



# Applied lab-on-a-chip technology – the Agilent 2100 bioanalyzer

The Agilent 2100 bioanalyzer is the industry standard for RNA sample QC and has replaced labor-intensive gel electrophoresis for this application. It is also rapidly replacing gel electrophoresis for DNA fragment analysis and SDS-PAGE analysis of protein samples. A unique feature of the Agilent 2100 bioanalyzer is that it can be used for both electrophoretic separation and flow cytometric analysis of cell fluorescence parameters. This versatility makes the Agilent 2100 bioanalyzer an indispensable tool for the molecular biologist and biochemist.

Miniaturization of analytical instrumentation has many advantages over conventional techniques. These advantages include improved data precision and reproducibility, short analysis times, minimal sample consumption, improved automation and integration of complex workflows. Launched in 1999, the Agilent 2100 bioanalyzer was the first commercially available instrument to use microfluidics technology for the analysis of biological samples.

# Automated, fast analysis with excellent data quality for analytical biochemistry

# Advantages of the Agilent 2100 bioanalyzer:

- Ready-to-use assays and pre-packaged reagent kits
- Minimal sample consumption (1-4 µL) and results within 30 minutes
- Improved assay accuracy and precision
- Comparable results from lab to lab

- Digital data for convenient analysis, archiving and storage
- Various data-display options as gel view, electropherograms and tables
- Ease-of-use with simplified sample comparison
- Minimum exposure to hazardous materials
- Supports compliance with 21 CFR Part 11

## **Choose from two configurations:**

- Agilent 2100 bioanalyzer with exchangeable cartridges for electrophoresis and flow cytometry applications
- Agilent 2100 electrophoresis bioanalyzer with exchangeable cartridge for electrophoresis applications only

Both instrument configurations include:

- 1. Chip priming station
- 2. Chip vortexer
- Agilent 2100 expert software for instrument control and data analysis (expandable for full compliance support in regulated environments)
- **4.** Service and support on system and applications





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# A wide range of applications with a single compact system

A multi-purpose platform for streamlined workflows from disease and drug discovery and development to the QA/QC of biopharmaceuticals, the Agilent 2100 bioanalyzer is the most successful microfluidics-based platform for the analysis of proteins, DNA, RNA and cells. It is the industry's only platform with the ability to cover many steps in your workflow with a single compact system. As the first commercial, analytical instrument based on lab-on-a-chip technology, the Agilent 2100 bioanalyzer has proven to be a fast and easy alternative to messy and labor-intensive gel electrophoresis. It improves and shortens time-consuming techniques associated with agarose gels or SDS-PAGE with fast, automated, highquality digital data.



## 1. Fast and easy operation Add sample

- Ready-to-use reagent kits
- Quick-start instructions
- Chip preparation in less than five minutes
- Minimal use of hazardous chemicals and waste disposal
- Sample volumes in the µL range

## **Typical applications**

The Agilent 2100 bioanalyzer has been cited in over 4500 reference publications

- RNA sample QC prior microarray or qPCR experiments
- DNA Analysis of PCR/mPCR and RT-PCR products
- Protein expression analysis
- Protein purity during purification
- Cell-based analysis in gene silencing or apoptosis



## 2. Automation Start chip run

- Start analysis by simply pressing a single button
- Predefined methods
- System uses internal standards to calculate results
- Unattended analysis of up to 12 samples
- 1. The sample moves through the microchannels from the sample well.
- **2.** The sample is injected into the separation channel.
- **3.** Sample components are electrophoretically separated.
- Components are detected by their fluorescence and translated into gel-like images (bands) and electropherograms (peaks).



## 3. Digital data in 30 minutes Watch real-time data display

- · Automated data analysis
- Digital data can be shared with other applications or programs
- No user-dependent data interpretation
- RIN algorithm for RNA QC applications



# **RNA Series II kits**

## Fast quality control of RNA with minimal sample consumption

Do you need a standardized method to check the quality of your total RNA preparation after isolation? Are you confident about the quality of your mRNA or Cy5 labeled RNA? Agilent offers RNA assays that allow characterization of total or mRNA samples and estimation of their concentrations within minutes, with only a few nano- or picograms of sample.



- RNA Integrity Number (RIN) standardization of RNA quality control
- 1 µL sample consumption use as little as 50 pg of total RNA for analysis, saving most of your valuable preps
- RNase free uses RNase free reagents and chips to avoid sample degradation during analysis
- Clean minimal exposure to hazardous materials, such as ethidium bromide

## **Quality of RNA**

- Identify degradation of total RNA with RIN
- Identify degradation of mRNA
- Unparalleled sensitivity in the picogram range and minimal sample consumption



RNase degradation of RNA samples is a common reason for failed downstream experiments. The Agilent 2100 bioanalyzer provides RNA quality control results in both gel-like image as well as electrophoretic data making it easy to detect even small degradation effects. In addition an RNA Integrity Number (RIN) is provided for each total RNA sample allowing standardization.



# **DNA Series II kits**

## A smarter solution for nucleic acid analysis

DNA chips facilitate analysis of high-resolution multiplex PCR reactions, measuring precise size and concentration of each fragment. High sensitivity and a large linear dynamic range of the analysis enable detection of small impurities in PCR amplifications.

## Advantages of the DNA assays

- High sensitivity use laser (LIF) detection to detect DNA fragments down to 0.1 ng
- Broad linear dynamic range detect very weak bands next to very strong bands (more than two orders of magnitude)
- Excellent sizing and quantification unmatched accuracy and reproducibility with pre-packaged reagents, standardized assays and automated data analysis
- Clean minimal exposure to hazardous materials, such as ethidium bromide

## Choose from three kits (25–1000 bp; 100–7500 bp; 100–12000 bp)

**High resolution PCR fragment analysis** Ideally suited for:

- Analysis of small PCR products
- Multiplex PCR analysis
- Analysis of RT-PCR reactions
- · Restriction digests of plasmids
- Optimization of PCR reactions



For comparative PCR it is important to get good resolution over the entire size range of PCR products. When analyzing a mixture of different PCR products, the DNA 1000 kit outperforms traditional slab gels. In addition, accurate quantitative data is obtained, which allows discrimination of minute differences in the amplified amounts. Example: High resolution multiplex PCR of 13 targets (99–955 bp). Data kindly provided by QIAGEN GmbH, Hilden, Germany.

# **Protein Series II kits**

## The fast and reliable way to perform protein analysis

For expressing recombinant proteins, purifying proteins, performing stability studies or working with antibodies the Agilent 2100 bioanalyzer provides details on protein size, purity and concentration in one fast step.

## Reasons to switch from SDS-PAGE to the Agilent 2100 bioanalyzer

- Improved data reliability pre-packaged reagents and standardized assays yield highly reproducible data
- Faster results sizing and quantification of 10 samples in less than 45 minutes including sample preparation and data analysis
- Applicable for QC in regulated environments – IQ & OQ/PV services for hardware and software, declaration of conformity for consumables
- Minimal sample consumption only 4 µL of protein sample required per analysis
- No manual staining and destaining steps – all integrated into a single, automated step
- Quick and easy sample comparison

   one-click overlay, scaling or zooming features
- Clean minimal exposure to dyes or other hazardous materials

## Protein 80 and Protein 230 kits

### **Protein expression**

- Select clones based on protein
   expression
- · Identify overexpressed proteins
- Compare different expression
   patterns

### **Protein purification**

- Monitor the protein isolation and purification process
- Check fractions for impurities
- Quickly optimize purification protocols



### Protein QA/QC

- Monitor protein degradation and integrity preps
- Determine protein contaminations
- Analyze proteins under reducing and non-reducing conditions



Stress stability test to identify typical degradation and aggregation patterns for a polyclonal antibody under reducing conditions. The control sample shows only two peaks corresponding to the light and heavy chain of the antibody. After stressing the sample for 12 weeks at 40 °C additional peaks appear in the electropherogram. The Agilent 2100 bioanalyzer automatically determines the degree of degradation.

# **Cell Solutions Series II kits\***

\* Requires 2100 bioanalyzer - not available for 2100 e-bioanalyzer

# On-chip flow cytometry – an easy way to acquire cell-based fluorescence parameters

Whether you are doing transfection experiments for protein expression, studying apoptosis in cell cultures or looking to optimize your gene silencing experiments, the Agilent cell kit makes it easy to measure fluorescence parameters from individual cells.

## Advantages of the lab-on-a-chip approach

- Easy-to-use system short setup time and easy straightforward data analysis software makes flow cytometry accessible for everyone
- Analyze a broad range of cell parameters – endogenous fluorophores such as GFP, antibody staining, or apoptosis detection by Annexin V binding as well as Caspase-3 detection, live/dead cell dyes and much more
- Adapt or develop your own protocols – general application tools in the software allow you to adapt the system to your assay requirements or use predefined flow cytometric assays for easy startup
- Minimal sample consumption work with 10 µL cell suspension (20,000 down to 2,500 cells) – enables flow cytometry analysis of primary and other precious cells
- Automation simply load one to six samples onto a chip and start run
- On-chip staining procedure –
   speeds up workflow
- Analyze a large variety of cell samples – the system works equally well on most kinds of eukaryotic cells
- Single platform upgrade your Agilent 2100 bioanalyzer with the flow cytometry set for the automated analysis of cells, nucleic acids and proteins

## Transfection optimization

- Measure expression of green fluorescence protein (GFP) as reporter gene
- Transfection efficiency of Cy5
   labeled siRNA to optimize delivery
- Counterstain with live-cell dye
   in second reference color

## Measure cellular protein expression

- Apply antibody staining with direct labeled or secondary antibodies
- · Expression of cell surface proteins
- · Expression of intracellular proteins



## Apoptosis assays

- Measure apoptosis by Annexin V binding of live cells
- Apoptotic cells can also be detected by intracellular antibody staining of active caspase-3
- Detect DNA laddering (DNA assay)



Annexin V binds to phosphatidylserine (PS) – a membrane lipid that is kept to the inner leaflet of the cell membrane of intact cells. Exposure of PS to the outer leaflet is an early indicator of apoptotic processes. Annexin V binding is made detectable by Cy5 staining of the Annexin V via biotin-streptavidin interaction. Calcein staining of the cells is used as a live control to distinguish living and apoptotic cells from dead cells.

# Agilent 2100 expert software – get the most out of your digital data

## Powerful software for the analysis of RNA, DNA, proteins and cells

The Agilent 2100 expert software is the single solution specifically created for the bioanalyzer system. Built on the experience of several generations of bioanalyzer software it offers the flexibility of the integrated 2100 expert platform, with features carefully designed to help you get the most out of your digital data.

## Benefits at a glance

- Powerful data evaluation tools single platform for all available assays
- Unique RNA Integrity Number (RIN) algorithm for unbiased total RNA integrity assessment
- Ready for compliance support system validation services (IQ and OQ) and 21 CFR Part 11 compliance using the optional security pack
- Color-coded result flagging tool an easy-to-use, rule-defined system for automated result display
- Flexible results tables and graphics allow easy instrument control and support standard and advanced user modes
- Fast single click overlay, scaling and zooming features allow quick comparison of up to 48 samples within one chip or across multiple chips
- Multiple exportable data formats allow flexible data exchange
- Free data-review software enables offline evaluation and sharing
- Efficient integrated diagnostic tools minimize system downtime
- Improved smear analysis for RNA, DNA and protein samples
- Native XML file format for seamless data integration across platforms and projects



Various graphical views, such as the gel-like format shown here, are supported by tables of additional information and facilitate easy analysis of results.



The comparison context now offers to line up to 48 gel lanes visible as a single gel for convenient comparison of samples from various chip runs.

# Agilent 2100 expert software – feel safe in regulated environments

## Agilent supports your validation process from start to finish

For scientists working in regulated environments, the Agilent 2100 expert software supports software and hardware IQ and OQ/PV in a dedicated validation context.

## Paving the way for compliance

Biopharmaceutical companies bear the extra costs and workload associated with quality control and regulatory compliance. For companies to achieve compliance, laboratory and production procedures have to be standardized and reproducible, while meeting good laboratory practice (GLP) and good manufacturing practice (GMP). Agilent helps to ensure consumer safety while minimizing the impact on biopharmaceutical companies with the Agilent 2100 bioanalyzer for standardized, reliable quality control. Agilent supports the validation process with DQ documentation and IQ and 00/PV tools and services. The security pack software for the Agilent 2100 bioanalyzer supports all 21 CFR Part 11 requirements. This includes the handling of electronic records, data security, data integrity and audit traceability. The Agilent 2100 expert software is a prerequisite for the Agilent 2100 expert security pack functionality.





## **Design Qualification (DQ)**

DQ defines the functional and operational specifications of the 2100 bioanalyzer system and ensures that it has all the necessary functions and performance criteria. Documents provided for the 2100 bioanalyzer system include:

- Declaration of system validation
- Declaration of conformity for instrument to manufacturing specification
- Declaration of conformity for instrument according to ISO/IEC Guide 22 and CEN/CENELEC EN 45014
- Declaration of conformity for chips and reagents

## Installation Qualification (IQ)

IQ ensures that the Agilent 2100 bioanalyzer instrument and the 2100 expert software are installed correctly upon delivery.

### **Operational Qualification (OQ)**

OQ is the process of demonstrating that an instrument will function according to its operational specifications in the selected environment.

### **Performance Qualification (PQ)**

Customers are responsible for the PQ which demonstrates that the 2100 bioanalyzer performs according to a specification appropriate for its routine use and produces reliable, consistent and accurate data.

"I believe Agilent provides the most complete range of compliance and validation services in the world. It offers global, multi-vendor, multi-product packages that let you make one call for virtually all your compliance needs."

# Support – 24-hour instrument repair, extended system warranty, application consulting and compliance services

## Hardware and software support services

All Agilent 2100 bioanalyzer system components carry a one-year factory warranty. The Agilent 2100 bioanalyzer instrument is covered by the premium repair service of either 24-hour instrument express exchange or return for repair with loan instrument. This significantly reduces the instrument downtime. The premium warranty service can be extended in the following ways to ensure maximum uptime.

- One-year or multi-year warranty extensions for all major Agilent 2100 bioanalyzer system components including, PC, printer, software and express exchange for the instrument. In addition, this warranty extension provides an annual system PM (Preventive Maintenance) service
- One-year or multi-year express exchange warranty extension for the Agilent 2100 bioanalyzer instrument, with the option of including the Agilent bundle PC and printer
- One-year or multi-year software warranty extension, comprising unlimited feature support, automated, free-of-charge software updates and software status bulletins

## **Assay support services**

Two on-site assay related support services are available:

- Start-up services to familiarize the new user with the hardware, software and an application of choice
- Operational services including trouble-shooting for applicationrelated problems and user training for a kit of your choice. Running customer samples is included in this training

## **Compliance services**

For all current Agilent 2100 bioanalyzer instrument bundles\*, Agilent offers complete system (IQ) Installation Qualification and (OQ) Operational Qualification services. The Agilent 2100 bioanalyzer IQ and OQ services are exclusively provided by specially trained and certified Agilent service personnel. The complete suite of compliance services comprises qualifying multiple assays, cartridges and instruments.



Agilent 2100 bioanalyzer

One platform – endless possibilities for DNA, RNA, protein and cell analysis

# Specifications for Series II kits: RNA, DNA, protein, cell fluorescence



Analytical Specifications	Agilent RNA 6000 Nano Total RNA Assay	Agilent RNA 6000 Nano mRNA Assay	Agilent RNA 6000 Pico Total RNA Assay	Agilent RNA 6000 Pico mRNA Assay
Quantitative range	25–500 ng/μL	25–250 ng/μL	-	-
Qualitative range	5–500 ng/µL	25–250 ng/µL	50–5000 pg/μL (in water)	250–5000 pg/µL (in water)
			(Signal/Noise>3)	(Signal/Noise>3)
Quantitation accuracy	20 % CV (for ladder as sample)	20 % CV (for ladder as sample)	30 % CV (for ladder as sample)	30 % CV (for ladder as sample)
Buffer compatibility*	100 mM Tris or 125 mM NaCl	100 mM Tris or 125 mM NaCl	50 mM Tris or 50 mM NaCl	50 mM Tris or 50 mM NaCl
	or 15 mM MgCl <sub>2</sub>	or 15 mM MgCl <sub>2</sub>		
Reproducibility of quantitation 10 % CV         10 % CV         20 % CV         20 % CV			20 % CV	
* Due to the high sensitivity of the assay, different ions and higher salt concentrations might influence the performance of the assay.				
Divising Sensitivations				

Filysical opecifications				
Analysis run time	30 minutes	30 minutes	30 minutes	30 minutes
Number of samples	12 samples/chip	12 samples/chip	11 samples/chip	11 samples/chip
Sample volume	1 µL	1 µL	1 μL	1 µL
Kit stability	4 months	4 months	4 months	4 months
	(Storage temperature see individual box)			

Analytical Specifications	Agilent DNA 1000 Assay	Agilent DNA 7500 Assay	Agilent DNA 12000 Assay
Sizing range	25–1000 bp	100–7500 bp	100–12000 bp
Typical sizing resolution	± 5 bp 25-100 bp	± 5 % 100-1000 bp	± 5 % 100-1000 bp
	± 5 % 100-500 bp	± 15 % 1000-7500 bp	± 15 % 1000-12000 bp
	± 10 % 500-1000 bp		
Sizing accuracy	$\pm$ 10 %* (for ladder as sample)	± 10 % (for ladder as sample)	± 15 % (for ladder as sample)
Sizing reproducability	5 % CV (for ladder as sample)	5 % CV (for ladder as sample)	5 % CV (for ladder as sample)
Quantitation accuracy	20 %* CV (for ladder as sample)	20 % CV (for ladder as sample)	25 % CV (for ladder as sample)
Quantitation reproducibility	25-500 bp: 15 % CV; 500-1000 bp: 5 % CV	100-1000 bp: 10 % CV; 1000-7500 bp: 5 % CV	100-1000 bp: 15 % CV; 1000-12000 bp: 10 % CV
	(for ladder as sample)	(for ladder as sample)	(for ladder as sample)
Qualitative range	0.1–50 ng∕µL	0.5–50 ng/µL	0.5–50 ng/µL
Maximum salt	250 mM for KCl or NaCl, 15 mM for MgCl_ $_{\rm 2}$	250 mM for KCl or NaCl, 15 mM for MgCl <sub>2</sub>	250 mM for KCl or NaCl, 15 mM for $MgCl_2$

\* Some fragments below 70 bp may deviate from the above specifications.

Physical Specifications			
Analysis run time	35 minutes	30 minutes	30 minutes
Number of samples	12 samples/chip	12 samples/chip	12 samples/chip
Sample volume	1 μL	1 µL	1 μL
Kit stability	4 months (Storage temperature see individual box)	4 months (Storage temperature see individual box)	4 months (Storage temperature see individual box)

Analytical Specifications	Agilent Protein 80 Assay	Agilent Protein 230 Assay
Sizing range	5-80 kDa	14-230 kDa
Typical sizing resolution	10 %	10 %
Typical sizing accuracy	10 % CV (CAII, BLG)	10 % CV (BSA, CAII)
Sizing reproducibility	3 % CV (CAII, BLG)	3 % CV (BSA, CAII)
Sensitivity (Signal/Noise>3)	6 ng/µL CAII (15 ng/µL BSA) in PBS, 10 ng/µL (CAII)	6 ng/µL CAII (15 ng/µL BSA) in PBS 30 ng/µL (BSA)
	in 0.5 M NaCl (30ng/µL BSA in 0.5 M NaCl)	in 0.5 M NaCl
Quantitative range	60-2000 ng/µL CAII in PBS	15-2000 ng/µL CAII, 30-2000 ng/µL BSA in PBS
Qualitative range	6-4000 ng/μL CAII and BLG	6-5000 ng/µL CAII, 15-5000 ng/µL BSA in PBS
Quantitation reproducibility	20 % CV (CAII, BLG)	20 % CV (BSA, CAII)
Physical Specifications		
Analysis run time	30 minutes	25 minutes
Number of samples	10 samples/chip	10 samples/chip
Sample volume	4 μL	4 μL
Kit stability	4 months (Storage temperature see individual box)	4 months (Storage temperature see individual box)

CAII = Carbonic Anhydrase, BSA = Bovine Serum Albumin, BLG = beta-Lactoglobulin

Analysis run time	30 minutes
Number of samples	6
Sample volume	10 µL
Kit stability	4 months at 4 °C



# Agilent 2100 bioanalyzer

## **Instrument specifications**

Туре	Specification
Weight	10 kg (22 lbs)
Dimensions (height × width × depth)	290 × 162 × 412 mm (11.4 × 6.4 × 16.2 inches)
Line voltage	100 – 240 VAC
Line frequency	50 – 60 Hz
Power consumption	60 VA
Ambient operating temperature	5-40 °C, (41-104 °F)
Safety standards IEC, EN, CSA, UL	Installation Category II, Pollution Degree 2, Laser Class 1

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