

Thermal cycler comparison: the ProFlex 96-Well PCR System demonstrates consistent, reliable performance

Introduction

The Applied Biosystems™ ProFlex™ PCR System was first introduced in 2013, and it has developed a strong reputation as a precise and reliable thermal cycler. This study compares the ProFlex 96-Well PCR System to our discontinued Applied Biosystems™ GeneAmp™ PCR System 9700 and other thermal cycler models, including:

- Bio-Rad™ C1000 Touch™ 96-Well Thermal Cycler
- MJ Research PTC-200 96-Well Thermal Cycler
- Eppendorf™ Mastercycler™ Pro S thermal cycler



Materials and methods

Two PCR templates (0.9 kb and 3 kb) were tested using the chemistries and amplification profiles shown in Figures 1 and 2.

Product	Volume per reaction (μL)	Cat. No.
Invitrogen™ Platinum™ PCR SuperMix*	46.0	11306016
Forward primer (100 pmol/μL)	0.5	A15612
Reverse primer (100 pmol/μL)	0.5	A15612
DNA template (50 ng plasmid)	1.0	NA
Invitrogen™ UltraPure™ DNase/RNase-Free Distilled Water	2.0	10977015

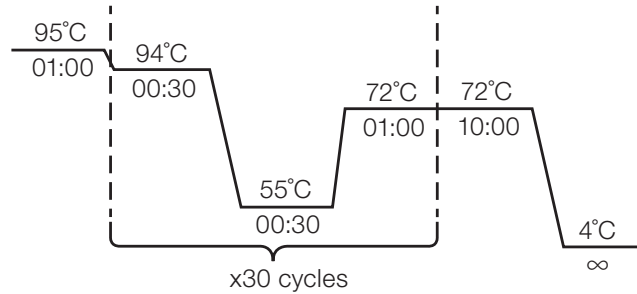


Figure 1. PCR reaction composition and cycling conditions for the 0.9 kb template.

Product	Volume per reaction (μL)	Cat. No.
Invitrogen™ Platinum™ PCR SuperMix High Fidelity	46.0	12532016
Forward primer (100 pmol/μL)	0.5	A15612
Reverse primer (100 pmol/μL)	0.5	A15612
DNA template (50 ng plasmid)	1.0	NA
UltraPure DNase/RNase-Free Distilled Water	2.0	10977015

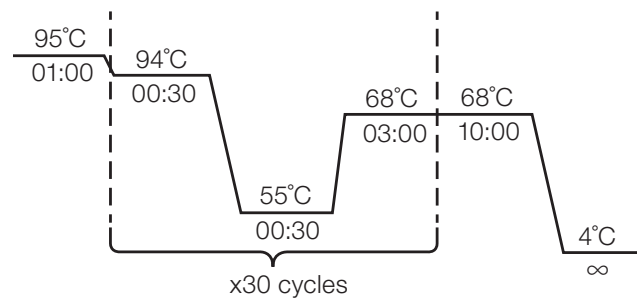


Figure 2. PCR reaction composition and cycling conditions for the 3 kb template.

Invitrogen™ E-Gel™ Agarose Gels with SYBR™ Safe DNA Gel Stain, 1.2% (Cat. No. G521801) and TrackIt™ 1 Kb Plus DNA Ladder (Cat. No. 10488085) were used to visualize PCR products. To account for variation in the thermal block, PCR reactions were placed in the positions shown in Figure 3, with a negative control placed at position G12.

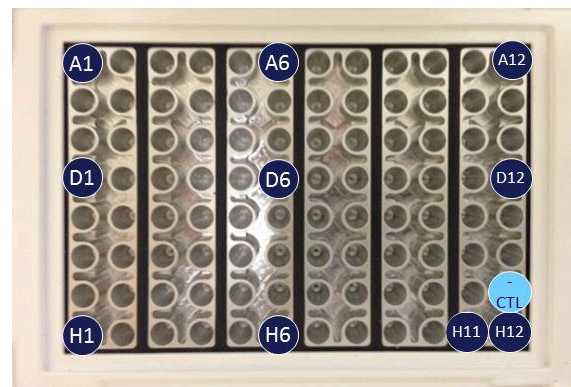


Figure 3. PCR reaction positions in the thermal block.

* Discontinued product.

Results

PCR amplification was comparable across the five instruments tested, for the 0.9 kb template (Figure 4). There was no major difference between the instruments in terms of product yield. Each instrument generated the correctly sized PCR product in all wells tested. However, for the 3 kb template (Figure 5), the Bio-Rad C1000 Touch 96-Well Thermal Cycler showed positional variability.

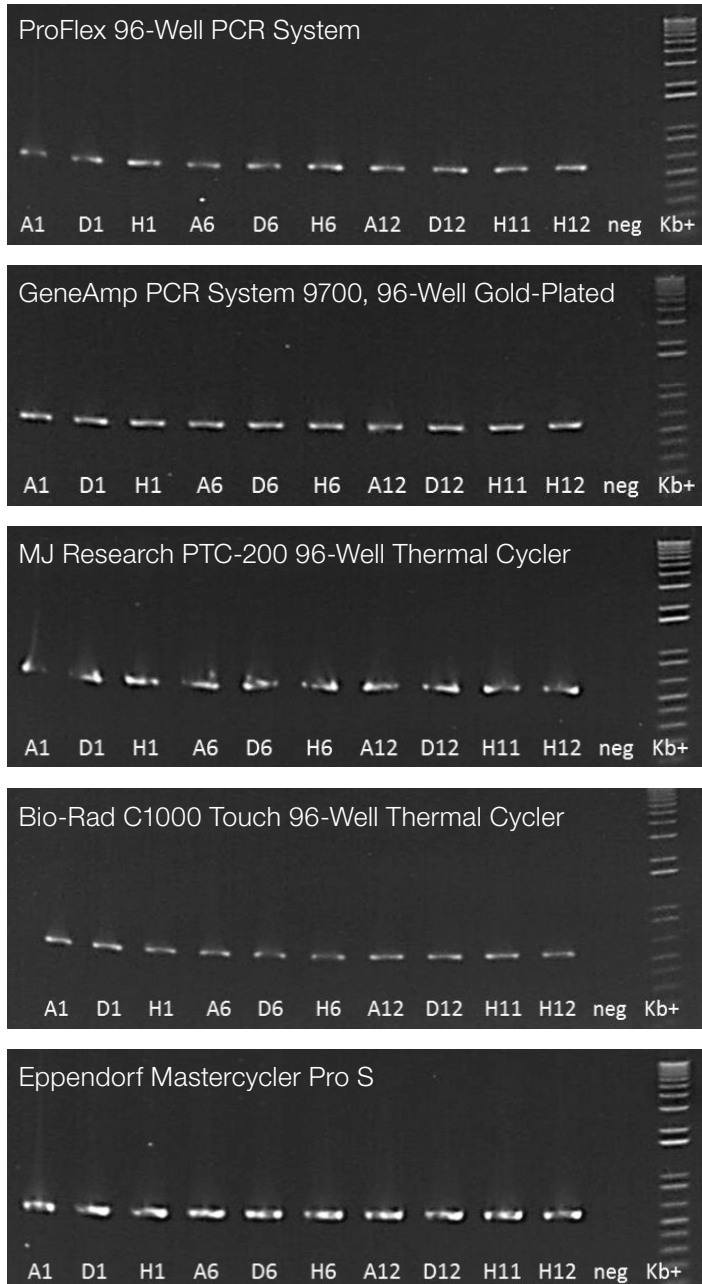


Figure 4. Amplification of the 0.9 kb template.

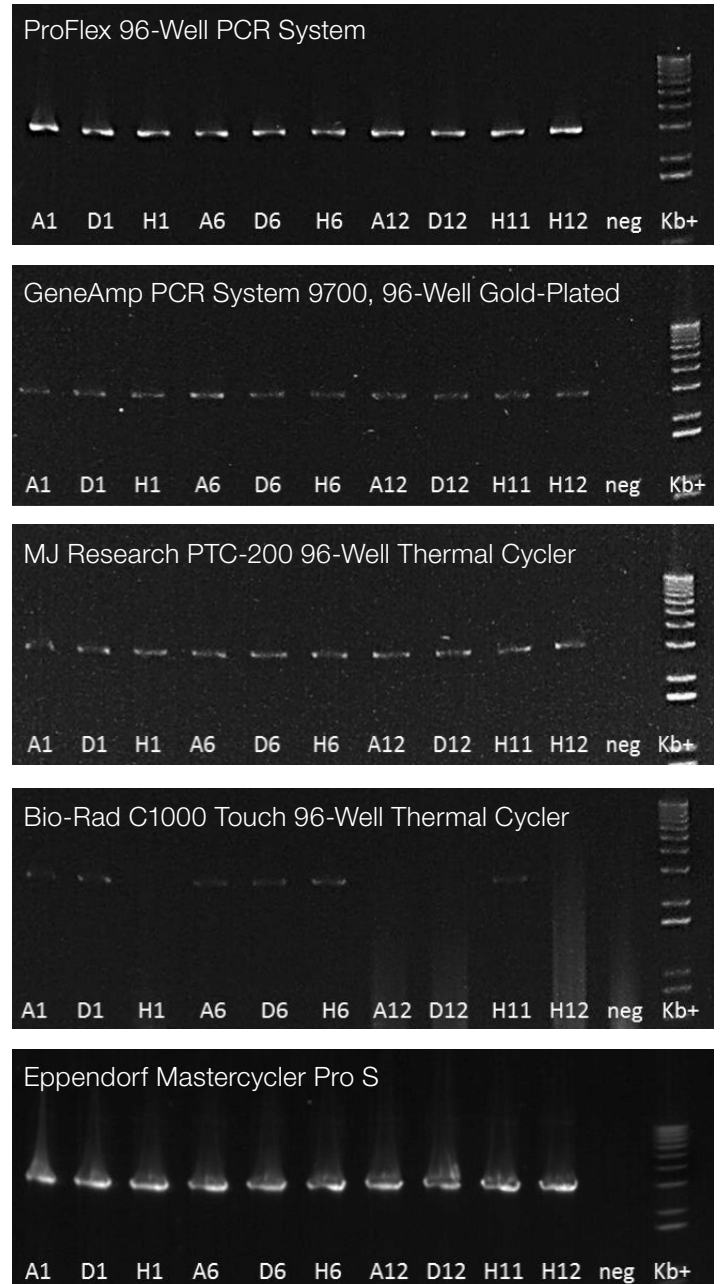


Figure 5. Amplification of the 3 kb template.

Conclusions

The ProFlex PCR System demonstrated product yield comparable to that of the proven and reliable GeneAmp PCR System 9700. Significantly less well-to-well variability was observed with these systems, compared to the Bio-Rad C1000 Touch 96-Well Thermal Cycler, with the 3 kb template. These results are assay-specific, and results may vary depending on the PCR experimental conditions.

Instrument specifications

	ProFlex PCR System	GeneAmp PCR System 9700	Bio-Rad C1000 Touch 96-Well Thermal Cycler	Eppendorf Mastercycler Pro S
Formats available	3 x 32-well independent control; 1 x 96-well VeriFlex™ Block; 2 x 96-well; dual flat block for chip formats; 2 x 384-well	1 x 96-well, 0.2 mL; 1 x 60-well, 0.5 mL; 2 x 96-well, 0.2 mL; dual flat block for chip formats; 2 x 384-well	1 x 96-well, 0.2 mL; 1 x 96 deep well; 2 x 48-well, 0.2 mL; 1 x 384-well	1 x 96-well, 0.2 mL; 1 x 384-well
Maximum block ramp rate	6°C/sec	2.6°C/sec (for gold-plated block)	5°C/sec	Approx. 6°C/sec
Maximum sample ramp rate	4.4°C/sec (measured at 1 µL volume)	2.3°C/sec (for gold-plated block; measured at 1 µL volume)	Not published	Not published
Temperature range	0°–100°C	4°–99°C	0°–100°C	4°–99°C
Temperature accuracy	±0.25°C (35°–99.9°C)	±0.25°C (35°–99.9°C)	±0.2°C of programmed target at 90°C	±0.2°C
Temperature uniformity	<0.5°C (20 sec after reaching 95°C)	±0.5°C (30 sec after reaching 95°C)	±0.4°C well-to-well within 10 sec of arrival at 90°C	±0.3°C (20°–72°C) ±0.4°C (95°C)
Input power	100–240 V, 50–60 Hz Max: 950 VA	100–240 V, 50–60 Hz Max: 725 VA	Max: 850 W	Max: 950 W
Display	8.4 in. color TFT LCD touch screen	Monochrome LCD display and tactile keypad	8.5 in. LCD display and touch screen	Removable, push-button control panel
Ports	USB x 3	PCMCIA	USB A x 5, USB B x 1	USB, CAN
Memory	USB, onboard with >1,000 protocols	PCMCIA, onboard	USB, onboard with >1,000 protocols	Not published
Approx. dimensions (W x D x H)	33 x 57 x 27 cm (13 x 22 x 11 in.)	30 x 41 x 26 cm (12 x 16 x 10 in.)	33 x 46 x 20 cm (13 x 18 x 8 in.)	26 x 42 x 37 cm (10 x 16 x 15 in.)
Approx. weight	19 kg (41 lb)	9 kg (19 lb)	10 kg (23 lb)	19 kg (41 lb)
Temperature optimization range	VeriFlex Blocks: 5°C in 32-well blocks (2 zones); 25°C in 96-well blocks (6 VeriFlex zones)	NA	30°–100°C gradient block	30°–99°C gradient block
Programming options	Touch screen, and preloaded onboard protocols	Buttons	Step-based graphical and automatic	Buttons
Security features	3 levels of security for regulated environments	NA	Optional log-in required; mode for regulated environments	Safe mode available
VeriFlex Blocks	Yes	No	No	No
External software	Mobile application for remote monitoring	External PC-based software available	External PC-based software available	External PC-based software available

Ordering information

Product	Quantity	Cat. No.
ProFlex 96-Well PCR System	1 system	4484075
ProFlex 3 x 32-Well PCR System	1 system	4484073
ProFlex 2 x 96-Well PCR System	1 system	4484076
ProFlex 2 x Flat PCR System	1 system	4484078
ProFlex 2 x 384-Well System	1 system	4484077
ProFlex 96-Well Sample Block	1 block	4483637
ProFlex 3 x 32-Well Sample Block	1 block	4483638
ProFlex 2 x 96-Well Sample Block	1 block	4484071
ProFlex 2 x Flat Sample Block	1 block	4484074
ProFlex 2 x 384-Well Sample Block	1 block	4484072
Platinum PCR SuperMix High Fidelity	100 reactions	12532016
DNA oligo (custom), 25 nmol, desalted, dry	25 nmol	A15612
UltraPure DNase/RNase-Free Distilled Water	500 mL	10977015
E-Gel Agarose Gels with SYBR Safe DNA Gel Stain, 1.2%	18 gels	G521801
TrackIt 1 Kb Plus DNA Ladder	100 applications	10488085
MicroAmp Optical 96-Well Reaction Plate with Barcode	20 plates	4306737
MicroAmp Clear Adhesive Film	100 films	4306311

Find out more at thermofisher.com/proflex