

## Specifications

### Optics

Dye detection limit < 2 nM for FAM/Cy3/TxR/Cy5  
Optical channel characterization:

Channel	1	2	3	4
Instrument	FAM,	Cy3, TET,	TxR	Cy5
Calibration Dyes	Intercalating dye	Alexa 532		Alexa 647
Excitation (nm)	450–495	500–550	565–590	630–650
Emission (nm)	510–527	565–590	606–650	670–750

### Reaction site thermal controls

- Solid state heater and forced-air cooling at each site
- Reaction chamber thermistors calibrated to  $\pm 0.50$  °C using National Institute of Standards and Technology (NIST)–traceable standards
- 16 independently–controlled reaction sites per processing block

### Reaction tubes

Single–use disposable tubes  
Polypropylene construction  
25  $\mu$ L volumes  
No–leak closures

### Performance parameters

Heating ramp rates (max.):  
10 °C/sec from 50 °C to 95 °C  
Cooling ramp rates (max.):  
2.5 °C/sec from 95 °C to 50 °C  
Temperature duration accuracy:  
 $\pm 1.0$  sec from programmed time  
Temperature accuracy:  
 $\pm 0.5$  °C from 60 °C to 95 °C  
Melt curve programmable ramp rates:  
0.1 °C/sec to 1.0 °C/sec

### Physical dimensions

Processing block: 12" w x 12" h x 10" l, 22 lbs  
As little as 2.5 linear feet of bench space  
SmartCycler TD travel case: 24" w x 20" h x 25.5" l,  
total weight with processing block, computer & accessories 74 lbs

### Power requirements

100–240 VAC, 50–60 Hz, 350 Watts

### SmartCycler® System U.S. Part Numbers\* — with Life Science Research Software

SmartCycler 1600 System	SC2500N1–1
– processing unit with desktop computer	
SmartCycler 1600 TD System	SC2500N2–1
– processing unit with laptop computer and case	
SmartCycler 1600 System	SC2500N4–1
– processing unit with laptop computer	
SmartCycler 3200 System	SC2500N5–1
– 2 processing units with desktop computer	
SmartCycler 3200 System	SC2500N6–1
– 2 processing units with laptop computer	
SmartCycler 4800 System	SC2500N12–1
– 3 processing units with desktop computer	
SmartCycler 4800 System	SC2500N13–1
– 3 processing units with laptop computer	
SmartCycler 6400 System	SC2500N14–1
– 4 processing units with desktop computer	
SmartCycler 6400 System	SC2500N15–1
– 4 processing units with laptop computer	
SmartCycler 8000 System	SC2500N16–1
– 5 processing units with desktop computer	
SmartCycler 8000 System	SC2500N17–1
– 5 processing units with laptop computer	
SmartCycler 9600 System	SC2500N18–1
– 6 processing units with desktop computer	
SmartCycler 9600 System	SC2500N19–1
– 6 processing units with laptop computer	
SmartCycler Upgrade Unit	SC2500N3–1
– Single processing unit	

\* For complete product catalog and international part numbers, please visit [www.cepheid.com](http://www.cepheid.com)

Practice of the patented polymerase chain reaction (PCR) process requires a license. The SmartCycler® thermal cycler is an authorized thermal cycler and may be used with PCR licenses available from Applied Biosystems. Its use with authorized reagents also provides a limited PCR license in accordance with the label rights accompanying such reagents. Purchase of this instrument does not convey any right to practice the 5' nuclease assay or any of the other real-time methods covered by patents owned or controlled by Roche or Applied Biosystems. Cepheid's SmartCycler® thermal cycler is a licensed real-time thermal cycler under Applera's European Patent No. EP 0 872 562, Japanese Patent No. JP 3136129 and patents pending, for all fields including human in vitro diagnostics except for diagnosis and monitoring of HIV and HCV infections.

# SmartSystem™

Potentially the most sensitive real-time PCR system in the world.



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Sample in. Answer out.™

Prep. Amplify. Detect.





# SmartCycler®: built smart for your needs.



### Flexible and Expandable

Cepheid’s SmartCycler® instrument is the only random-access, modular real-time PCR instrument on the market — where each of up to 96 sites can run a different protocol. Test 16 different protocols simultaneously in one instrument, or up to 96 different protocols with 6 instruments. Because all sites are calibrated optically and thermally, every site will perform the same when programmed to run identical protocols. Installation of the SmartCycler System is plug-and-play, and system expansion only requires an additional USB connection.

### Fast

With the SmartCycler System, you can optimize PCR denaturation, annealing and extension temperatures and times in a single run. With average time-to-results in 20-40 minutes, the SmartCycler System can deliver results in less than half the time of a 96 well plate instrument.

### High Throughput

Two SmartCycler instruments can process an equal or greater number of samples than a 96 well instrument in a single day. Scientists, graduate students, and technicians can increase lab efficiency by using the instrument at the same time without needing to batch samples. Previous runs can be viewed and analyzed, and results can be printed while the instrument is still in use. A new run can always be created and started while other runs are in progress.

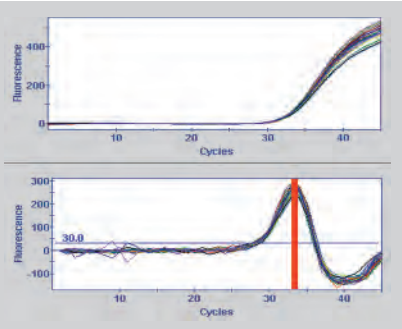
### Assay Optimization Made Easy

- Increase Flexibility** – random access accommodates variable amplicon lengths, cycling times, and assay design. There’s no need for universal cycling conditions, allowing you to be creative in assay development.
- Increase Robustness** – shorter cycling times extend the life of Taq polymerase and hybridization probes.
- Decrease time to results** – random access and shorter cycling times reduce optimization from weeks to hours, especially for multiplex applications.

### Mobile

Heavy-duty airline safe transport case and laptop configuration is available for the SmartCycler System, making it ideal for field work. The optical system has no moving parts to get out of alignment or bulbs to be damaged during transport.

### Instrument Precision



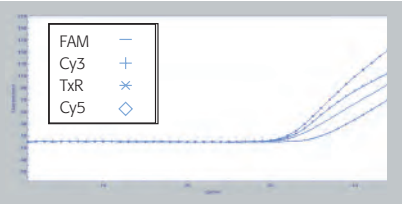
Growth curves and second derivative curves for 32 sites (2 processing blocks). Data are from run #3 (refer to results table below). Precision data: *Neisseria gonorrhoeae* assay at 5000 copies.

Reproducible data is achieved through the SmartCycler’s robust optical, heating and cooling elements.

Run #	n	Mean Ct	SD	%CV
1	32	33.2	0.14	0.43%
2	32	33.2	0.13	0.39%
3	32	33.3	0.17	0.51%

Total mean (n = 96) 33.2  
Total SD (n = 96) 0.16

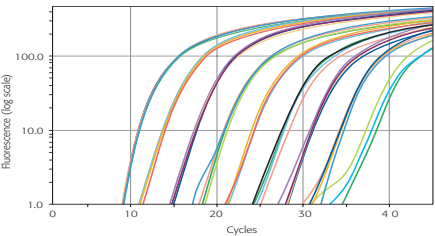
### Multiplex Capability



Amplification and detection of the *Bacillus anthracis* protective antigen gene on pX01 plasmid (FAM), capB gene on pX02 plasmid (Cy3), internal control (TxR), and sample prep control (Cy5). Ten spores *B. anthracis*, 10 spores sample prep control, 1 fg internal control plasmid.

Multiplex assays allow for the detection of several targets within a single sample. The use of multiple fluorescent dye labeled probes permits detection of signal in up to four channels at one time on the SmartCycler System. Various detection chemistries can be used with the SmartCycler optics, including TaqMan®, Eclipse, and Molecular Beacons probes, Amplifluor™ and Scorpion™ primers, and intercalating dyes.

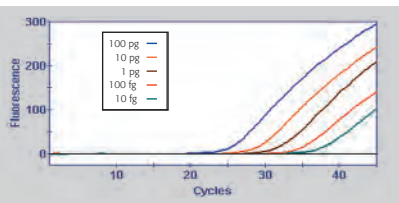
### Dynamic range



Mycoplasma DNA with amplification and detection of a 71 bp amplicon using TaqMan probe. Detection from 10<sup>1</sup> to 10<sup>6</sup> molecules with four replicates per concentration.

The SmartCycler System allows detection over a broad range of target concentration. A linear standard curve can be created from a serial dilution, allowing the determination of an unknown sample concentration.

### Sensitivity



Dilution series of 100 pg to 10 fg of vaccinia DNA with a TaqMan probe labeled with Cy5/BHQ2.

Assay sensitivity when conducting real-time PCR is affected by many factors, including the quality of template preparation, primer and probe design, and optimization of PCR conditions. Single copy detection is often achievable on the SmartCycler with a properly optimized assay design. Quantitative low copy detection on the SmartCycler is illustrated with an orthopox assay.



# The heart of the SmartSystem™: I-CORE®

### Maintenance-free:

At the heart of the SmartCycler System is the I-CORE module – a reliable, solid-state optical system with no moving parts. Each of the standard 16 (expandable to 96) I-CORE modules require no warm-up time, no routine maintenance, and no normalization dye.

### Superior Multiplexing:

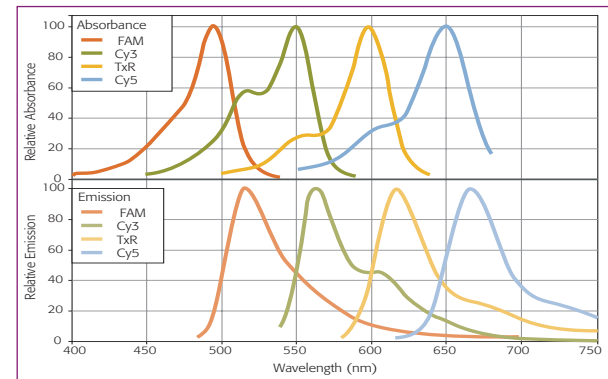
Four LEDs and four photodiode detectors enable superior multiplexing capabilities. Band pass filters in each of the 4 channels reduce the risk of crosstalk. The optical signal is measured at a 90° angle to minimize the risk of interference.

### Rapid Thermal Cycling:

Achieve faster results with Cepheid's high thermal conductivity ceramic heater plates — coupled with a high efficiency fan.

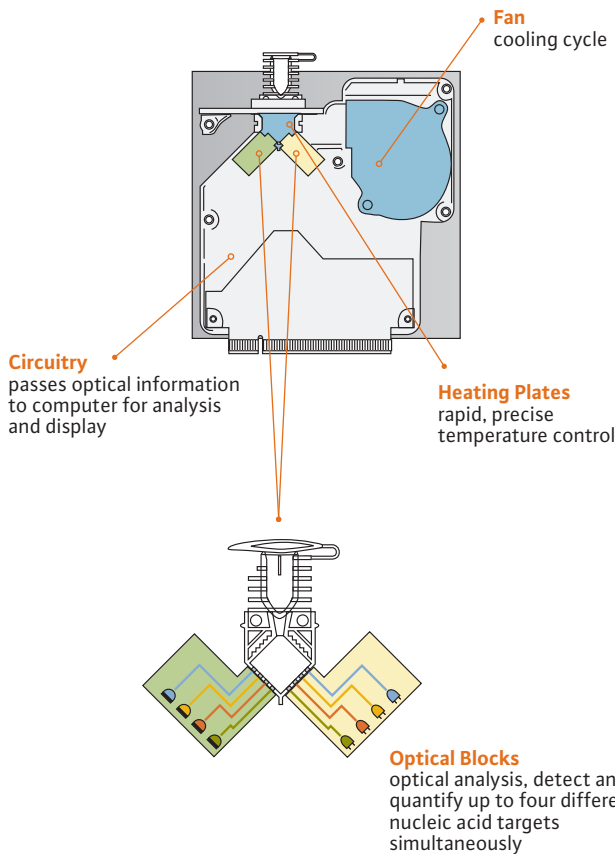


### Four Optical Channels

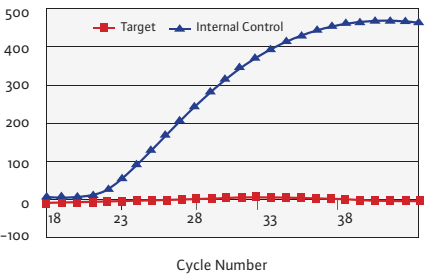


SmartCycler primary dye excitation and emission spectra.

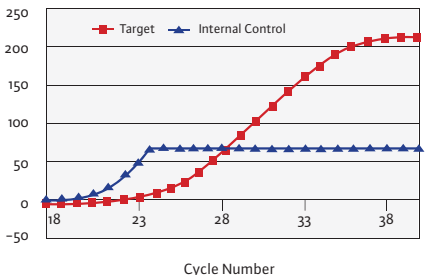
The SmartCycler System's optics allow the measurement of fluorescence in four channels at the same time. High intensity LEDs and optical filters are optimized for spectral separation. The instrument's current calibration allows the use of FAM and Intercalating Dyes in Channel 1, Cy3, TET, and Alexa 532 in Channel 2, Texas Red (TxR) in Channel 3, and Cy5 and Alexa 637 in Channel 4.



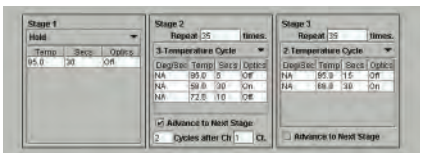
# SmartSystem™ Software: creative assay development



Protocol run with advance to next stage feature off. Target signal suppressed because internal control is in high abundance.



Same protocol run as above with advance to next stage feature on. Target signal is detected because internal control signal was quenched by temperature controlled primer-limiting.



Numerous creative applications of the advance to next stage function are possible – exclusively on the SmartCycler System.

### Exclusive Features

**Advance to Next Stage** is an exclusive feature that automatically advances the thermal cycling protocol to a new stage by monitoring a designated emission channel in each module for a threshold crossing.

### Maximize the power of multiplexing with temperature-controlled primer-limiting:

Advance to next stage allows the thermal cycling protocol to automatically advance from one cycling stage to another to permit multiplex detection of targets with widely disparate copy numbers. For example, using temperature to control primer binding activity, advance to next stage allows you to detect a highly abundant target (such as an endogenous control) and a lower copy target in a single reaction without compromising dynamic range and sensitivity.

**Increased Throughput:** Advance to Next Stage allows you to increase efficiency and instrument throughput by automatically stopping a reaction site after a threshold crossing is detected in a designated emission channel.

### Simple and Flexible:

- Run multiple protocols simultaneously and compare results on a single graph
- Melt curve analysis of reactions using intercalating dyes and hybridization probes
- Monitor and compare two runs simultaneously
- Easily set up or import standard curves to quantify unknown samples
- Adjustable ramp rates for easy optimization

### Easy data management:

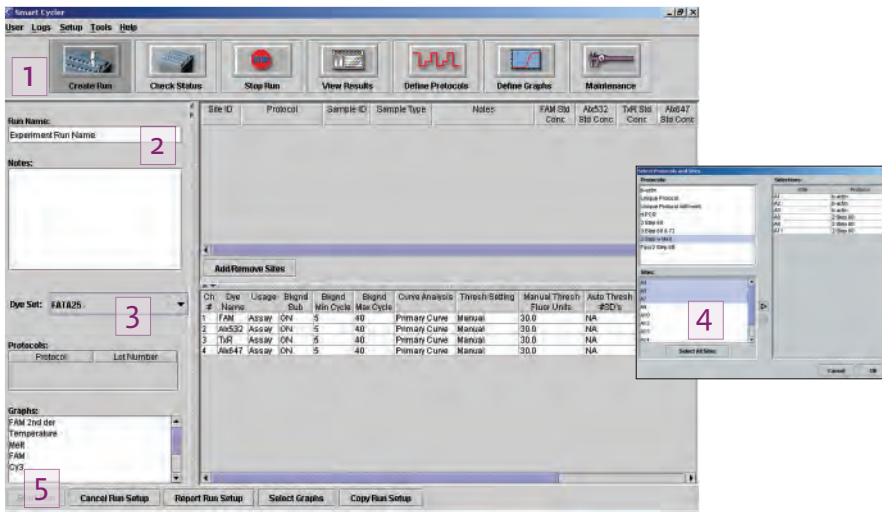
- Save graphs and screens as JPEG files
- Automatic exporting of data to Excel
- Customize graphs to display up to 4 channels on a single graph

### Share it:

- Multiple users can start different runs back to back
- View and print data while runs are in progress
- Run hybridization probe and intercalating dye chemistries at the same time

### Quick Start:

1. Click "Create Run"
2. Enter run name
3. Select dye set
4. Select reaction sites & protocols
5. Click "Start Run"





# SmartTube™:

Cepheid's SmartTube product is a sealed, pressurized polypropylene tube system designed to minimize the risk of amplicon contamination, maximize heat transfer, and optimize optical sensitivity. The SmartTube optical windows are set at 90 degree angles for the ideal optical read path. With SmartTube's high surface to volume ratio for rapid heating and cooling, reactions are more efficient and total run times are reduced. And, the included tube rack is compatible with multi-channel pipettors for high-throughput work flow.

High surface area  
to volume ratio



Rapid thermal  
response

Total reaction  
volume interrogation

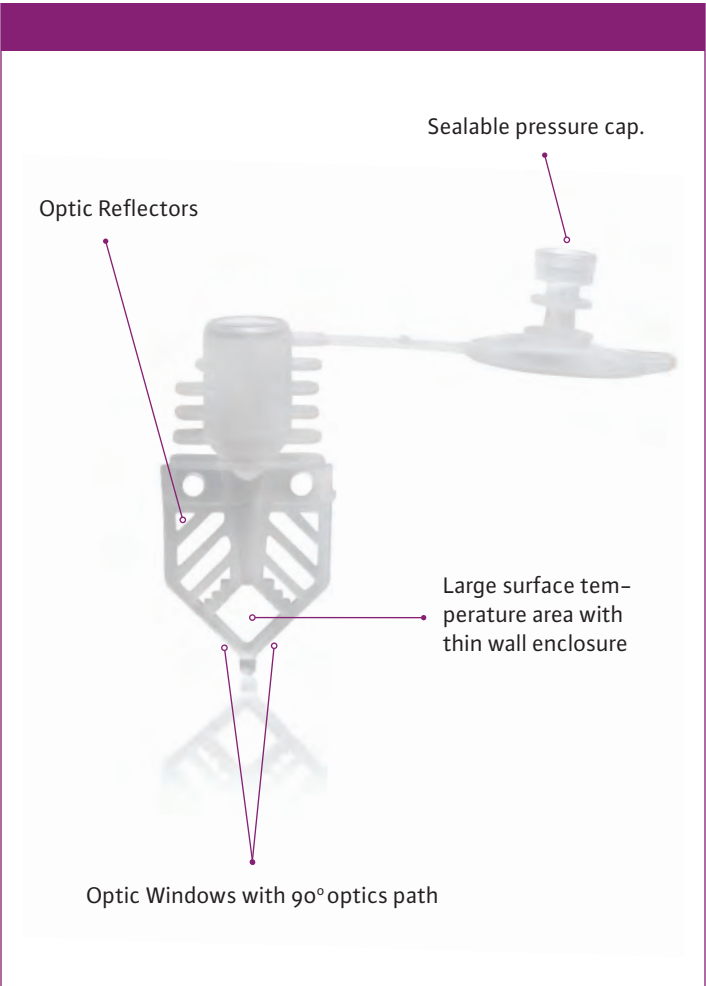


Maximum  
fluorescence signal

Closed  
Tube System



Eliminates risk of  
contamination

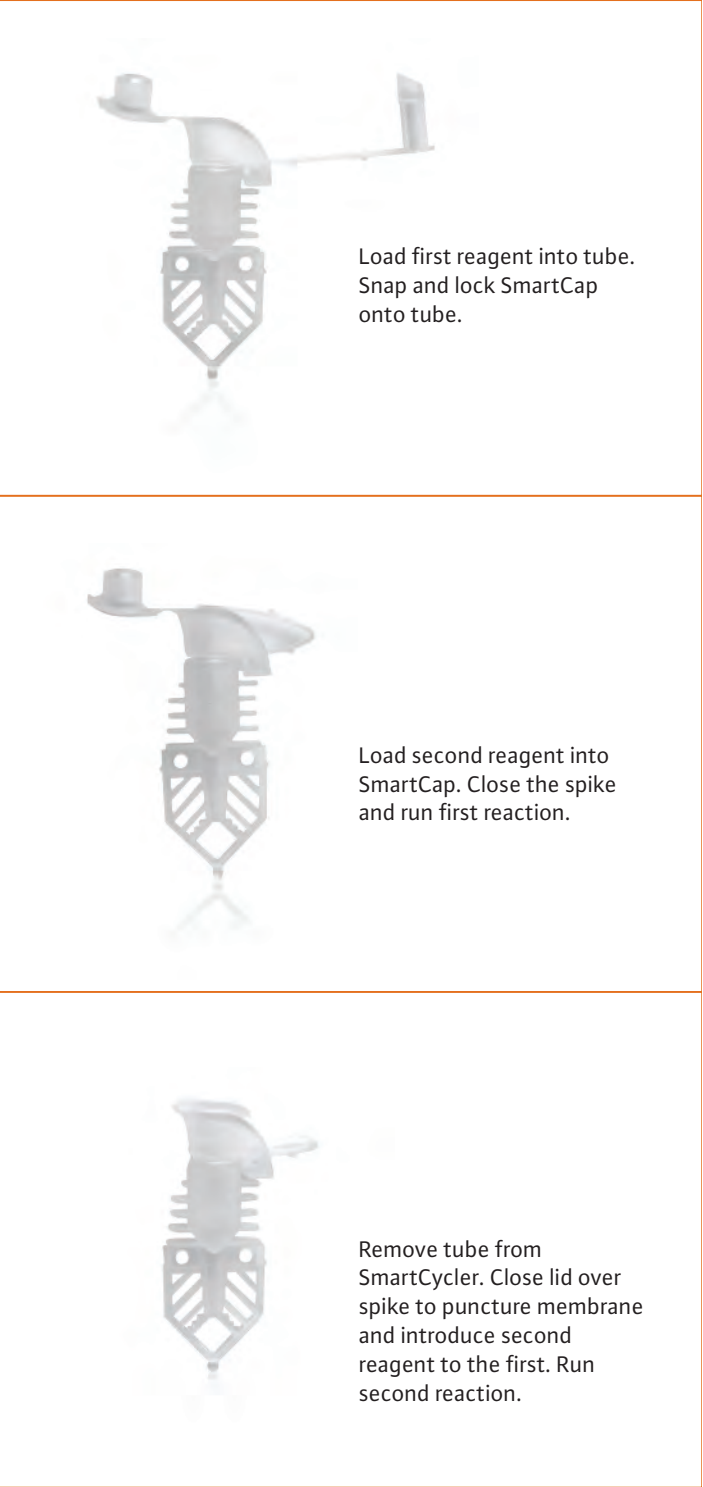


# SmartCap™:

potential for the world's most  
sensitive real-time PCR

## Simple. Convenient. Sensitive

With SmartCap, the SmartCycler® System potentially becomes the most sensitive real-time system in the world. The potential for increased sensitivity lies in the ability to perform 2-step RT-PCR, or nested PCR, in a single, sealed reaction tube — eliminating the risk of contamination.



## Why the Cepheid SmartSystem™ ?

The Cepheid SmartSystem™ is potentially the most sensitive real-time PCR testing platform available on the market. With up to 96 individually programmable reaction sites, it is one of today's most flexible, easy-to-use systems. By automating the entire amplification and detection process, the SmartCycler System can deliver highly accurate and consistent test results from prepared biological samples in 20–40 minutes.

### smart: **by design**

#### flexible:

**With up to 96 independently programmable reaction sites, the SmartCycler® System lets you perform multiple reactions simultaneously.**

Unlike conventional batch-processing thermal cyclers, in which all reactions are subjected to the same PCR protocol, each of the SmartCycler instrument's 16 to 96 reaction sites can be individually and independently controlled with a separate set of cycling protocols, threshold criteria and data analysis. This is a unique capability, enabling users to conduct up to 96 cycling protocols concurrently. Since experimental runs can be started at different times, multiple operators can easily use the SmartCycler System at the same time. This eliminates complex advanced scheduling and offers unparalleled flexibility to researchers who frequently operate under extreme time and staffing constraints.

#### expandable:

**Choose a system that fits your current requirements—and add to it at any time.**

You can configure the SmartCycler System to suit your exact needs—with 16, 32, 48, 64, 80 or 96 reaction sites. As testing volumes expand, you can add more capacity to the system at any time.

#### mobile:

**No other system is designed for complete portability in the field.**

The SmartCycler System is highly robust and compact with no moving components—ideally suited for mobile use in field-testing applications.



### smart: **for rapid time to results**

#### fast:

**Faster than most 96 well format instruments.**

Because cycling time is faster on the SmartCycler, throughput can match or exceed that of most 96 well instruments. Without the need to batch samples, lab efficiency can be improved with the SmartCycler – especially if your lab doesn't routinely maximize it's 96 well set-up. Results on the SmartCycler are delivered in less than an hour.

#### easy to use:

**Intuitive software eliminates interpretation.**

The system software comes pre-installed on a desktop or laptop computer and enables each of the reaction sites to be operated independently. Monitoring of thermal and optical data is in real time – and graphs of temperature, growth and melt curves are displayed during data collection. Advanced features include automatically moving to the next PCR stage after crossing a user-defined threshold, importing and saving a standard curve in an experimental run, and programming automatic backup or export of runs and the database.

#### simple:

**Single test, disposable reaction tubes help prevent contamination and speed testing.**

The sealable and nearly unbreakable polypropylene reaction tubes help reduce amplicon contamination and are designed for rapid thermal transfer and optical sensitivity.

### smart: **in action**

#### real-time PCR:

**Combines amplification and real-time detection.**

The SmartCycler System performs integrated amplification and detection automatically in a single step, with results in real time as PCR reactions are run. The presence of amplified product is confirmed when the fluorescent signal exceeds your user-defined threshold.

#### eight-color system:

**Designed to maximize multiplexing capabilities.**

The SmartCycler is capable of detecting 8 different dyes (FAM, Cy3, TET, Alexa 532, Texas Red, Cy5, Alexa 647 and Eva Green), and can use up to four dyes in a single reaction. Factory calibrated for the detection of FAM, Cy3, TET, Texas Red, Cy5, Alexa 532 and Alexa 647, SmartCycler is compatible with all common probe technologies that are utilized in real-time PCR – including TaqMan, Molecular Beacons, Scorpion primers, Eclipse probes, and LUX primers.

#### dynamic range:

**You can detect targets over a broad range of concentrations.**

A linear standard curve can be created from a serial dilution, allowing the determination of an unknown sample concentration.

#### quick optimization:

**Quickly optimize assay protocols.**

With the SmartCycler, you can run multiple protocols simultaneously, and use multiple detection methods and probe technologies – including TaqMan, Molecular beacons, Scorpion primers, or intercalating dyes.