Maximizing end-point PCR success with QIAGEN's automatable PCR solutions

PCR amplification techniques are routinely used in numerous areas of research. QIAGEN, as a leading provider of PCR technologies, offers an extensive range of PCR kits dedicated for specific applications. QIAGEN® end-point PCR kits deliver highly specific results without the need for optimization. In addition, QIAGEN offers automated platforms for PCR setup and DNA fragment analysis. Used in combination, QIAGEN's innovative solutions help to standardize the entire PCR workflow — from convenient PCR setup with the QIAgility® and specific amplification with QIAGEN end-point PCR kits to fast and precise DNA fragment detection with the QIAxcel® system (Figure 1). Find out how to benefit from this winning combination and achieve PCR success at the first attempt.

Figure 1. Standardized PCR workflow.

Superior PCR performance

QIAGEN offers a wide range of PCR solutions for standard, hot-start, multiplex, high-fidelity, long-range, and fast-cycling PCR, as well as for one-step RT-PCR and PCR-based genotyping. All QIAGEN PCR kits contain a dual cation buffer that strongly increases primer annealing specificity, ensuring PCR success at the first attempt (Figure 2).

QIAGEN end-point PCR kits provide:

- Highly specific amplification without the need for optimization
- High yields and reliable results, even with difficult applications
- Convenient kit formats, easy handling, and optimized protocols

QIAGEN end-point PCR solutions, such as *Taq* DNA Polymerase, HotStarTaq® DNA Polymerase, the Type-it® Mutation Detect PCR Kit, and others provide high-quality results and outperform kits from other suppliers. QIAGEN end-point PCR kits are compatible with the QIAgility and QIAxcel and have been extensively tested and consistently deliver superior results (Table 1). Used in combination, they ensure reliability, safety, and standardization (Figures 3–5).

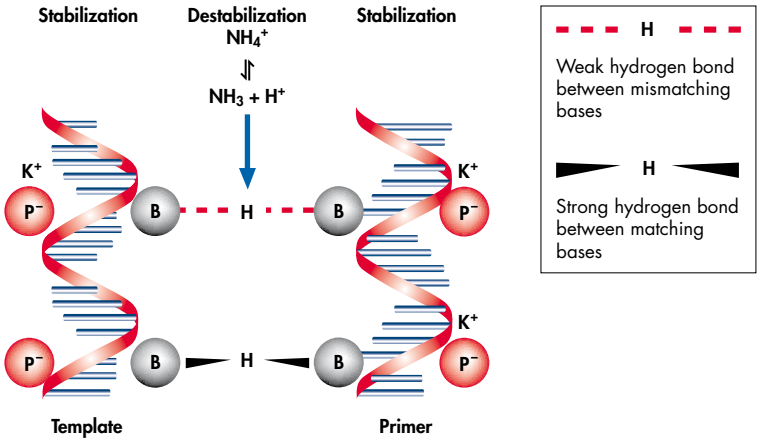

Figure 2. NH_4^+ and K^+ cations in QIAGEN PCR buffers increase specific primer annealing. K^+ binds to the phosphate groups (**P**) on the DNA backbone, stabilizing the annealing of the primers to the template. NH_4^+, which exists both as the ammonium ion and as ammonia under thermal-cycling conditions, can interact with the hydrogen bonds between the bases (**B**), destabilizing principally the weak hydrogen bonds at mismatched bases. The combined effect of the two cations maintains the high ratio of specific to nonspecific primer–template binding over a wide temperature range.

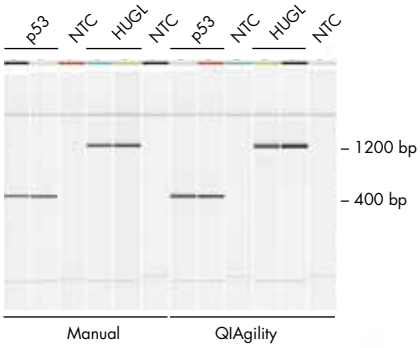

Figure 3. Highly specific PCR results with both manual and automated PCR setup. PCR setup was performed manually or was automated using the QIAgility. PCR products were analyzed on the QIAxcel. HotStarTaq DNA Polymerase enabled specific amplification of both p53 (400 bp) and HUGL (1200 bp). PCR setup with the QIAgility resulted in higher yields. Clear separation of fragments was achieved using the QIAxcel, enabling precise measurement of fragment size. **NTC**: no template control.

Convenient PCR setup and highly specific amplification

The innovative QIAgility enables rapid, high-precision automated PCR setup and eliminates manual pipetting steps that can be prone to human error. The QIAgility can set up multiple master mixes and can process multiple PCR setups in parallel. The risk of contamination is greatly reduced and improved yields are achieved. Used in combination with QIAGEN end-point PCR kits, the QIAgility delivers reproducible and reliable results faster (Figure 3).

The QIAgility provides:

- Automated PCR setup in a wide range of formats
- Standardized results and increased productivity
- Convenience and accuracy due to elimination of manual pipetting steps
- Flexible software and downloadable verified protocols for selected kits

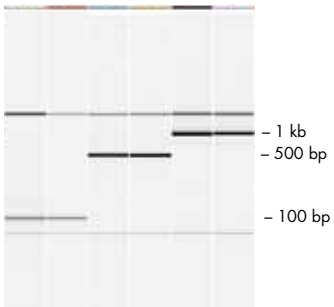

Figure 4. Highly specific amplification using QIAGEN *Taq* DNA Polymerase and clear separation of fragments using the QIAxcel. PCR was performed to amplify 3 different fragments (corresponding to 100 bp, 500 bp, and 1 kb). Reactions were run in duplicate. The QIAxcel enabled clear separation of the fragments.

Reliable PCR and precise DNA fragment detection

The QIAxcel system fully automates high-resolution capillary electrophoresis of up to 96 samples per run. It offers a fast and efficient alternative to gel electrophoresis, enabling effortless analysis of PCR products in as little as 10 minutes for 12 samples. It also ensures standardization as well as greater safety, as exposure to hazardous chemicals such as ethidium bromide is minimized. Used together, proven QIAGEN end-point PCR kits and the QIAxcel provide an all-in-one, pretested solution for reliable analysis of PCR fragments, ensuring reproducibility and significant time and cost savings (Figures 3–5).

The QIAxcel provides:

- Analysis of up to 96 samples without manual intervention
- Safety and convenience with ready-to-use gel cartridges
- Precise results for nucleic acid concentrations as low as 0.1 ng/µl
- Confident data interpretation with a resolution down to 3–5 bp
- Standardized processing with digital data collection

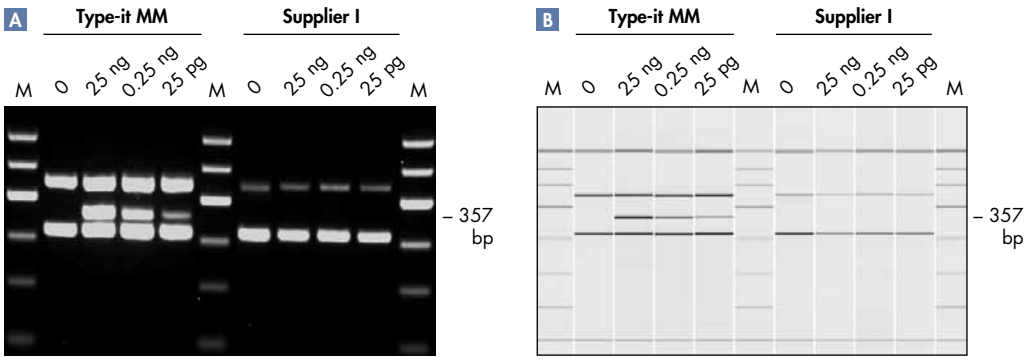

Figure 5. Sensitive detection of a mutated cancer-related gene. The indicated amounts of DNA extracted from a lymphoma related cell line (Ramos) were spiked into human leukocyte DNA and the mutated Ramos target was detected together with 2 internal controls. Using the Type-it Mutation Detect PCR Kit, the mutated gene was detected even when only 25 pg of DNA was present. **A** Electrophoresis was performed on a 1.3% agarose gel. **B** Electrophoresis was performed on the QIAxcel system using the QIAxcel High Resolution cartridge. **M**: 100 bp ladder.

Table 1. Overview of automatable QIAGEN PCR kits

Application	QIAgility	QIAxcel	Kit	PCR kit description	Sample kit available
Standard PCR	■	■	TopTaq® DNA Polymerase	Fridge-storage enzyme for highly reliable end-point PCR with unrivaled ease-of-use	✓
	■	■	TopTaq Master Mix Kit	Fridge-storage, ready-to-use master mix for highly reliable end-point PCR with unrivaled ease-of-use	
	■	■	*Taq* DNA Polymerase	For standard and specialized PCR applications	
	■	■	*Taq* PCR Core Kit	For standard and specialized PCR applications; includes dNTP mix	
	■	■	*Taq* PCR Master Mix Kit	For standard and specialized PCR applications: ready-to-use master mix format for convenient setup	
Hot-start PCR	■	■	HotStarTaq *Plus* DNA Polymerase	For fast and highly specific amplification in all applications: with ready-to-load PCR buffer	✓
	■	■	HotStarTaq *Plus* Master Mix Kit	For fast and highly specific amplification in all applications: ready-to-use master mix format for convenient setup plus ready-to-load PCR buffer	
	■	■	HotStarTaq DNA Polymerase	For highly specific amplification with no need for optimization	
	■	■	HotStarTaq Master Mix Kit	For highly specific amplification in all applications: ready-to-use master mix format for convenient setup	
Fast-cycling PCR	■	■	QIAGEN Fast Cycling PCR Kit	For ultrafast and specific hot-start PCR on any thermal cycler: ready-to-use master mix format for convenient setup	✓
High-fidelity PCR	■	■	HotStar HiFidelity Polymerase Kit	For highly sensitive and reliable high-fidelity hot-start PCR	
Multiplex PCR	■	■	QIAGEN Multiplex PCR Kit	For highly specific and sensitive multiplex PCR without the need for optimization: ready-to-use master mix format for convenient setup	
PCR-based genotyping	■	■	Type-it Mutation Detect PCR Kit	For accurate and reliable multiplex PCR analysis of mutations: ready-to-use master mix format for convenient setup	✓
	■	■	Type-it Microsatellite PCR Kit	For fast and reliable multiplex PCR analysis of microsatellite loci: ready-to-use master mix format for convenient setup	✓
Long-range PCR	■	■	QIAGEN LongRange PCR Kit	For sensitive and accurate long-range PCR	✓
	■	■	QIAGEN LongRange 2Step RT-PCR Kit	For sensitive and accurate long-range two-step RT-PCR	✓
One-step RT-PCR	■	■	QIAGEN OneStep RT-PCR Kit	For highly sensitive and successful one-step RT-PCR	

■ Verified QIAgility protocol available for download.

A winning combination for end-point PCR success

QIAGEN's end-point PCR kits together with automated platforms for PCR setup and DNA fragment analysis provide a complete solution for your research, ensure reproducibility and convenience, and consistently deliver successful results faster. Standardize your workflow and trust QIAGEN's winning combination for reliable PCR results at the first attempt!

Visit www.qiagen.com/PCR/Automation for more information.

Ordering Information

Product	Contents	Cat. no.
Taq DNA Polymerase (250 U)*	250 units *Taq* DNA Polymerase, 10x PCR Buffer, 10x CoralLoad® PCR Buffer, 5x Q-Solution®, 25 mM $MgCl_2$	201203
HotStarTaq DNA Polymerase (250 U)*	250 units HotStarTaq DNA Polymerase, 10x PCR Buffer, 5x Q-Solution, 25 mM $MgCl_2$	203203
Type-it Mutation Detect PCR Kit (70)*	For 70 x 25 µl reactions: Type-it Multiplex PCR Master Mix, 5x Q-Solution, RNase-Free Water, and CoralLoad Dye	206143
QIAgility	Robotic workstation for automated PCR setup, including notebook computer, QIAgility Software, 1-year warranty on parts and labor	Varies†
QIAxcel System	Capillary electrophoresis device, including computer, BioCalculator Analysis software, 1-year warranty on parts and labor	9001421

* Other kit sizes and/or formats available; see www.qiagen.com/goto/PCR.

† See www.qiagen.com/goto/QIAgility for more information.

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For an overview of on our extensive PCR product range, visit www.qiagen.com/goto/PCR/overview.

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