

# EconoTaq<sup>®</sup> PLUS 2X Master Mix



IMPORTANT!

**-20 °C Storage Required**

Immediately Upon Receipt

FOR RESEARCH USE ONLY. NOT FOR HUMAN OR DIAGNOSTIC USE

# EconoTaq<sup>®</sup> PLUS 2X Master Mix

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## Technical Support

Lucigen is dedicated to the success and satisfaction of our customers. Our products are tested to assure they perform as specified when used according to our recommendations. It is imperative that the reagents supplied by the user, especially the DNA targets to be cloned, are of the highest quality. Please follow the manual carefully and contact our technical service representatives if additional information is necessary. We encourage you to contact us with your comments regarding the performance of our products in your applications. Thank you.

Lucigen Technical Support

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Product Guarantee: Lucigen guarantees that this product will perform as specified for one year from the date of shipment. Please avoid using reagents for greater than one year from receipt.

## Components & Storage Conditions

**Components:** EconoTaq PLUS 2X Master Mix contains all of the components necessary to perform PCR amplification, except for template and primers. The Master Mix also contains agarose gel loading buffer.

| Catalog # | Number of reactions   |
|-----------|---|
| 30035-0   | 50 reactions (Trial Size: 1 tube, containing 1,250 $\mu$ l) |
| 30035-1   | 500 reactions (10 tubes, each containing 1,250 $\mu$ l)     |
| 30035-2   | 1000 reactions (20 tubes, each containing 1,250 $\mu$ l)    |

**Storage:** EconoTaq PLUS 2X Master Mix can be stored at  $-20^{\circ}\text{C}$  for 12 months. For everyday use, an aliquot can be stored at  $+4^{\circ}\text{C}$  for up to three months. The EconoTaq PLUS 2X Master Mix needs to be mixed well prior to use. It is stable for ten freeze-thaw cycles.



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## Description

EconoTaq PLUS 2X Master Mix is a ready-to-use PCR master mix containing agarose gel loading buffer. A PCR reaction is set up simply by combining the EconoTaq PLUS Master Mix with template DNA, primers, and water. After the reaction is complete, it can be loaded directly onto an agarose gel. All other necessary components are provided in the Master Mix, which contains the following: 0.1 units/μl of EconoTaq DNA Polymerase, Reaction Buffer (pH 9.0), 400 μM dATP, 400 μM dGTP, 400 μM dCTP, 400 μM dTTP, 3 mM MgCl<sub>2</sub>, and a proprietary PCR Enhancer/Stabilizer. For difficult templates, such as those containing GC content up to 75%, it has been found that EconoTaq PLUS Master Mix performs well with denaturation temperatures up to 98 °C.

## Introduction to PCR

The Polymerase Chain Reaction (PCR) is a powerful technique that amplifies specific DNA sequences using multiple cycles of a 3-step process. The first step involves denaturation of a double-stranded DNA template at a high temperature. In the second step, sequence-specific primers anneal to complementary sites flanking the target sequence. In the third step, a thermostable DNA polymerase extends the annealed primers, thereby copying the original DNA sequence. The newly synthesized DNA becomes the template for subsequent DNA amplification, doubling the amount of template with each cycle. These steps are typically repeated 25-35 times, resulting in a 10<sup>5</sup>-10<sup>9</sup> fold increase in the amount of target DNA.

## PCR Setup

**1) Materials supplied by the user.** PCR amplification is performed by adding template DNA, primers, and water to the EconoTaq 2X Master Mix. The following components must be supplied by the user:

- Template DNA (10-50 ng of plasmid DNA; 50-200 ng of genomic DNA)
- Forward Primer (100 pmol/μl)
- Reverse Primer (100 pmol/μl)
- Nuclease-free water
- Thermocycling apparatus

**2) Reaction Setup.** Set up PCR amplifications of the desired size, according to the following chart:

|                              | 25 μl Reaction | 50 μl Reaction | 100 μl Reaction | Final concentration |
|------------------------------|----------------|----------------|-----------------|---------------------|
| EconoTaq PLUS 2X Master Mix  | 12.5 μl        | 25.0 μl        | 50.0 μl         | 1 X                 |
| Forward Primer (100 pmol/μl) | 0.25 μl        | 0.5 μl         | 1.0 μl          | 1 pmol/μl (1 μM)    |
| Reverse Primer (100 pmol/μl) | 0.25 μl        | 0.5 μl         | 1.0 μl          | 1 pmol/μl (1 μM)    |
| DNA template (10 ng/μl)      | 1.0 μl         | 1.0 μl         | 1.0 μl          |                     |
| Water, Nuclease-free         | 11.0 μl        | 23.0 μl        | 47.0 μl         |                     |

**3) Gently mix the PCR components in a thin-walled reaction tube and spin briefly in a microcentrifuge. Add a drop of mineral oil if the thermocycler does not have a heated lid.**

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## PCR Cycling Conditions

- 1) Pre-heat the thermocycler to 94 °C.
- 2) For initial denaturation of target template DNA, incubate the reactions at 94°C for two minutes.
- 3) Denature, anneal, and extend the DNA according to the following chart for subsequent cycles of amplification:

| Cycling step          | Temperature | Time         | # of Cycles |
|-----------------------|-------------|--------------|-------------|
| Initial Denaturation* | 94 °C       | 2 min        | 1           |
| Denaturation*         | 94 °C       | 15 - 30 sec  | 25 - 35     |
| Annealing**           | 50 – 65 °C  | 15 - 30 sec  |             |
| Extension             | 72 °C       | 1 min/kb     |             |
| Final Extension       | 72 °C       | 5 - 10 min   | 1           |
| Hold                  | 4 °C        | Indefinitely | 1           |

\* EconoTaq PLUS performs well with denaturation temperatures up to 98 °C.

\*\*Anneal at  $T_m$  of primer  $\pm 2$  °C. See PCR Guidelines section.

- 4) After completion of the PCR, a 5  $\mu$ L aliquot of the reaction is loaded onto an agarose gel for analysis or size selection.

## PCR Guidelines

Optimization of PCR conditions is required for amplification involving templates with high GC content, internal secondary structure, or products greater than 5 kb. The following guidelines can be used to improve the success of amplifying these templates:

- 1) **Cold Reaction Set-Up.** Reactions using EconoTaq PLUS Master Mix yield best results when set up on ice and maintained at 4 °C prior to amplification. The EconoTaq Polymerase has residual activity at temperatures above 4°C that can cause non-specific background amplification. Add primers last to reactions just prior to target addition and incubation/cycling.
- 2) **Template DNA.** Use of purified, high quality template DNA enhances the success rate of PCR. We recommend using 10 - 50 ng of plasmid DNA and 50 - 200 ng of genomic DNA. Template should be suspended in water, rather than EDTA-containing solution such as TE buffer.
- 3) **Primer Design.** Oligonucleotide primers for PCR should be 20-25 bases in length and should have a GC content of 40-60%, with the GC bases evenly spaced in the primer. Self-annealing of primers leads to production of primer-dimers, which can diminish the amount of authentic product; therefore, the 3' end of each primer should not be complementary to itself or to the 3' end of the opposing primer. The melting temperature ( $T_m$ ) of the primers should be within 5 °C of each other. The final primer concentration in the reaction should be 1 pmol/ $\mu$ l (equal to 1 nmol/ml, or 1  $\mu$ M).

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- 4) **Annealing.** PCR enhancers in EconoTaq PLUS Master Mix may lower primer  $T_m$  slightly. Optimize the reaction conditions by performing the reaction starting with an annealing temperature 2 °C below the calculated melting temperature of the primers. Vary the annealing temperature to optimize for the primer/template combination. Reducing the annealing temperature improves yield and reaction efficiency, while increasing annealing temperature improves specificity.
- 5) **Denaturation Temperature.** EconoTaq PLUS 2X Master Mix will amplify most routine DNA templates using a denaturation temperature of 94 °C. For GC-rich templates, with GC content up to 75%, a denaturation temperature of 98 °C has been found to improve results.

## Quality Control

**PCR Activity:** EconoTaq 2X Master mix is tested in DNA amplification using a variety of templates and primers.

**Activity Determination:** One unit of EconoTaq DNA Polymerase catalyzes the incorporation of 10 nmoles of dNTP into acid-insoluble material in 30 minutes at 70°C in 50 mM Tris-HCl (pH 9.0), 50 mM NaCl, 5 mM MgCl<sub>2</sub>, 200 µM dGTP, dATP, dTTP, dCTP (a mix of unlabeled and [<sup>33</sup>P]dCTP), 10 µg Activated Calf Thymus DNA, and 0.1 mg/ml BSA.

**Absence of Endonuclease or Nicking Activity:** Incubation of 10 U of EconoTaq DNA Polymerase with 1 µg of supercoiled pBR322 DNA for 16 hours at 70°C results in no detectable conversion to relaxed or linear forms detectable by agarose gel electrophoresis.

**Absence of Exonuclease Activity:** Incubation of 10 U of EconoTaq DNA Polymerase with 1 µg of HindIII-cut lambda DNA for 16 hours at 70°C resulted in no smearing of bands on agarose gels.

**Purity:** EconoTaq DNA Polymerase is >99% pure as determined by SDS-PAGE. There is no detectable DNA contamination.

## Related Lucigen Products

- [EconoTaq<sup>®</sup> PLUS 2X Master Mix](#)
- [EconoTaq DNA Polymerase](#)
- [2.5 mM dNTP Mix, PCR Grade](#)
- [Gel-Ready<sup>™</sup> DNA Ladders](#)
- [BigEasy<sup>®</sup> v2.0 Linear Cloning Kit](#)
- [DNATerminator<sup>®</sup> End Repair Kit](#)
- [CloneDirect<sup>™</sup> Rapid Ligation Kit](#)
- [GC Cloning and Amplification \(pGC<sup>™</sup> Blue Vector\)](#)
- [CloneSmart<sup>®</sup> Cloning Kits \(pSMART<sup>®</sup> Vectors\)](#)
- [E. cloni<sup>®</sup> 10G and 10GF' Chemically Competent Cells](#)
- [E. cloni 10G and 10GF' Electrocompetent Cells](#)
- [Endura<sup>™</sup> Competent Cells](#)

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