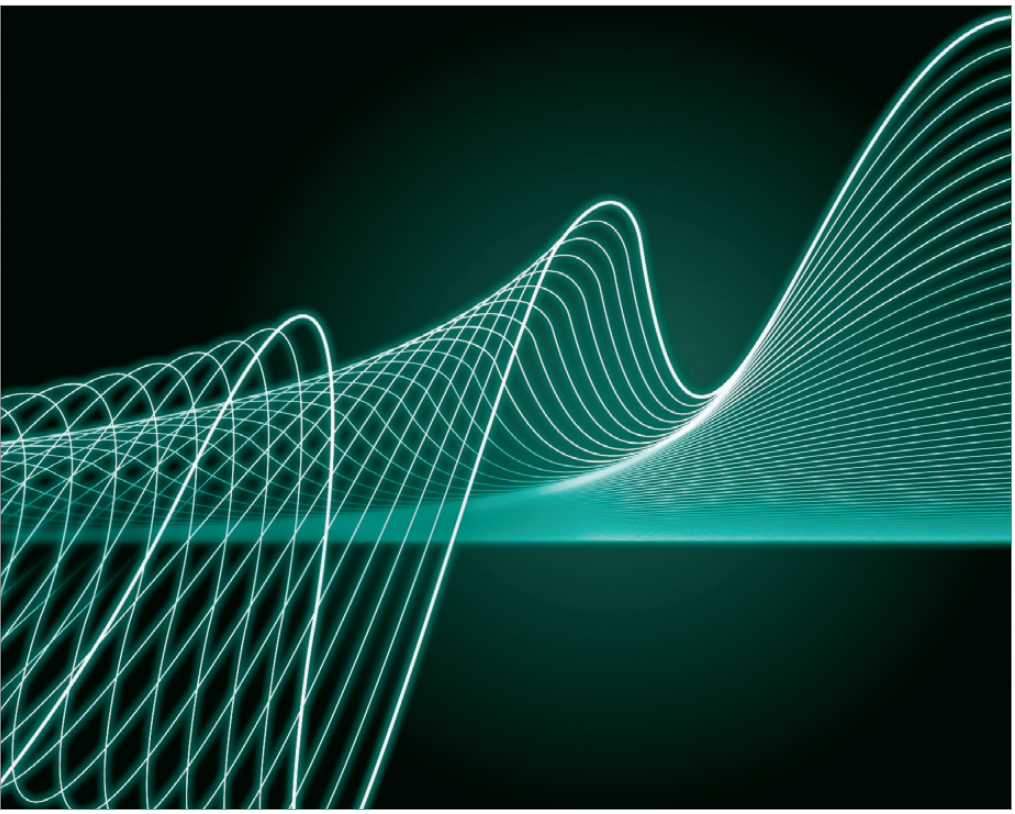


CFX384™ Real-Time PCR Detection System

BIO-RAD

The CFX384 System — Designed for the Way You Work

The CFX384 real-time PCR detection system builds on the power and flexibility of the C1000™ thermal cycler to create a high-throughput real-time PCR system that produces accurate, reliable data. With unsurpassed thermal cycler performance, an innovative optical design, and powerful yet intuitive software, the CFX384 real-time PCR detection system accelerates your real-time PCR research, shortening the time between getting started and obtaining great results.

With the CFX384 system you can:

- **Rely on performance** — system uses long-lasting solid-state technology with LEDs and photodiodes for precise quantitation and target discrimination
- **Conserve your samples and reagents** — 4-target multiplex experiments yield optimal results, using sample volumes as low as 3 µl
- **Analyze results when and where you want** — email notification with an attached data file can be sent when a run is finished
- **Save research time** — well-grouping software feature provides the flexibility to analyze multiple experiments from a single plate
- **Configure the system to fit your laboratory needs** — run a stand-alone system without a computer, up to 4 instruments from 1 computer, or integrated with the CFX automation system for higher throughput

Bio-Rad's PCR instruments, reagents, plastics, and software are powerful building blocks for your genomic research, providing the flexibility and reliability you need to accelerate discovery.

Reagents That Provide Optimal Performance

Bio-Rad reagents demonstrate best-of-class performance over a wide dynamic range of input RNA, cDNA, and genomic DNA. The broad mix of reverse transcription kits and supermixes for qPCR delivers maximum sensitivity and consistent results every time.

Don't Worry About Your Consumables

Bio-Rad's plastic consumables have been validated to deliver reliable, reproducible results, leaving you less to worry about.

Software Solutions

Bio-Rad offers a complete line of software products to accelerate your research. Precision Melt Analysis™ software is a powerful tool to genotype DNA samples based on the thermal denaturation properties of double-stranded DNA. Biogazelle's qbase^{PLUS} software makes higher throughput gene expression analysis accessible to every researcher. Identify the role of target genes in specific cellular processes or signaling pathways using a combination of tools from Bio-Rad.

System Configurations

Stand-alone

CFX96 or CFX384

Stand-alone multi-instrument

S1000

Software-controlled

PC

Software-controlled multi-instrument

CFX Automation System

The CFX384 real-time PCR detection system offers multiple control configurations so it can be easily integrated into your laboratory settings. The CFX384 system can be quickly installed, fitting on any lab bench; it is significantly smaller than other 384-well real-time PCR instruments. Its factory-calibrated optics let you get great results right away.

Stand-Alone

Perform real-time PCR runs on a CFX384 system in stand-alone mode, without the system being attached to a computer. Create a real-time PCR protocol using the C1000 control panel, or transfer a protocol previously created in CFX Manager™ software using a USB flash drive. Choose a data acquisition mode and start an experiment — there is no need to worry about the plate setup because data are acquired from all the wells. When a run is finished, export the data using a USB flash drive, or directly email the data from the C1000 chassis. Data are stored on the instrument during a run, regardless of the setup, so you always have built-in data backup.

Expanding Your Throughput

The flexibility of the 1000-series thermal cycling platform allows you to adjust your setup as your needs change. Adding more instruments to increase throughput or expand options is as easy as connecting a USB cable. CFX Manager software can independently run four instruments, including a combination of CFX96™ and CFX384 real-time PCR detection systems and C1000 or S1000™ thermal cyclers. Maximize laboratory throughput by integrating one CFX384 system with a CFX automation system for hands-free loading and unloading of up to 20 plates, letting you process up to 7,680 samples in a single run of 20 384-well plates.

Integrated for Optimal Results

Reliable and reproducible real-time PCR assays require an instrument with validated optical performance. The CFX384 system has unique features which ensure precise assay results, so that you can confidently make comparisons between data sets:

- Internal qualification before every scan to ensure the optics shuttle is homed with micron accuracy
- Internal reference spots, which the system reads to measure the consistency and accuracy of every scan
- System test software to qualify instrument performance
- Installation and operational qualification (IQ/OQ)

Uniform Thermal Cycling

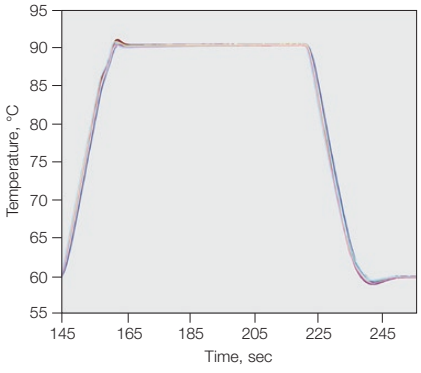
The CFX384 real-time PCR detection system brings flexibility and simplicity to researchers performing high-throughput real-time PCR in a 384-well format, with up to four-target detection and powerful data analysis. With the precise thermal control of the C1000 thermal cycler, the CFX384 system delivers sensitive, reliable detection for real-time PCR applications, including absolute quantitation, genetic variation analysis, and gene expression.

Superior Uniformity

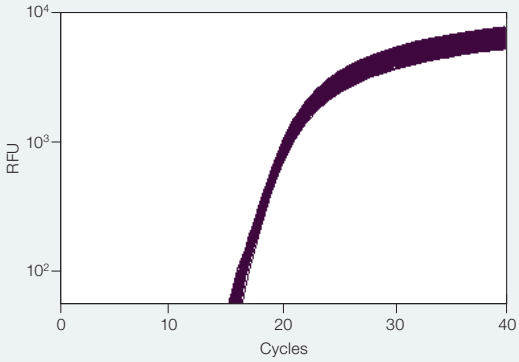
The rate and efficiency of PCR critically depend on the precision of the temperature steps. To obtain reliable, consistent results, all sample wells must maintain proper temperature throughout each step. The CFX384 system maintains tight temperature uniformity at all points during a run — even while ramping. Its fast and accurate thermal control ensures all wells reach temperature uniformity within 10 seconds of arrival to produce accurate quantitative results with shortened temperature steps.

Thermal Gradient for Easy Optimization

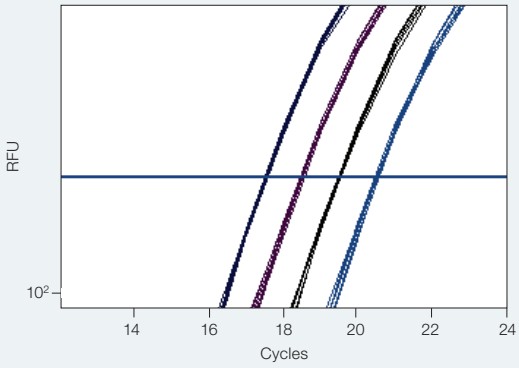
With the CFX384 system's thermal gradient feature, you can determine the optimal temperature for primer annealing in a single experiment, minimizing the use of precious samples and reagents and saving valuable research time. You can program a temperature gradient of up to 24˚C across the reaction block, with exceptional temperature uniformity and reproducibility within each gradient zone.



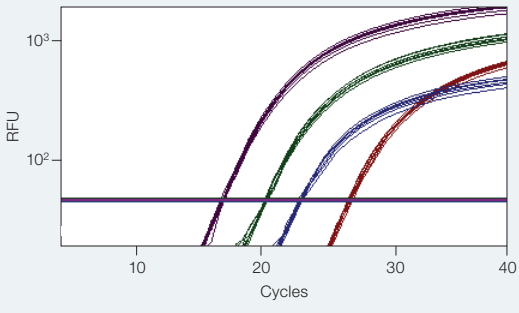
Rapid arrival at target temperature and superior uniformity. 1000-series thermal cyclers exhibit high average ramp rates, rapid settling time, and tight thermal uniformity throughout the ramp. This graph shows the temperature measured by probes in 12 wells across a sample block. The traces are nearly indistinguishable due to the tight uniformity.



Excellent uniformity. IL-1β plasmid template diluted to 10^5 copies per reaction amplified in the presence of a FAM-labeled detection probe with iQ™ supermix. Graph shows 384 replicates of 5 µl reactions. Average threshold cycle (C_T) = 18.11 ± 0.045. RFU, relative fluorescence units.



Precise target discrimination. One-cycle spacing between C_T values is precisely maintained in a series of twofold dilutions of human genomic DNA from 120 to 15 ng. IL-1β target was amplified using a FAM-labeled detection probe with iQ supermix. Graph shows eight replicates for each dilution with the following average C_T values: 17.47 ± 0.02, 18.44 ± 0.03, 19.43 ± 0.02, 20.44 ± 0.03. RFU, relative fluorescence units.



Accurate multiplex gene expression at low volumes. Human spleen RNA was transcribed into cDNA using the iScript™ cDNA synthesis kit. cDNA (50 ng) was amplified in four replicate 3 µl reactions using four reporter dyes to monitor fluorescence data from four targets: ■, FAM/actin; ■, Cy5/tubulin; ■, HEX/*GAPDH*; ■, Texas Red/IL2. RFU, relative fluorescence units.

Innovative Optical Design

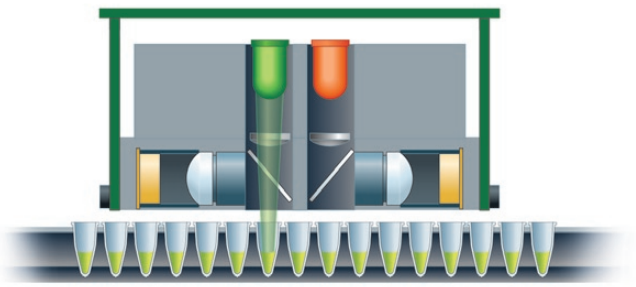
The CFX384 system's solid-state optical detection technology provides sensitive detection for precise quantitation and target discrimination. Scanning just above the sample plate, the optics shuttle individually illuminates and detects fluorescence from each well with high sensitivity and no cross talk.

Four-Target Multiplexing

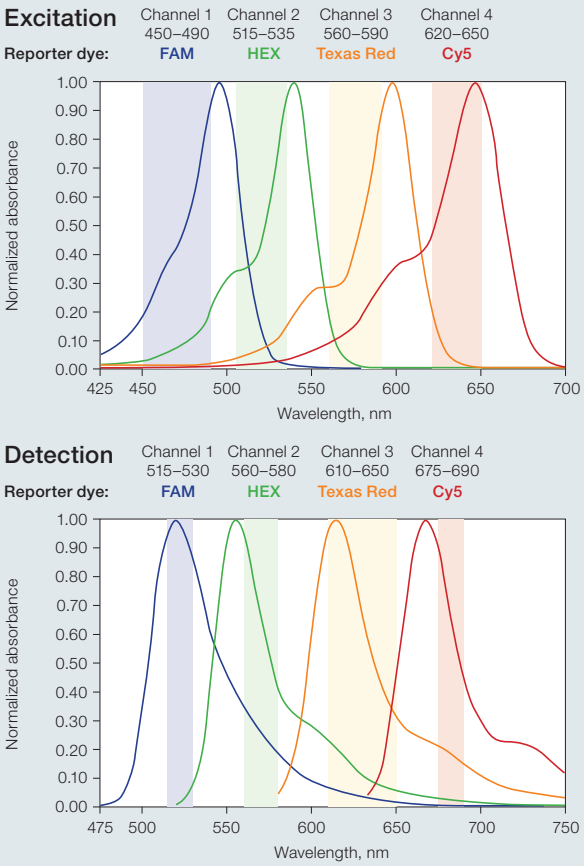
The CFX384 system can discriminate up to four targets in a single reaction well. The optical filter sets are designed to maximize fluorescence detection for specific dyes in specific channels. At every position and with every scan the optics shuttle is reproducibly centered above each well, so the light path is always fixed and optimal and there is no need to sacrifice data collection in one of the channels to normalize to a passive reference.

Multiple Data Acquisition Modes

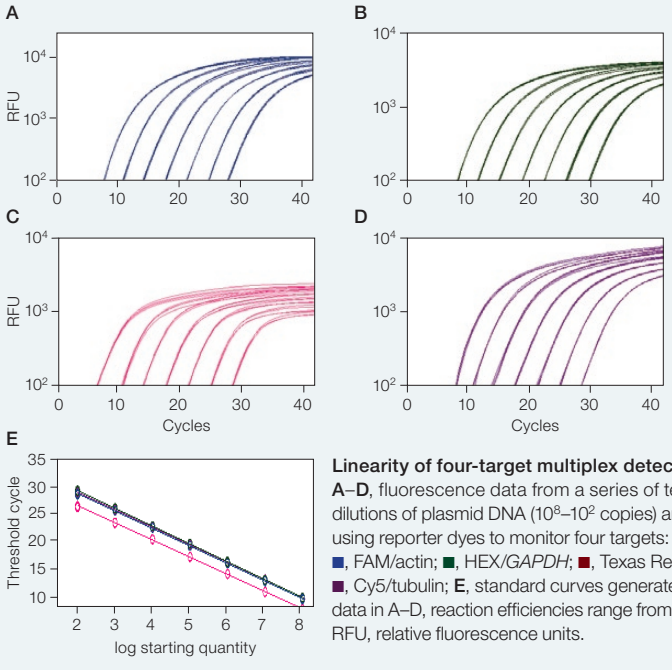
The CFX384 system can acquire data using several modes. Choose to acquire data for SYBR® Green I and single-color FAM protocols using the fast scan mode, or choose to acquire data from all channels when performing multiplex protocols. The CFX384 system's optics shuttle includes one channel with an LED-filter photodiode combination designated for single-color fluorescence resonance energy transfer (FRET) experiments, further expanding your experimental options.



As the CFX384 optics shuttle travels across the plate, light is focused directly into the center of each sample well. Side view of the optics shuttle shows the green LED firing over a well.



Excitation and detection wavelength ranges for the CFX384 system.



Linearity of four-target multiplex detection. **A**–**D**, fluorescence data from a series of tenfold dilutions of plasmid DNA (10^8–10^2 copies) amplified using reporter dyes to monitor four targets: ■, FAM/actin; ■, HEX/*GAPDH*; ■, Texas Red/cyclophilin; ■, Cy5/tubulin; **E**, standard curves generated from data in A–D, reaction efficiencies range from 98–103%. RFU, relative fluorescence units.

Powerful Software

CFX Manager software, which runs on a PC, is powerful software for a powerful instrument, providing the tools to seamlessly manage all your samples, from experiment setup to data analysis.

Getting Started

CFX Manager software provides numerous features and tools to streamline experiment setup, making it easy to get started and to get great real-time PCR results. The user-customizable Plate Editor is designed to handle large sample throughput. With intuitive controls to load well information, a zoom-in feature, and the ability to import/export well information from spreadsheets, tracking your samples is easy. Furthermore, you can enter or edit well information on your own schedule — before, during, or after a run.

Getting Answers

CFX Manager software can send an email notification with an attached data file when a run is finished, so you can analyze your results when and where you want.

The software provides customizable data analysis settings and display options, including color coding of fluorescence traces and a unique well-highlighting feature that facilitates tracking of individual well results. In addition, a well-grouping feature is available for analyzing multiple experiments from a single plate.

Take your results a step further without having to export data or set up your own analysis macro. Perform gene expression analysis by relative quantity (ΔC_T) or normalized expression ($\Delta\Delta C_T$) using multiple reference genes and individual reaction efficiencies. If you are performing a comprehensive study with multiple experiments, you can use CFX Manager software to combine and analyze all the results together.

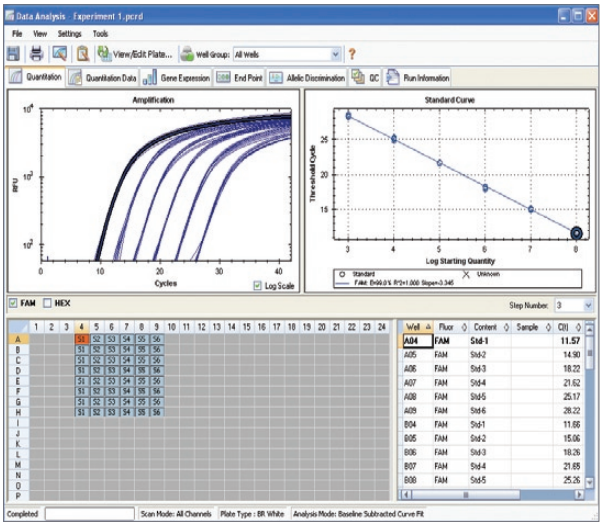
The Security You Need

CFX Manager software, Security Edition integrates the power of the CFX384 real-time PCR detection system with good laboratory practice standards for data collection and analysis. The Security Edition offers all the features of CFX Manager software, plus important tools for compliance with U.S. FDA 21 CFR Part 11 regulations.

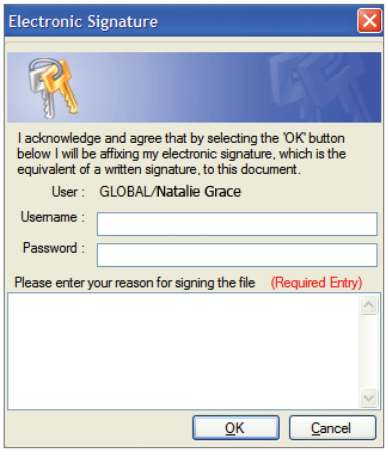
CFX Manager software, Security Edition works with the security features of both the Windows XP and Windows Vista operating systems to provide a secure environment for maintenance, verification, and tracking of the electronic records generated by the software.

CFX Manager software, Security Edition includes:

- Mandatory password-protected log-in
- File encryption with automatic integrity checking
- Ability to apply multiple electronic signatures to software-generated files
- Time- and date-stamped audit trails



CFX Manager software data analysis module.



Electronic signature window.

Software Solutions

Precision Melt Analysis Software

Precision Melt Analysis software is a convenient, easy-to-use application that imports and analyzes data files generated from the CFX96 or CFX384 real-time PCR detection system to genotype samples based on the thermal denaturation properties of double-stranded DNA. The software can be used for a variety of genotyping applications, including scanning for new gene variants, screening DNA samples for SNPs, identifying insertions/deletions or other unknown mutations, and determining the percentage of methylated DNA in unknown samples.

Precision Melt Analysis software saves analysis time by assigning sample genotypes automatically based on cluster analysis, or manually using multiple data view options to tailor the software to the appropriate analysis. Difference curve plots of a sample fluorescence versus a selected control at each temperature transition provide a convenient visual aid to interpret the data.

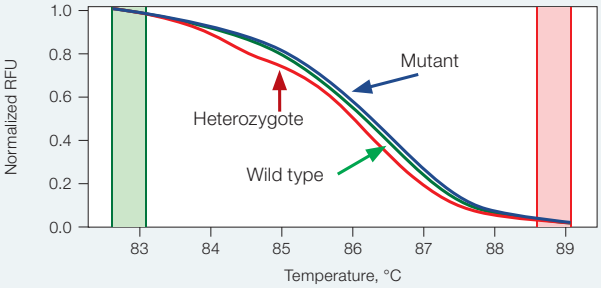
Precision Melt Analysis software enables data comparison between multiple file runs by combining data into a single Melt Study. Develop a standard library of melt curve runs to analyze an unlimited number of melt experiments without having to export data.

qbase^{PLUS} Software

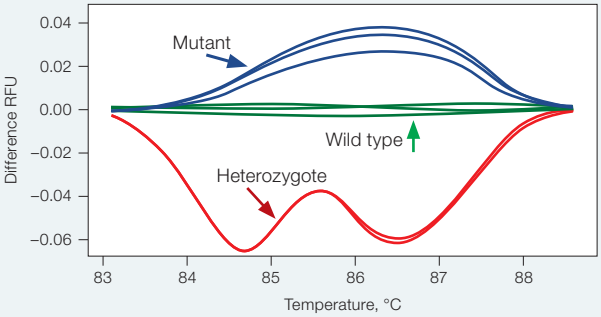
qbase^{PLUS} software is a powerful tool that imports and analyzes data generated from the CFX96 or CFX384 real-time PCR detection system. This platform-independent software package is available for major computer operating systems, such as Microsoft Windows, Macintosh, and Linux. qbase^{PLUS} accelerates real-time PCR data analysis and provides independent validation of gene expression results using proven, qualified algorithms.

Key benefits of qbase^{PLUS} software include:

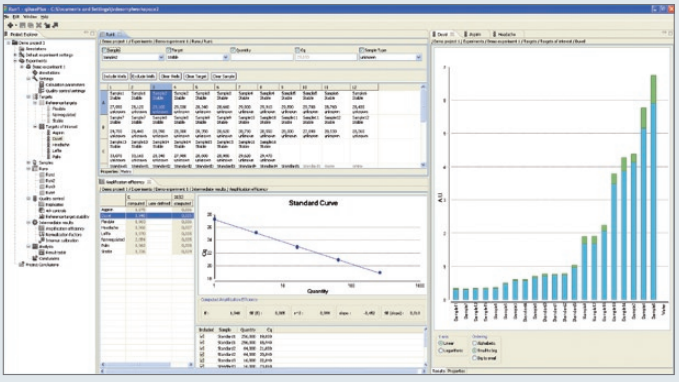
- Reliable validation — based on proven solutions for quality control, normalization, and inter-run calibration
- Easy-to-use program — intuitive navigation with automated calculations and error propagation
- Efficient analysis — fast calculations of results with direct import of instrument data; use the integrated data organizer to streamline managing results
- Flexible programming — intuitive to use for small experiments; powerful for big experiments



SNP genotyping by Precision Melt Analysis software using data generated by the CFX384 real-time PCR detection system. Discrimination of human hemochromatosis S65C SNP genotypes (A to T substitution). Data from homozygous wild type (■), mutant (■), and heterozygote (■) samples are shown on a normalized melt curve plot. RFU, relative fluorescence units.



A representative difference curve plot generated from data normalized to a mutant sample. Data from homozygous wild type (■), mutant (■), and heterozygote (■) samples are shown. RFU, relative fluorescence units.



Data analysis window in qbase^{PLUS} software.

Specifications

Thermal Cycler

Chassis	C1000
Maximum ramp rate	2.5°C/sec
Average ramp rate	2°C/sec
Heating and cooling method	Peltier
Lid	Heats up to 105°C
Temperature	
Range	0–100°C
Accuracy	±0.2°C of programmed target at 90°C
Uniformity	±0.4°C well-to-well within 10 sec of arrival at 90°C
Gradient	
Operational range	30–100°C
Programmable span	1–24°C

Optical Detection

Excitation	5 filtered LEDs
Detection	5 filtered photodiodes
Range of excitation/emission wavelengths	450–690 nm
Sensitivity	Detects 1 copy of target sequence in human genomic DNA
Dynamic range	10 orders of magnitude
Scan time	
All channels	<20 sec
Single channel fast scan	8 sec

CFX Manager Software

Operating systems	Windows XP, Windows Vista, Windows 7
Memory	Minimum 1 GB
Multiplex analysis	Up to 4 targets per well
Data analysis modes	PCR quantitation with standard curve
	Melt curve analysis
	Gene expression analysis by relative quantity (ΔC_T) or normalized expression ($\Delta\Delta C_T$) with multiple reference genes and individual reaction efficiencies
	Multiple file gene expression analysis for comparison of an unlimited number of C_T values
	Allelic discrimination
	End-point analysis
Data export	Save, copy, and print all graphs and spreadsheets from right-click menu
	Export results to Microsoft Excel
	Copy and paste directly into Microsoft Excel, Word, or PowerPoint files
	Customizable reports containing run settings, data graphs, and spreadsheets can be directly printed or saved as PDFs

System

Licensed for real-time PCR	Yes
Sample capacity	384 wells
Sample size	1–30 µl (5–20 µl recommended)
Communications	USB 2.0
Electrical approvals	IEC, CE
Dimensions (W x D x H)	33 x 46 x 36 cm (13 x 18 x 14")
Weight	21.4 kg (47 lb)

Ordering Information

Catalog #	Description
184-1000	**C1000 Thermal Cycler Chassis**, includes USB key, power cord; does not include reaction module
184-5384	**CFX384 Optical Reaction Module**, for use with C1000 thermal cycler chassis, includes CFX Manager software, license for qbase^{PLUS} software, communication cable, reagents, consumables
185-5384	**CFX384 Real-Time PCR Detection System**, includes C1000 thermal cycler chassis, CFX384 optical reaction module, CFX Manager software, license for qbase^{PLUS} software, communication cable, reagents, consumables
184-5001	**CFX Manager Software, Security Edition**, includes 1 user license, installation CD, HASP HL key
184-5025	**Precision Melt Analysis Software**, includes 2 user licenses, installation CD, 2 HASP HL keys, melt calibration kit
184-5008	**CFX Manager Software, Chinese Edition**, includes 3 user licenses, installation CD, 3 HASP HL keys
184-5028	**CFX Manager Software, Russian Edition**, includes 3 user licenses, installation CD, 3 HASP HL keys
184-5072	**CFX Automation System**, includes robotic plate handler, base tray, bar code scanner, CFX automation control software CD
172-5200	**SsoFast™ EvaGreen® Supermix**, 200 x 20 µl reactions, 2x mix contains dNTPs, Sso7d fusion polymerase, $MgCl_2$, EvaGreen dye, stabilizers
172-5230	**SsoFast Probes Supermix**, 200 x 20 µl reactions, 2x mix contains dNTPs, Sso7d fusion polymerase, $MgCl_2$, stabilizers
170-8891	**iScript cDNA Synthesis Kit**, 100 x 20 µl reactions, includes 5x iScript reaction mix, iScript reverse transcriptase, nuclease-free water
HSP-3805	**Hard-Shell® Thin-Wall 384-Well Skirted PCR Plates**, clear shell, white well, 50
MSB-1001	**Microseal® 'B' Adhesive Seals**, 100

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Web site *www.bio-rad.com* ***USA*** *800 424 6723* ***Australia*** *61 2 9914 2800* ***Austria*** *01 877 89 01* ***Belgium*** *09 385 55 11* ***Brazil*** *55 31 3689 6600* ***Canada*** *905 364 3435* ***China*** *86 20 8732 2339* ***Czech Republic*** *420 241 430 532* ***Denmark*** *44 52 10 00* ***Finland*** *09 804 22 00* ***France*** *01 47 95 69 65* ***Germany*** *089 31 884 0* ***Greece*** *30 210 777 4396* ***Hong Kong*** *852 2789 3300* ***Hungary*** *36 1 459 6100* ***India*** *91 124 4029300* ***Israel*** *03 963 6050* ***Italy*** *39 02 216091* ***Japan*** *03 6361 7000* ***Korea*** *82 2 3473 4460* ***Mexico*** *52 555 488 7670* ***The Netherlands*** *0318 540666* ***New Zealand*** *0508 805 500* ***Norway*** *23 38 41 30* ***Poland*** *48 22 331 99 99* ***Portugal*** *351 21 472 7700* ***Russia*** *7 495 721 14 04* ***Singapore*** *65 6415 3188* ***South Africa*** *27 861 246 723* ***Spain*** *34 91 590 5200* ***Sweden*** *08 555 12700* ***Switzerland*** *061 717 95 55* ***Taiwan*** *886 2 2578 7189* ***United Kingdom*** *020 8328 2000*