

# Q5<sup>®</sup> High-Fidelity DNA Polymerase

FIDELITY AT ITS FINEST



 NEW ENGLAND  
**BioLabs**<sup>®</sup> Inc.

*be* INSPIRED  
*drive* DISCOVERY  
*stay* GENUINE



# Fidelity at its finest.

## 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.

*“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

## 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



Visit [Q5PCR.com](http://Q5PCR.com) to request a sample and to view the latest video tutorials on Q5 DNA Polymerase from NEB scientists.

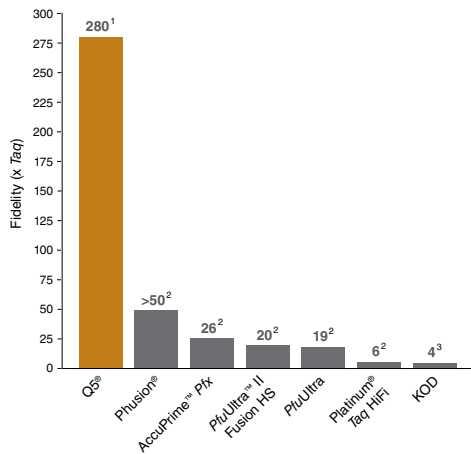
Mandarin Ducks (*Aix galericulata*) are frequently featured in Chinese art and are regarded as a symbol of fidelity.

# The five quality features of Q5

## 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.

The highest fidelity amplification available



<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)

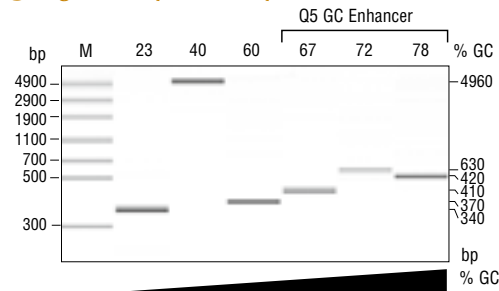
<sup>3</sup> Takagi et al (1997) Appl. Env. Microbiol. 63, 4504-4510.

<sup>3</sup> Takagi et al (1997) Appl. Env. Microbiol. 63, 4504-4510.

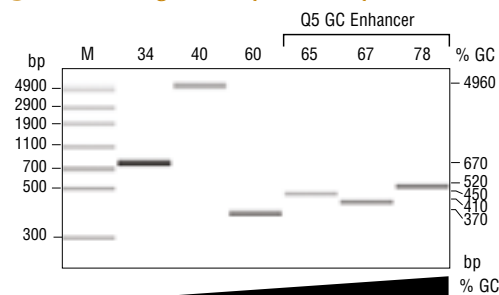
## 2. Robust amplification with minimal optimization

High specificity and yield are absolute requirements for today's molecular biology techniques. Q5 delivers both for a wide range of templates.

Q5 High-Fidelity DNA Polymerase



Q5 Hot Start High-Fidelity DNA Polymerase

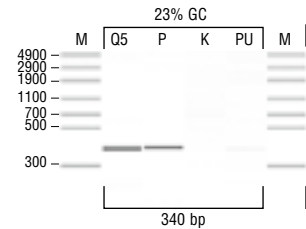


Robust amplification with Q5 and Q5 Hot Start High-Fidelity DNA Polymerases, regardless of GC content: Amplification of a variety of human genomic amplicons from low to high GC content using either Q5 or Q5 Hot Start High-Fidelity DNA Polymerase. Reactions using Q5 Hot Start were set up at room temperature. All reactions were conducted using 30 cycles of amplification and visualized by microfluidic LabChip<sup>®</sup> analysis.

## 3. Superior coverage

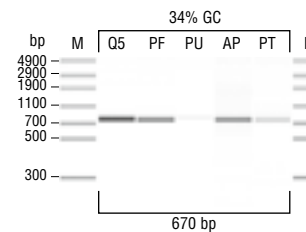
While other DNA polymerases struggle, Q5 offers superior performance for a wide range of templates.

Q5 High-Fidelity DNA Polymerase



Q5 = Q5 High-Fidelity DNA Polymerase (NEB)  
P = Phusion<sup>®</sup> High-Fidelity DNA Polymerase (NEB)

Q5 Hot Start High-Fidelity DNA Polymerase



Q5 = Q5 Hot Start High-Fidelity DNA Polymerase (NEB)  
PF = Phusion Hot Start Flex DNA Polymerase (NEB)

## 4. Shorter PCR protocols

Achieve precision without sacrifice. The SSII domain enables shorter extension times (10 seconds per kb). Additionally, the Q5 Hot Start requires no initial denaturation step.

*"Q5 DNA Polymerase on the first shot."*

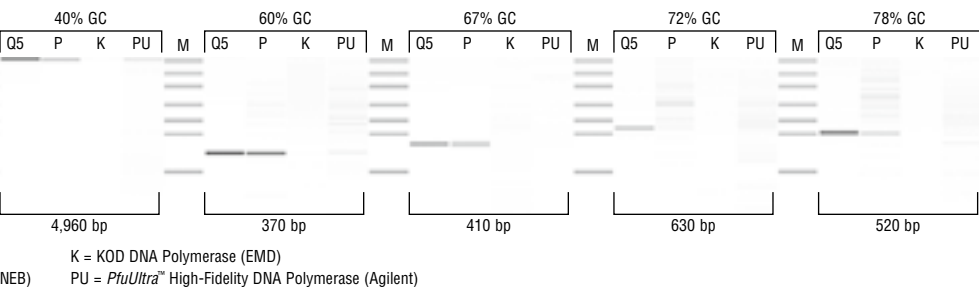
RESEARCH TECHNOLOGIST — UNIVERSITY OF CALIFORNIA, SAN DIEGO

# High Fidelity DNA Polymerase

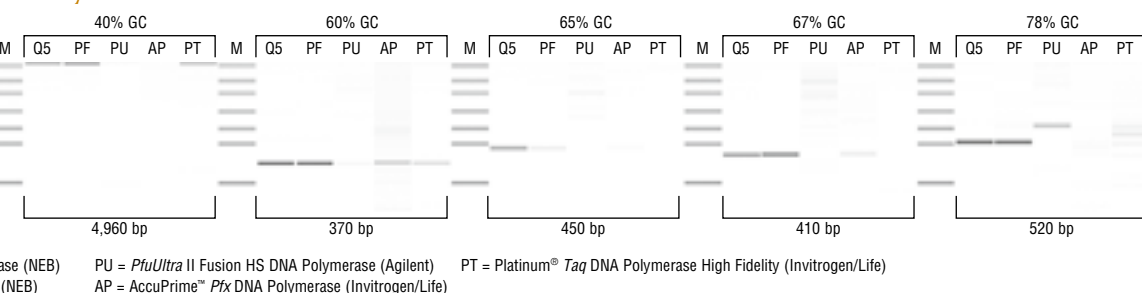
range for a broad range of amplicons, regardless of GC content

ases can have difficulty amplifying high-GC or high-AT amplicons, Q5 DNA Polymerase displays wide range of templates.

erases



NA Polymerase



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.

## protocols

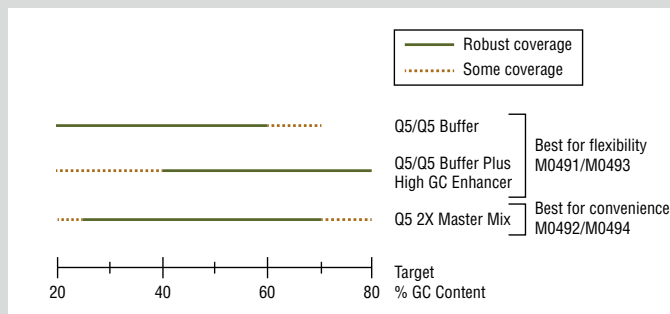
sacrificing speed. Q5's unique 7d processivity-enhancing extension times, as low as normally, aptamer-based hot start inhibition step.

*...gave me wonderful results*

UNIVERSITY OF NEBRASKA MEDICAL CENTER

## 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](http://Q5PCR.com)



# Choose Q5 High-Fidelity DNA Polymerase for ALL your high-fidelity PCR needs.

## Comparison of high-fidelity polymerases

PRODUCT NAME (SUPPLIER)	POLYMERASE FIDELITY (Reported by supplier)	MAXIMUM AMPLICON LENGTH <sup>4</sup>	EXTENSION TIME <sup>6</sup> (For simple templates <sup>5</sup> )	EXTENSION TIME <sup>6</sup> (For complex templates <sup>5</sup> )
Q5 High-Fidelity DNA Polymerase (NEB)	~280X <i>Taq</i> <sup>1</sup>	20 kb simple; 10 kb complex	10 s/kb	10 s/kb (<1 kb) 20–30 s/kb (>1 kb)
Phusion High-Fidelity DNA Polymerase (NEB)	>50X <i>Taq</i> <sup>2</sup>	20 kb simple; 10 kb complex	15 s/kb	30 s/kb
AccuPrime <i>Pfx</i> (Life)	26X <i>Taq</i> <sup>2</sup>	12 kb <sup>4</sup>	60 s/kb <sup>4</sup>	
<i>PfuUltra</i> II Fusion HS (Agilent)	20X <i>Taq</i> <sup>2</sup>	19 kb <sup>4</sup>	15 s/kb (<10 kb <sup>4</sup> ) 30 s/kb (>10 kb <sup>4</sup> )	
<i>PfuUltra</i> High-Fidelity DNA Polymerase (Agilent)	19X <i>Taq</i> <sup>2</sup>	17 kb simple; 6 kb complex	60 s/kb (<10 kb) 120 s/kb (>10 kb)	60 s/kb (<6 kb) 120 s/kb (>6 kb)
Platinum <i>Taq</i> HiFi (Life)	6X <i>Taq</i> <sup>2</sup>	20 kb <sup>4</sup>	60 s/kb <sup>4</sup>	
KOD DNA Polymerase (EMD)	4X <i>Taq</i> <sup>3</sup>	6 kb simple; 2 kb complex	10–20 s/kb	30–60 s/kb

<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)

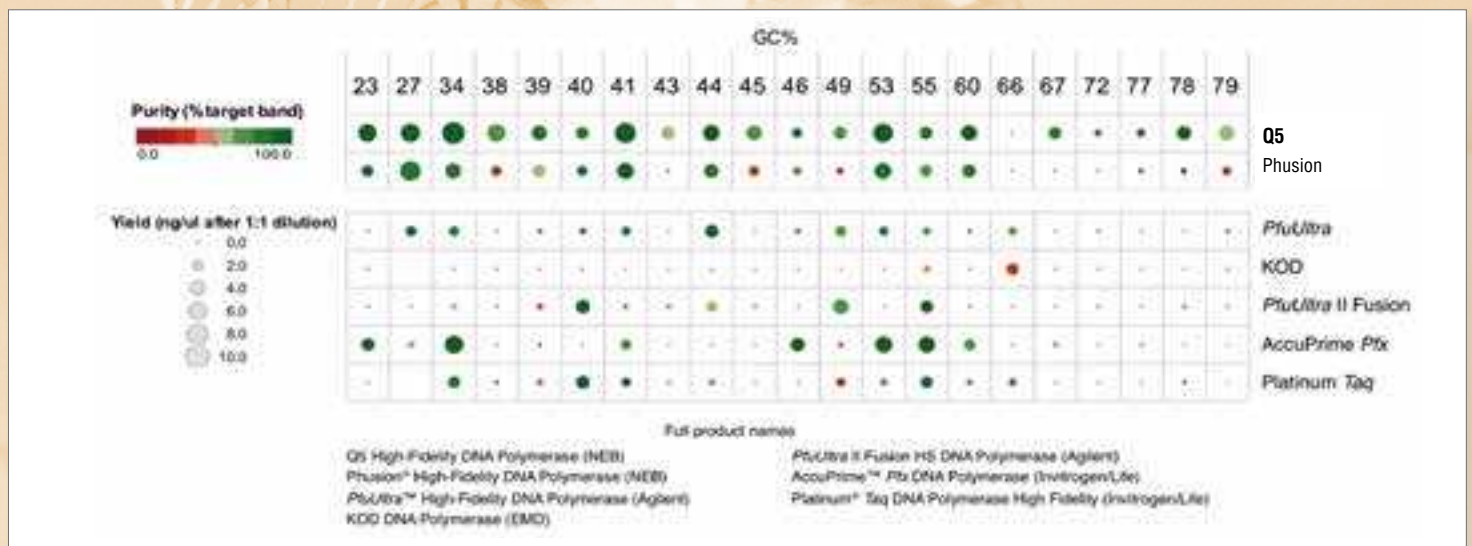
<sup>3</sup> Takagi et al (1997) Appl. Env. Microbiol. 63, 4504-4510.

<sup>4</sup> Template not specified.

<sup>5</sup> Simple templates include plasmid, viral and *E. coli* genomic DNA. Complex templates include plant, human and other mammalian genomic DNA.

<sup>6</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.

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

One or more of these products are covered by patents, trademarks and/or copyrights owned or controlled by New England Biolabs, Inc. For more information, please email us at [gbd@neb.com](mailto:gbd@neb.com). The use of these products may require you to obtain additional third party intellectual property rights for certain applications.

Your purchase, acceptance, and/or payment of and for NEB's products is pursuant to NEB's Terms of Sale at [www.neb.com/support/terms-of-sale](http://www.neb.com/support/terms-of-sale). NEB does not agree to and is not bound by any other terms or conditions, unless those terms and conditions have been expressly agreed to in writing by a duly authorized officer of NEB.

PHUSION® and THERMO SCIENTIFIC® are registered trademarks and property of Thermo Fisher Scientific. PHUSION® DNA Polymerase was developed by Finnzymes Oy, now a part of Thermo Fisher Scientific. LABCHIP® is a registered trademark of Caliper Life Sciences, part of Perkin Elmer, Inc. PLATINUM® is a registered trademark of Life Technologies, Inc. ACCUPRIME™ is a trademark of Life Technologies, Inc. PFUULTRA™ is a trademark of Agilent Technologies, Inc.

© COPYRIGHT 2017, NEW ENGLAND BIOLABS, INC.; ALL RIGHTS RESERVED

Request a free sample of  
Q5 High-Fidelity DNA Polymerase  
at [Q5PCR.com](http://Q5PCR.com)

## USA

New England Biolabs, Inc.  
Telephone (978) 927-5054  
Toll Free (USA Orders) 1-800-632-5227  
Toll Free (USA Tech) 1-800-632-7799  
Fax (978) 921-1350  
[info@neb.com](mailto:info@neb.com)  
[www.neb.com](http://www.neb.com)

## Canada

New England Biolabs, Ltd.  
Toll Free: 1-800-387-1095  
[info.ca@neb.com](mailto:info.ca@neb.com)

## China

New England Biolabs (Beijing), Ltd.  
Telephone: 010-82378265/82378266  
[info@neb-china.com](mailto:info@neb-china.com)

## France

New England Biolabs France  
Telephone : 0800 100 632  
[info.fr@neb.com](mailto:info.fr@neb.com)

## Germany & Austria

New England Biolabs GmbH  
Free Call: 0800/246 5227 (Germany)  
Free Call: 00800/246 52277 (Austria)  
[info.de@neb.com](mailto:info.de@neb.com)

## Japan

New England Biolabs Japan, Inc.  
Telephone: +81 (0)3 5669 6191  
[info.jp@neb.com](mailto:info.jp@neb.com)

## Singapore

New England Biolabs, PTE. Ltd.  
Telephone +65 638 59623x  
[sales.sg@neb.com](mailto:sales.sg@neb.com)

## United Kingdom

New England Biolabs (UK), Ltd.  
Call Free: 0800 318486  
[info.uk@neb.com](mailto:info.uk@neb.com)

[www.neb.com](http://www.neb.com)

## Featured Online Tools

### PCR Selector

For help with choosing the best polymerase for your PCR, try our PCR selector at [PCRselector.neb.com](http://PCRselector.neb.com).

### Tm Calculator

For help with calculating annealing temperatures, try our Tm Calculator at [TmCalculator.neb.com](http://TmCalculator.neb.com).

