

# Crimson Taq DNA Polymerase



1-800-632-7799  
info@neb.com  
www.neb.com



M0324S 014131215121

## M0324S



**200 units**    **5,000 U/ml**    **Lot: 0141312**  
**RECOMBINANT Store at -20°C Exp: 12/15**

**Description:** *Taq* DNA Polymerase is a thermostable DNA polymerase that possesses a 5'→3' polymerase activity (1,2,3) and a 5' flap endonuclease activity (4,5).

Crimson *Taq* DNA Polymerase offers superior performance in its newly formulated PCR buffer. Crimson *Taq* Reaction Buffer contains a density reagent, which allows direct loading of PCR products onto a gel. In addition, Crimson *Taq* Reaction Buffer has trace amounts of a red dye, which serves as an indicator for homogenous reaction setup, a color aid in gel loading and a tracking dye which migrates at about 10 bp on a 1% TBE gel.

**Source:** An *E. coli* strain that carries the *Taq* DNA Polymerase gene from *Thermus aquaticus* YT-1.

### Applications:

- PCR
- Primer Extension
- Colony PCR
- High-throughput PCR

Supplied in: 100 mM KCl, 10 mM Tris-HCl (pH 7.4), 0.1 mM EDTA, 1 mM dithiothreitol, 0.5% Tween® 20, 0.5% IGEPAL® CA-630 and 50% glycerol.

**Reagents Supplied with Enzyme:**  
5X Crimson *Taq* Reaction Buffer

**Reaction Conditions:** 1X Crimson *Taq* Reaction Buffer, DNA template, primers, 200 μM dNTPs (not included) and 1.25–2.5 units of Crimson *Taq* DNA Polymerase in a total reaction volume of 50 μl.

### 1X Crimson *Taq* Reaction Buffer:

12.5 mM Tricine  
42.5 mM KCl  
1.5 mM MgCl<sub>2</sub>  
6% Dextran  
Acid Red  
pH 8.5 @ 25°C

**Unit Definition:** One unit is defined as the amount of enzyme that will incorporate 15 nmol of dNTP into acid insoluble material in 30 minutes at 75°C.

**Unit Assay Conditions:** 1X ThermoPol® Reaction Buffer, 200 μM dNTPs including [<sup>3</sup>H]-dTTP and 200 μg/ml activated Calf Thymus DNA.

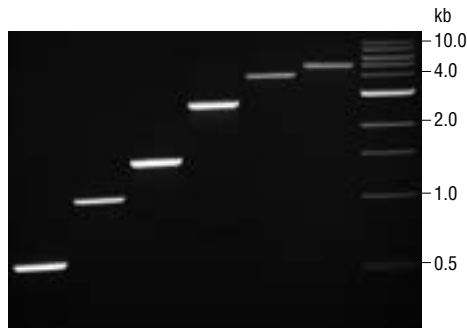
**Heat Inactivation:** No

### Quality Control Assays

**5 kb Lambda PCR:** 25 cycles of PCR amplification of 5 ng Lambda DNA with 1.25 units of Crimson *Taq* DNA Polymerase in the presence of 200 μM dNTPs and 0.2 μM primers in Crimson *Taq* Reaction Buffer results in the expected 5 kb product.

**3'→5' Exonuclease Activity:** Incubation of a 20 μl reaction in ThermoPol Reaction Buffer containing a minimum of 20 units of Crimson *Taq* DNA Polymerase with 10 nM fluorescent internally labeled oligonucleotide for 30 minutes at either 37°C or 75°C yields no detectable 3'→5' degradation as determined by capillary electrophoresis.

**Endonuclease Activity:** Incubation of a 50 μl reaction in ThermoPol Reaction Buffer containing a minimum of 20 units of Crimson *Taq* DNA Polymerase with 1 μg of supercoiled φX174 DNA for 4 hours at 75°C results in < 10% conversion to the nicked form as determined by agarose gel electrophoresis.



Amplification of specific sequences from human genomic DNA using Crimson *Taq* DNA Polymerase. Amplicon sizes are indicated below gel. Marker M is NEB 1 kb DNA Ladder (NEB #N3232).

## PCR

The Polymerase Chain Reaction (PCR) is a powerful and sensitive technique for DNA amplification (6). *Taq* DNA Polymerase is an enzyme widely used in PCR (7). The following guidelines are provided to ensure successful PCR using New England Biolabs' Crimson *Taq* DNA Polymerase. These guidelines cover routine PCR reactions. Amplification of templates with high GC content, high secondary structure, low template concentrations, or amplicons greater than 5 kb may require further optimization.

### Reaction setup:

We recommend assembling all reaction components on ice and quickly transferring the reactions to a thermocycler preheated to the denaturation temperature (95°C).

COMPONENT	25 μl REACTION	50 μl REACTION	FINAL CONCENTRATION
5X Crimson <i>Taq</i> Reaction Buffer	5 μl	10 μl	1X
10 mM dNTPs	0.5 μl	1 μl	200 μM
10 μM Forward Primer	0.5 μl	1 μl	0.2 μM (0.05–1 μM)
10 μM Reverse Primer	0.5 μl	1 μl	0.2 μM (0.05–1 μM)
Crimson <i>Taq</i> DNA Polymerase	0.125 μl	0.25 μl	1.25 units/ 50 μl PCR
Template DNA	variable	variable	<1,000 ng
Nuclease-Free Water	to 25 μl	to 50 μl	

Notes: Gently mix the reaction. Collect all liquid to the bottom of the tube by a quick spin if necessary. Overlay the sample with mineral oil if using a PCR machine without a heated lid.

Transfer PCR tubes from ice to a PCR machine with the block preheated to 95°C and begin thermocycling:

### Thermocycling Conditions for a Routine PCR:

STEP	TEMP	TIME
Initial Denaturation	95°C	30 seconds
30 Cycles	95°C	15–30 seconds
	45–68°C	15–60 seconds
	68°C	1 minute/kb
Final Extension	68°C	5 minutes
Hold	4–10°C	

## General Guidelines:

1. **Template:**  
Use of high quality, purified DNA templates greatly enhances the success of PCR reactions. Recommended amounts of DNA template for a 50 μl reaction are as follows:

DNA	AMOUNT
Genomic	1 ng–1 μg
Plasmid or Viral	1 pg–1 ng

2. **Primers:**  
Oligonucleotide primers are generally 20–40 nucleotides in length and ideally have a GC content of 40–60%. Computer programs such as Primer3 (<http://frodo.wi.mit.edu/primer3>) can be used to design or analyze primers. The final concentration of each primer in a PCR reaction may be 0.05–1 μM, typically 0.1–0.5 μM.
3. **Mg<sup>++</sup> and additives:**  
Mg<sup>++</sup> concentration of 1.5–2.0 mM is optimal for most PCR products generated with Crimson *Taq* DNA Polymerase. The final Mg<sup>++</sup> concentration in 1X Crimson *Taq* Reaction Buffer is 1.5 mM. This supports satisfactory amplification of most amplicons. However, Mg<sup>++</sup> can be further optimized in 0.5 or 1.0 mM increments using MgCl<sub>2</sub>.  
Amplification of some difficult targets, like GC-rich sequences, may be improved with additives, such as DMSO (8) or formamide (9).
4. **Deoxynucleotides:**  
The final concentration of dNTPs is typically 200 μM of each deoxynucleotide.

5. **Crimson *Taq* DNA Polymerase Concentration:**  
We generally recommend using Crimson *Taq* DNA Polymerase at a concentration of 25–50 units/ml (1.25–2.5 units/50 μl reaction). However, the optimal concentration of Crimson *Taq* DNA Polymerase may range from 5–50 units/ml (0.25–2.5 units/50 μl reaction) in specialized applications.

6. **Denaturation:**  
An initial denaturation of 30 seconds at 95°C is sufficient for most amplicons from pure DNA templates. For difficult templates such as GC-rich sequences, a longer denaturation of 2–4 minutes at 95°C is recommended prior

(see other side)

to PCR cycling to fully denature the template. With colony PCR, an initial 5 minute denaturation at 95°C is recommended.

During thermocycling a 15–30 second denaturation at 95°C is recommended.

7. **Annealing:**  
The annealing step is typically 15–60 seconds. Annealing temperature is based on the  $T_m$  of the primer pair and is typically 45–68°C. Annealing temperatures can be optimized by doing a temperature gradient PCR starting 5°C below the calculated  $T_m$ . We recommend using NEB's  $T_m$  Calculator, available at [www.neb.com/TmCalculator](http://www.neb.com/TmCalculator) to determine appropriate annealing temperatures for PCR.

When primers with annealing temperatures above 60°C are used, a 2-step PCR protocol is possible (see #10).

8. **Extension:**  
The recommended extension temperature is 68°C. Extension times are generally 1 minute per kb. A final extension of 5 minutes at 68°C is recommended.
9. **Cycle number:**  
Generally, 25–35 cycles yields sufficient product. Up to 45 cycles may be required to detect low-copy-number targets.
10. **2-step PCR:**  
When primers with annealing temperatures above 60°C are used, a 2-step thermocycling protocol is possible.

#### Thermocycling Conditions for a Routine 2-Step PCR:

STEP	TEMP	TIME
Initial Denaturation	95°C	30 seconds
30 Cycles	95°C 60–68°C	15–30 seconds 1 minute/kb
Final Extension	60–68°C	5 minutes
Hold	4–10°C	

11. **PCR product:**  
The PCR products generated using Crimson *Taq* DNA Polymerase contain dA overhangs at the 3'-end; therefore the PCR products can be ligated to dT/dU-overhang vectors.

#### FAQs:

1. *What are the advantages or disadvantages of Crimson Taq DNA Polymerase?*

The Crimson *Taq* Reaction Buffer formulation offers three convenient features. First, the 5X Crimson *Taq* Reaction Buffer contains a red dye, which serves as a visual indicator of homogeneous reaction setup. Second, the 5X Crimson *Taq* Reaction Buffer contains a density reagent, dextran, which allows direct loading of PCR products on a gel. Third, the trace amount of red dye in Crimson *Taq* Reaction Buffer works as a gel tracking dye (migrates at about 10 bp) during electrophoresis.

If the PCR products will be analyzed by absorbance or fluorescence excitation, acid red ( $\lambda_{max}$ = 510 nm) may interfere with the assay; therefore Standard *Taq* Reaction Buffer is recommended.

2. *Does the 5X Crimson Taq Reaction Buffer offer amplification efficiency similar to that of Standard Taq Reaction Buffer or ThermoPol Reaction Buffer?*

Yes.

3. *Can the PCR product be used directly in T/A cloning?*

Yes. PCR products can be directly ligated to dT/dU-overhang vectors and then transformed directly into host cells.

4. *How do I remove the dye and dextran from my PCR reactions using Crimson Taq Reaction Buffer?*

Spin columns for PCR clean-up can be used to remove both the dye and dextran.

5. *How long is the buffer stable in non-optimal storage conditions?*

The buffer is best stored at -20°C, but full activity is retained in buffer that is stored at 4°C for two weeks. Storage at room temperature is not recommended for more than 4 days.

#### References:

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#### Companion Products Sold Separately:

Crimson <i>Taq</i> Reaction Buffer Pack #B0324S	6.0 ml
Crimson <i>Taq</i> (Mg-free) Reaction Buffer Pack #B0325S	6.0 ml
Magnesium Chloride (MgCl <sub>2</sub> ) Solution #B9021S	6.0 ml
<i>Taq</i> PCR Kit #E5000S	200 Reactions
<i>Taq</i> 2X Master Mix #M0270S	100 Reactions
#M0270L	500 Reactions
Quick-Load® <i>Taq</i> 2X Master Mix #M0271S	100 Reactions
#M0271L	500 Reactions
<i>Taq</i> 5X Master Mix #M0285S	100 Reactions
#M0285L	500 Reactions
Crimson <i>Taq</i> DNA Polymerase with (Mg-free) Buffer #M0325S	200 units
#M0325L	1,000 units
Deoxynucleotide Solution Set #N0446S	25 µmol each
Deoxynucleotide Solution Mix #N0447S	8 µmol each
#N0447L	40 µmol each

 Annealing temperature



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