

PCR Enzyme Selection Guide

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High Yield

Application	Mammalian Genotyping	Library Construction	Routine PCR	Low Copy Number and/or Dirty Samples
Recommended product	Titanium Taq	Advantage 2	EmeraldAmp MAX HS PCR Master Mix	TaKaRa Ex Taq DNA Polymerase
Choose for:	Sensitive and robust	Long PCR and enhanced fidelity	Streamlined workflow	Higher fidelity and yield
Amplicon size				
gDNA	<2 kb	<6 kb	<15 kb	<20 kb
Plasmid/lambda	<2 kb	<18.5 kb	NA	<30 kb
cDNA	<4 kb	<8.5 kb	NA	NA
Enzyme properties				
5'-3' exonuclease activity			✓	✓
3'-5' exonuclease activity		✓	✓	✓
T/A overhangs or Blunt	T/A	T/A	T/A	T/A
Format/Features				
Premix			✓	Available
Eco-Friendly format	Available	Available		
PCR Kit with control template and primers available	✓	✓		
Dye added			✓	
Hot Start	✓	✓	✓	Available

High Fidelity

Application	In-Fusion Cloning	Long PCR, sequencing, cloning	Cloning and expression, DNA sequencing
Recommended product	CloneAmp HiFi	PrimeSTAR GXL	PrimeSTAR Max
Choose for:	In-Fusion Cloning	Excellent all-around performance on a variety of templates	Highest fidelity
Amplicon size			
gDNA	<6 kb (human), <10 kb (E. coli)	<30 kb	<6 kb
Plasmid/lambda	<15 kb	<40 kb	<15 kb
cDNA	<6 kb	<13.5 kb	<10 kb
Enzyme properties			
5'-3' exonuclease activity			
3'-5' exonuclease activity	✓	✓	✓
T/A overhangs or Blunt	Blunt	Blunt	Blunt
Fidelity (sequencing)	29X Taq (GC-rich target)	6.5X Taq (GC-rich target)	29X Taq (GC-rich target)
Speed	5 sec/kb	10 sec/kb (rapid protocol)	5 sec/kb
GC-Rich targets		Up to 73%	
Format/Features			
Premix	✓		✓
Hot Start	✓	✓	✓

Lyophilized

Application	High throughput genotyping	High throughput genotyping
Recommended product	High Yield PCR EcoDry Premix	High Fidelity PCR EcoDry Premix
Choose for:	High yield and easy-to-use	Long PCR and enhanced fidelity
Amplicon size		
gDNA	<2 kb	<6 kb
Plasmid/lambda	<2 kb	<18.5 kb
cDNA	<4 kb	<8.5 kb
Enzyme properties		
5'-3' exonuclease activity		
3'-5' exonuclease activity		✓
T/A overhangs or Blunt	T/A	T/A
Fidelity (Kunkel)	1X Taq	3X Taq
Format/Features		
Premix	✓	✓
Eco-Friendly lyophilized format	✓	✓
Dye added		
Hot Start	✓	✓

Long PCR

Application	Long PCR, sequencing, cloning	Long PCR, GC-rich, cloning, sequencing	Long PCR, sequencing, cloning
Recommended product	TaKaRa LA Taq DNA Polymerase	TaKaRa LA Taq DNA Polymerase with GC Buffers	PrimeSTAR GXL
Choose for:	Maximum length	High fidelity	Excellent all-around performance on a variety of templates
Amplicon size			
gDNA	<30 kb	<17.5 kb	<30 kb
Plasmid/lambda	<48 kb	<35 kb	<40 kb
Enzyme properties			
5'-3' exonuclease activity	✓	✓	
3'-5' exonuclease activity	✓	✓	✓
T/A overhangs or Blunt	T/A	T/A	Blunt
Fidelity (Kunkel)	6.5X Taq (Standard %GC target)	6.5X Taq (Standard %GC target)	
Fidelity (Sequencing)			6.5X Taq (GC-rich target)
Speed	60 sec/kb	60 sec/kb	10 sec/kb (rapid protocol)
GC-Rich targets	Up to 67%	Up to 74%	Up to 73%
Format/Features			
Premix	Available		
Hot Start	Available		✓

GC-Rich

Application	Robust genotyping	Long PCR, sequencing, cloning	Amplification prior to NGS
Recommended product	Advantage GC 2 Polymerase Mix	TaKaRa LA Taq DNA Polymerase with GC Buffers	PrimeSTAR GXL
Choose for:	High % GC	Long PCR with GC-rich templates	Highest fidelity
Amplicon size			
gDNA	<3.5 kb	<17.5 kb	<30 kb
Plasmid/lambda	<6 kb	<35 kb	<40 kb
cDNA	<2 kb	NA	<13.5 kb
Enzyme properties			
5'-3' exonuclease activity		✓	
3'-5' exonuclease activity	✓	✓	✓
T/A overhangs or Blunt	T/A	T/A	Blunt
Fidelity (Kunkel)	3X Taq (Standard %GC target)	6.5X Taq (Standard %GC target)	
Fidelity (Sequencing)			6.5X Taq (GC-rich target)
Speed	60 sec/kb	60 sec/kb	10 sec/kb (rapid protocol)
GC-Rich targets	Up to 90%	Up to 74%	73%
Format/Features			
PCR Kit with control template and primers	Available	Available	
Hot Start			✓

Direct PCR

Application	Mouse tissues	Mouse tissues	Compatible with tough tissue	Direct genotyping on FFPE samples	Direct genotyping on FTA Cards
Recommended product	Terra PCR Direct Polymerase Mix	Terra PCR Direct Red Dye Premix	Terra PCR Direct Genotyping Kit	Terra PCR Direct FFPE Kit	Terra PCR Direct Card Kit
Choose for:	Genotyping	Direct genotyping and streamlined workflow	Genotyping and adaptable workflow	Genotyping with fixed samples	Genotyping with archived samples
Amplicon size					
gDNA	<2 kb	<2 kb	<2 kb	<2 kb	<2 kb
Enzyme properties					
T/A overhangs or Blunt	T/A	T/A	T/A	T/A	T/A
GC-Rich targets	70%	70%	70%	70%	70%
Format/Features					
Premix		✓			
Dye added		✓	Loading dye included separately		
Hot Start	✓	✓	✓	✓	✓
Direct PCR	✓	✓	✓	✓	✓

Fast PCR

Application	Cloning, sequencing	Colony PCR	High throughput
Recommended product	PrimeSTAR Max	SapphireAmp Fast PCR Master Mix	SpeedSTAR HS DNA Polymerase
Choose for:	Fast, convenient, and highest fidelity	Fast routine PCR	Fast moderate fidelity PCR
Amplicon size			
gDNA	<6 kb	<6 kb	<20 kb
Plasmid/lambda	<15 kb	<5 kb	<20 kb
cDNA	<6 kb	NA	NA
Enzyme properties			
5'-3' exonuclease activity		✓	✓
3'-5' exonuclease activity	✓	✓	✓
T/A overhangs or Blunt	Blunt	T/A	T/A
Speed	5 sec/kb	10 sec/kb	10 sec/kb
Format/Features			
Premix	✓	✓	
Dye added		✓	
Hot Start	✓	✓	✓

General Purpose

Application	General applications, multiplexing	Genotyping	High yield genotyping
Recommended product	TaKaRa Taq DNA Polymerase	EmeraldAmp GT PCR Master Mix	EmeraldAmp MAX PCR Master Mix
Choose for:	Routine use	Value choice	Streamlined workflow
Amplicon size			
gDNA	<3 kb	<4 kb	<15 kb
Plasmid/lambda	<12 kb	NA	NA
cDNA	NA	NA	NA
Enzyme properties			
5'-3' exonuclease activity	✓	✓	✓ (weak)
3'-5' exonuclease activity			✓
T/A overhangs or Blunt	T/A	T/A	T/A
Format/Features			
Premix	Available	✓	✓
Dye added		✓	✓
Hot Start	Available		Available

Methylation Analysis

	Methylation analysis
Recommended product	TaKaRa EpiTaq HS (for bisulfite-treated DNA)
Choose for:	Amplification of bisulfite-treated DNA
Amplicon size	Approximate range: 150 bp–1,000 bp
Enzyme properties	
5'–3' exonuclease activity	✓
3'–5' exonuclease activity	
T/A overhangs or Blunt	T/A
Format/Features	
Hot Start	✓

Molecular Diagnostics

	Titanium Taq SP DNA Polymerase	PrimeSTAR GXL SP DNA Polymerase
General characteristics	Sensitive and robust performance	Excellent all-around performance on a variety of templates High fidelity
	Appropriate for use in general laboratory applications, including molecular diagnostic development and testing	
Applications	Multiplex PCR Whole-genome PCR SNP assays Genotyping (including mammalian samples) Primer extension Rare template amplification Preparative PCR	Amplification prior to NGS Long PCR Sequencing Cloning PCR with GC-rich, AT-rich, or repetitive sequences Amplification of rare alleles PCR with limiting sample amounts
Registered GPR	✓	✓
Amplicon size		
gDNA	<2 kb	<30 kb
Plasmid/lambda	<2 kb	<40 kb
cDNA	<4 kb	<13.5 kb
Enzyme properties/features		
3'-5' exonuclease activity		✓
T/A overhangs or blunt ends	T/A	Blunt
Fidelity (sequencing)		6.5X Taq (GC-rich target)
Speed		10 sec/kb (rapid protocol)
GC-rich targets		Up to 73%
Hot start	✓	✓

Commercial Use

	Titanium Taq SP DNA Polymerase	PrimeSTAR GXL SP DNA Polymerase
General characteristics	Sensitive and robust performance	Excellent all-around performance on a variety of templates High fidelity
	Specially formulated for commercial and OEM use	
Applications	Multiplex PCR Whole-genome PCR SNP assays Genotyping (including mammalian samples) Primer extension Rare template amplification Preparative PCR	Amplification prior to NGS Long PCR Sequencing Cloning PCR with GC-rich, AT-rich, or repetitive sequences Amplification of rare alleles PCR with limiting sample amounts
Registered GPR	✓	✓
Amplicon size		
gDNA	<2 kb	<30 kb
Plasmid/lambda	<2 kb	<40 kb
cDNA	<4 kb	<13.5 kb
Enzyme properties/features		
3'-5' exonuclease activity		✓
T/A overhangs or blunt ends	T/A	Blunt
Fidelity (sequencing)		6.5X Taq (GC-rich target)
Speed		10 sec/kb (rapid protocol)
GC-rich targets		Up to 73%
Hot start	✓	✓