X Master Mix</td>
<td>M0492S/L</td>
<td>100/500 reactions</td>
</tr>
<tr>
<td>Q5 Hot Start High-Fidelity DNA Polymerase</td>
<td>M0493S/L</td>
<td>100/500 units</td>
</tr>
<tr>
<td>Q5 Hot Start High-Fidelity 2X Master Mix</td>
<td>M0494S/L</td>
<td>100/500 reactions</td>
</tr>
<tr>
<td>Q5 High-Fidelity PCR Kit</td>
<td>E0555S/L</td>
<td>50/200 reactions</td>
</tr>
<tr>
<td>Q5 Site-Directed Mutagenesis Kit (With or Without Competent Cells)</td>
<td>E0554S/E0552S</td>
<td>10 reactions</td>
</tr>
<tr>
<td>NEBNext Ultra II Q5 Master Mix</td>
<td>M0544S/L</td>
<td>50/250 reactions</td>
</tr>
</tbody>
</table>

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For help with calculating annealing temperatures, try our Tm Calculator at TmCalculator.neb.com.