

# QIAxcel<sup>®</sup> — Pure Excellence

## QIAxcel Advanced System

Designed to speed up  
your gel electrophoresis



# The QIAxcel Advanced System — for effortless DNA and RNA analysis

Accelerate your research with the QIAxcel Advanced System and perform DNA fragment analysis of 12 samples in as little as 3 minutes — without the need for tedious agarose gel preparation. The revolutionary QIAxcel Advanced System replaces traditional, labor-intensive gel analysis of DNA and RNA — streamlining your workflow and reducing time to result (Figures 5). The QIAxcel Advanced System fully automates sensitive, high-resolution capillary electrophoresis of up to 96 samples per run. Ready-to-run gel cartridges allow 96 samples to be analyzed with a minimum of hands-on interaction, reducing manual handling errors and eliminating the need for tedious gel preparation. User-friendly QIAxcel ScreenGel® Software ensures convenient analysis and documentation of data.



Figure 1. The QIAxcel Advanced System.



Figure 2. QIAxcel Advanced instrument and QIAxcel ScreenGel Software.



Figure 3. QIAxcel Kit.

## The QIAxcel Advanced System provides:

- Rapid analysis of up to 96 samples without manual intervention
- Safety and convenience with ready-to-use gel cartridges
- Robust results for nucleic acid concentrations as low as 0.1 ng/μl
- Standardized and accurate analysis with a resolution down to 3–5 bp
- User-friendly analysis software that supports 21 CFR part 11 compliance

## A ready-to-go solution for electrophoresis

Perform fully automated DNA and RNA analysis with ready-to-run gel cartridges, allowing maximum cost efficiency and time savings.

## The QIAxcel Advanced System includes:

- QIAxcel Advanced instrument
- QIAxcel ScreenGel Software
- Laptop
- Accessories

## QIAxcel Kits contain:

- Gel cartridge with 12 separation micro-channels with a built-in gel matrix
- Prepared buffers
- Protocol

Go to [www.qiagen.com/online-demo](http://www.qiagen.com/online-demo) to see the virtual demo!

## Taking ease of use to a new level

Just a few, simple steps are required to operate the QIAxcel Advanced System: load the gel cartridge of your choice, fill and load the buffer tray, load your samples in 96-well plates or in PCR tubes or strips, select the process profile to be used — and go! Tedious gel or chip preparation and extensive user training are eliminated, streamlining the workflow in your lab and facilitating integration of the system in your daily routine. Within minutes of starting a run, you can see the first results appearing in real time on the computer screen.

## Innovative technology and gel chemistry for a wide range of applications

The QIAxcel Advanced instrument includes an array of light-emitting diodes and micro-optical collectors that latch to capillaries within QIAxcel gel cartridges. Fragments that are migrating through a gel matrix within the capillary pass excitation and detection spots and the signal is transmitted through a photomultiplier tube to the QIAxcel ScreenGel Software for data interpretation (Figure 4).

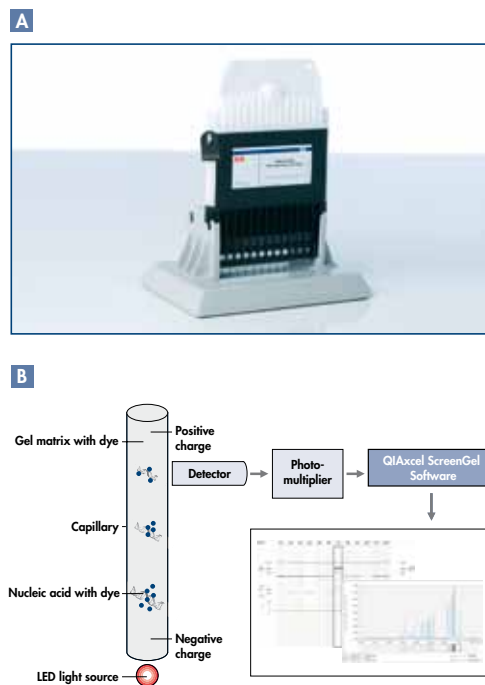
The high detection sensitivity provided by the QIAxcel Advanced instrument enables robust results, even with low concentrations of nucleic acid. With a resolution of 3–5 bp for fragments smaller than 500 bp, the QIAxcel Advanced System ensures greater accuracy than slab-gel methods, as well as greater confidence in data interpretation. Sample consumption is less than 0.1 µl per analysis, saving your precious sample for further downstream analysis.

A range of QIAxcel Kits is available for various applications, meeting different resolution and speed requirements (Table 1).

**Table 1. QIAxcel Kit specifications**

QIAxcel Kit	Analyte	Size range	Best resolution				Run time/ 12 samples†
			100 bp – 500 bp	500 bp – 1 kb	1 kb – 5 kb	5 kb – 10 kb	
QX DNA High Resolution Kit	DNA	15 bp – 10 kb	3 – 5 bp	50 bp	200 – 500 bp	1 – 1.5 kb	7 – 20 min
QX DNA Screening Kit	DNA	15 bp – 5 kb	20 – 50 bp	50 – 100 bp	500 bp	–	5 min
QX DNA Fast Analysis Kit	DNA	15 bp – 3 kb	50 – 100 bp	100 – 250 bp	250 bp – 1 kb*	–	3 – 5 min
QX RNA QC Kit v2.0	RNA	15 bp – 6 kb	–	–	–	–	10 min

\* Best resolution between 1 – 3 kb. † Run time depends on method used.



**Figure 4. A) QIAxcel gel cartridge. B) Capillary gel electrophoresis using the QIAxcel Advanced.** Nucleic acid molecules are size separated by applying a current to a gel-filled capillary, and detected as they migrate toward the positively charged terminus. The signal data pass through a photomultiplier and are converted to an electropherogram and gel image by the QIAxcel ScreenGel Software.

## Unmatched speed of analysis

In addition to superior resolution, the QIAxcel DNA High Resolution Kit ensures significant time savings compared to high-resolution agarose gels. The QIAxcel DNA Fast Analysis Kit is highly suitable for routine evaluation of fragments for qualitative single or multiplex PCR applications. The use of the gel cartridge for PCR screening streamlines the workflow by minimizing analysis time for fragments of 15 bp to 3 kb in size — 96 samples are processed in approximately 25 minutes. For routine evaluation of fragments for restriction endonuclease digestion, qualitative single or multiplex PCR, and other DNA applications, we offer the QIAxcel DNA Screening Kit. The use of gel cartridges for DNA screening streamlines the workflow by minimizing analysis time for fragments of 15 bp to 5 kb in size — 12 samples can be processed within 5 minutes.



## Exceptional safety and convenience

Overcome the bottlenecks of slab-gel electrophoresis and enjoy greater process safety and convenience with the QIAxcel Advanced System. Hands-free sample loading and self-contained components minimize exposure to hazardous chemicals such as ethidium bromide.

### Experience additional benefits such as:

- Reduced need for waste handling
- Software that supports 21 CFR part 11 compliance
- Minimal risk of error due to fewer manual steps
- Superior performance due to proven QIAGEN Quality®
- Reliability and higher sensitivity

## Bringing you peace of mind

QIAGEN offers unrivaled instrument support and assures continued success with your QIAxcel Advanced System. You benefit from comprehensive instrument service that fully covers costs for labor, travel, and repair parts during the warranty period. We also offer Warranty PLUS extended warranties, giving you complete cost control and enhanced coverage through priority response time.



## Streamline your workflow

The QIAxcel Advanced System not only speeds up your DNA and RNA analysis by eliminating slab-gel electrophoresis, but also contributes to streamlining your entire sample purification and analysis workflow (Figure 5). Used in combination with proven QIAGEN end-point PCR kits, the QIAxcel Advanced provides an all-in-one, pretested solution for reliable analysis of PCR fragments, ensuring reproducibility and significant time and cost savings.

**For an overview of QIAGEN's comprehensive solutions for PCR and RT-PCR, visit [www.qiagen.com/maximize-success](http://www.qiagen.com/maximize-success).**

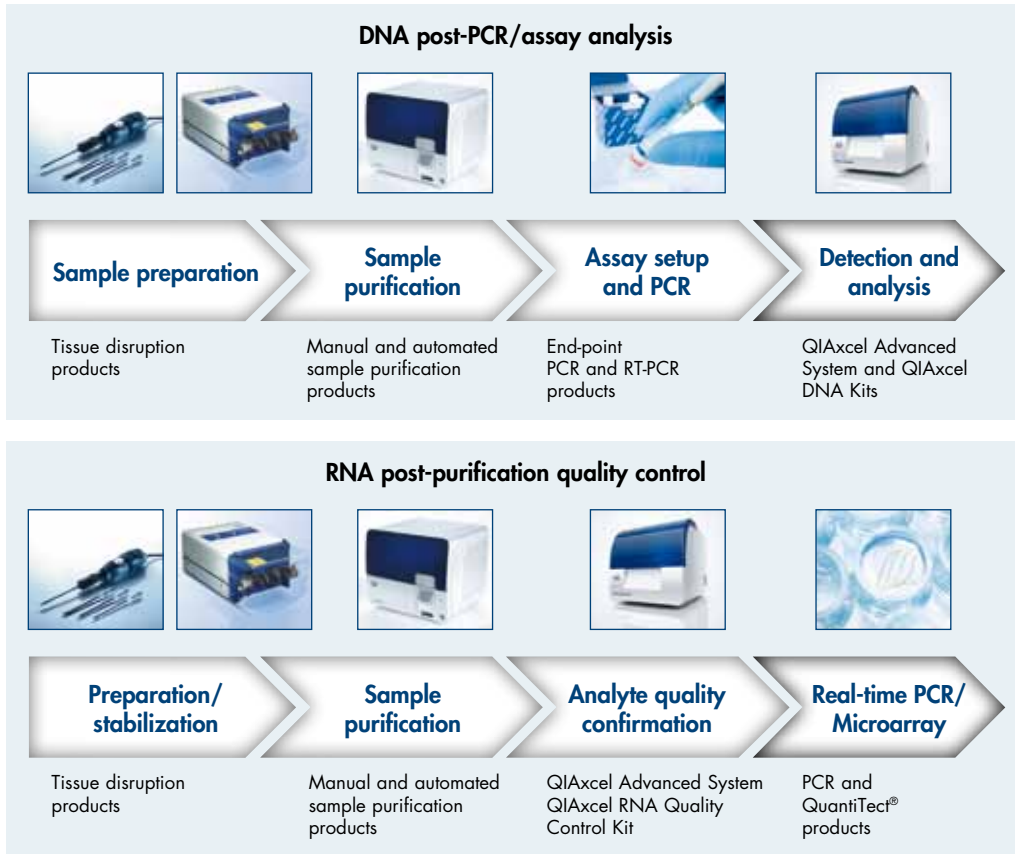
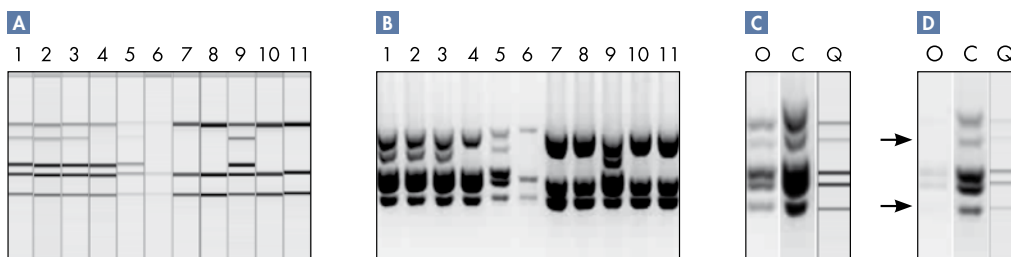


Figure 5. Streamline your workflow.

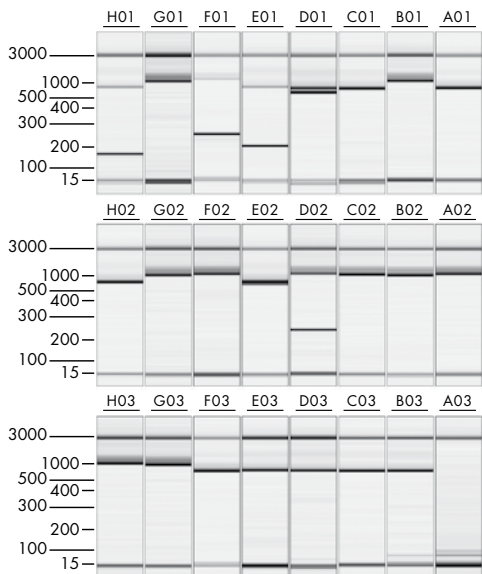
## Multiple DNA applications on the QIAxcel Advanced System

### Accurate, sensitive bacterial genotyping

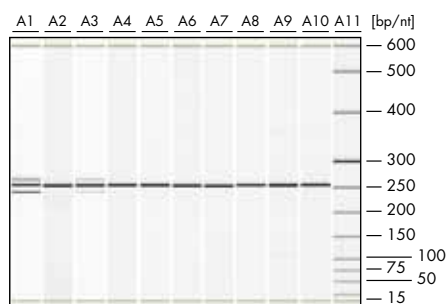
The QIAxcel Advanced System can be successfully used together with the QIAxcel DNA Screening Kit for high-throughput genotyping of bacteria. The QIAxcel Advanced System enables greater sizing accuracy and more sensitive detection than conventional agarose gel electrophoresis (Figure 6).



**Figure 6. False negative error calls due to weak amplicons when analyzing samples by agarose gel electrophoresis.** Samples were analyzed on either **A** the QIAxcel Advanced System at the original concentration or **B** by agarose gel electrophoresis with five-fold concentration. Samples 3 **C** and 5 **D** were analyzed by agarose gel electrophoresis at the original concentration (**O**), with five-fold concentration (**C**), and at the original concentration on the QIAxcel Advanced (**Q**). The arrows represent bands originally scored as negative. *Data kindly provided by Mutschall and coworkers, Laboratory for Foodborne Zoonoses, Public Health Agency of Canada, Lethbridge, Alberta, Canada.*



**Figure 7. Screenshot showing data from PCR fragment analysis.** PCR products from a standard PCR were directly analyzed using the QIAxcel DNA Fast Analysis Kit without prior purification.



**Figure 8. Detection of deletion mutations in EGFR exon 19.** Human EGFR exon 19 has an amplicon size of 250 bp. Lanes A1 and A3 are from samples with EGFR exon 19 deletions and have extra bands, while the remaining lanes are from wild-type EGFR.

**Figure 9. Sensitive detection of a mutated cancer-related gene.** DNA from a lymphoma-related cell line (Ramos) was spiked into human leukocyte DNA and the mutated Ramos target was detected along 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 Advanced System using the QIAxcel DNA High Resolution Kit.
- M:** 100 bp ladder.

### Fast PCR fragment analysis for typing purposes

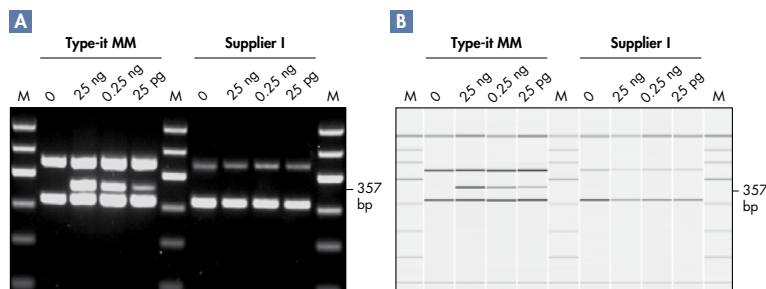
The QIAxcel DNA Fast Analysis Kit is highly suited for routine evaluation of DNA fragments in qualitative single or multiplex PCR applications (Figure 7). The use of the QIAxcel DNA Fast Analysis cartridge for PCR screening streamlines the workflow in your lab by minimizing analysis time for fragments of 15 bp to 3 kb in size – 96 samples are processed in approximately 25 minutes.

### Pre-sequencing testing: Deletion/insertion analysis

QIAxcel Advanced is highly suitable for pre-screening of amplicons prior to Sanger sequencing or Pyrosequencing®. For example, in analysis of the EGFR gene (exon 19), QIAxcel Advanced showed high accuracy in identifying wild-type and mutated DNA fragments based on size estimation. Human EGFR exon 19 has an amplicon size of approximately 250 bp. Where deletions had occurred, extra bands were observed in the gel images (Figure 8).

### Sensitive detection of genetic mutations using a combination of multiplex PCR and capillary gel electrophoresis

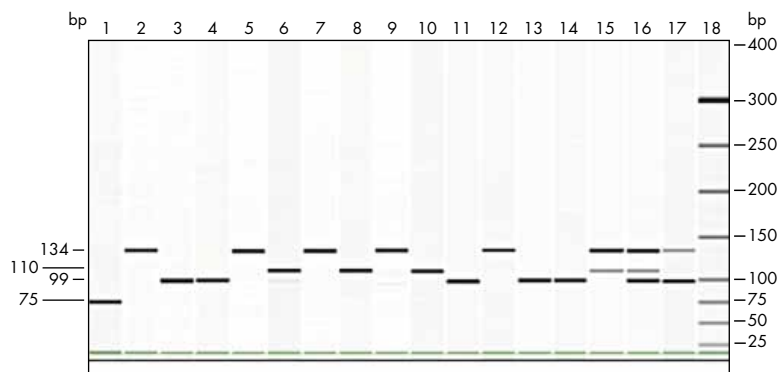
Mutation analysis is performed in several research areas including detection and analysis of genetic differences, typing of disease loci, and investigating relationship and paternity patterns. Reliable multiplex PCR assays are essential and require specific and sensitive co-amplification, even of low-abundance targets or targets with high GC content and secondary structures. However, establishing sensitive multiplex PCR assays can be challenging, often requiring lengthy optimization of experimental parameters and yielding irreproducible results. The Type-it® Mutation Detect PCR Kit and the QIAxcel Advanced provide a rapid and straightforward, standardized procedure for multiplex analysis of mutations (Figure 9).



## Identification of allergenic nut species

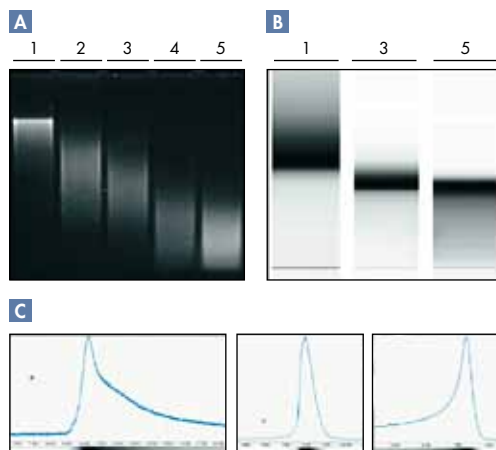
For the benefit of consumers who are allergic to certain food ingredients, current EU regulations require labeling disclosure of the presence of any of 14 major allergens if used as ingredients in prepacked foods. Singleplex and multiplex PCR assays have been developed to detect and identify DNA originating from allergenic nut materials in processed foods. The QIAxcel Advanced instrument can be easily integrated as part of an allergen-detection workflow that applies PCR-based technologies. The system provides rapid, reliable, and inexpensive identification of nut species (Figure 10).

**Figure 10. Successful use of the QIAxcel Advanced System for DNA fragment analysis.** DNA fragments from macadamia, peanut, hazelnut, and almond are clearly visible. **Lane 1:** Macadamia (75 bp); **lanes 3, 4, 11, 13, 14, 16, and 17:** peanut (99 bp); **lanes 6, 8, 10, 15 and 16:** hazelnut (110 bp); **lanes 2, 5, 7, 9, 12, 15, 16, and 17:** almond (134 bp); **lane 18:** QX DNA Size Marker 25–500 bp.



## Quality control of genomic DNA

The results of numerous molecular screening and assay methods rely on the quality of the genomic DNA (gDNA) that is used. The sizes of purified gDNA fragments fall between 20 and 30 kb when spin columns with silica-based membranes are used, and can be up to 100 kb or more when salting-out precipitation is applied. Using the QIAxcel Advanced System, quality control is possible for all gDNA that has been purified with silica membrane-based methods. It offers a straightforward and effective means for checking the quality of all samples purified with kits that use this approach (Figure 11).



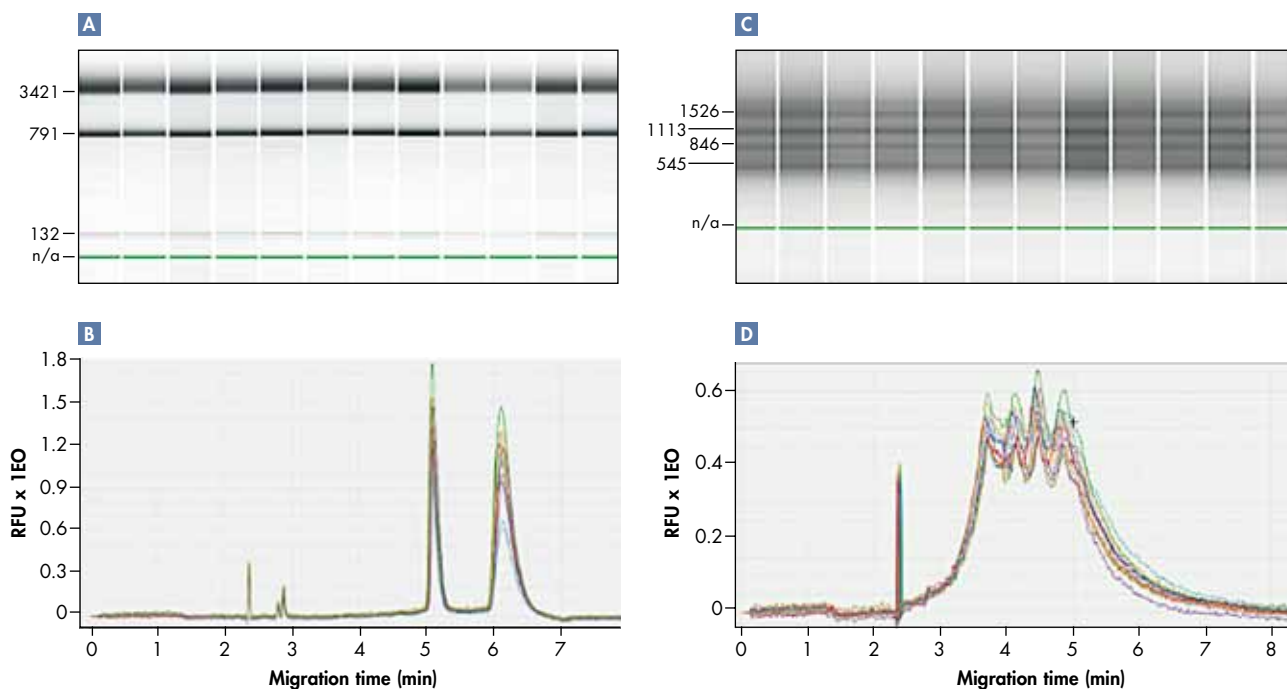
**Figure 11. Assessment of DNA degraded by sonication.**

**A** Agarose gel photo showing gDNA in various states of degradation. **Lane 1:** Non-degraded gDNA samples; **lanes 2 and 3:** gDNA samples partially degraded by sonication with 7 and 14 pulses, respectively; **lanes 4 and 5:** gDNA samples fully degraded with 70 and 105 pulses, respectively. **B** QIAxcel gel photo showing gDNA samples in three states of degradation. 1, 3, and 5 correspond to lanes 1, 3, and 5 in **A**. **C** Electropherograms and a gel photo of gDNA samples from lanes 1, 3, and 5 in **A**. **Lane 1:** Electropherogram indicates very good quality gDNA (no degradation products before the major peak, long tailing off); **lane 3:** partially degraded gDNA (some degradation product signals, no tailing off); **lane 5:** highly degraded gDNA (many degradation product signals, no tailing off).

## RNA quality control for reliable downstream analysis

### Quality control of total RNA and cRNA for microarray analysis

During microarray analysis, monitoring the integrity of the initial total RNA sample as well as products generated throughout the entire procedure is crucial, since RNA degradation strongly influences the predictive power obtained from the microarray data. The QIAxcel Advanced System is highly suitable for analyzing the integrity of total RNA and size distribution of fragmented or intact cRNA. The data shown below illustrate the benefits of using the QIAxcel Advanced System and the QIAxcel RNA QC Kit v2.0 for RNA quality control before microarray analysis (Figure 12).

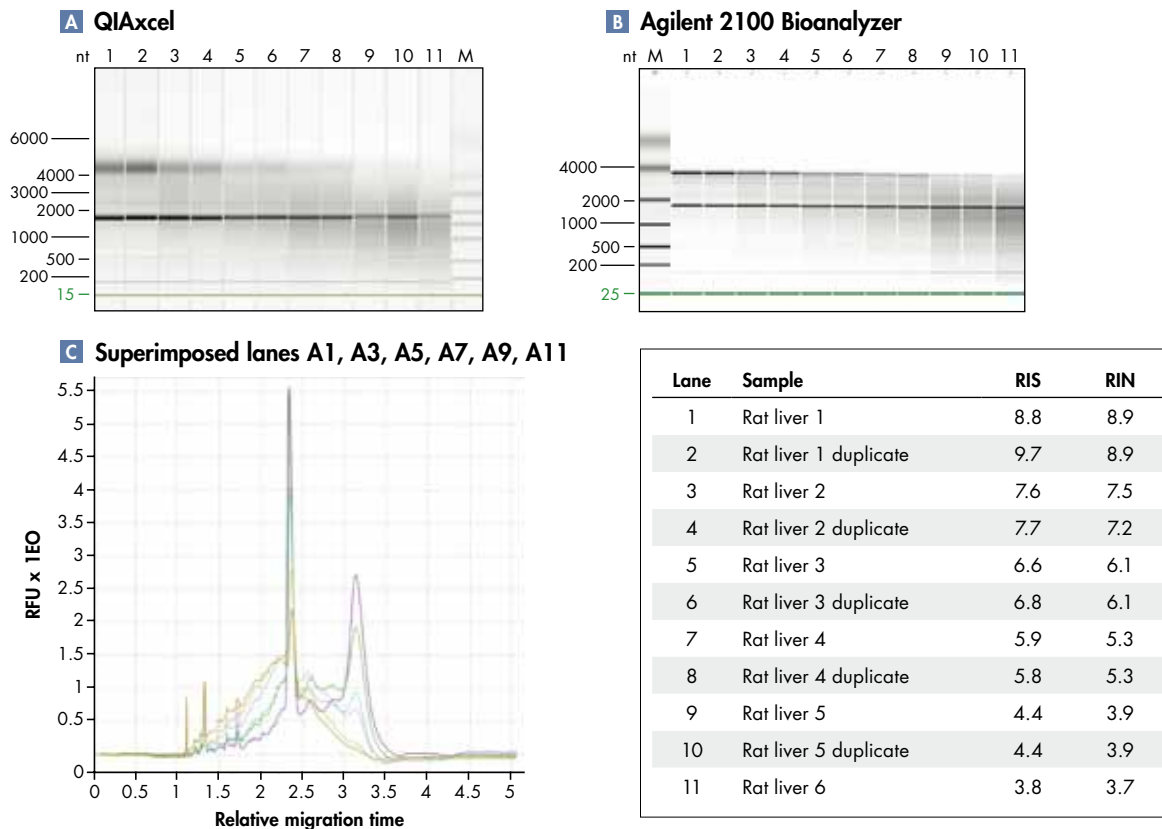


**Figure 12. Streamlined RNA analysis using the QIAxcel Advanced System.** Total RNA purified from *Schizosaccharomyces pombe*. Results presented as **A** a gel image and **B** a superimposed electropherogram view. Reliable quality control of unlabeled cRNA generated from yeast total RNA. Results presented as **C** a gel image and **D** a superimposed electropherogram view.

### Objective quality values — RNA Integrity Score

Implementing rigorous quality control at appropriate breakpoints across workflows enables researchers to eliminate samples that do not meet the quality criteria required for downstream processes, reducing the risk of needing to repeat experiments. Traditional methods, such as formaldehyde gel electrophoresis, show 2 distinct bands — the 28S and 18S ribosomal RNA (rRNA) — and possibly also smaller bands representing small RNA species. RNA is considered of high quality when the ratio between the 2 rRNA bands is  $>1.8$ . However, this approach relies on human interpretation and is highly operator dependent and may not be reproducible. The QIAGEN RNA Integrity Score (RIS) is a value from 1 to 10, where a value of 10 indicates completely intact RNA. The RIS enables researchers to determine RNA integrity by providing an objective measurement value (Figure 13).





**Figure 13. RIS indicates RNA integrity.** Total RNA was extracted from rat liver samples using the RNeasy® Plus Mini Kit and subjected to decomposing conditions. Samples of increasing levels of degradation were analyzed on the QIAxcel Advanced and the Agilent® 2100 Bioanalyzer platform. The results are depicted in the gel view pictures for the QIAxcel Advanced **A** and the Agilent Bioanalyzer **B**. The electropherogram of selected samples analyzed on the QIAxcel Advanced is shown in **C**. The RIS (QIAxcel Advanced) and RIN (Agilent Bioanalyzer) numbers are listed in the table.

## QIAxcel ScreenGel Software — a new level of convenience

The powerful QIAxcel ScreenGel Software was specifically developed for use with the QIAxcel Advanced System. Interactive tools simplify analysis, facilitate rapid data interpretation, and provide flexibility. Results can be viewed individually or as overlays for easy comparison in electropherogram or gel image formats. All-in-one analysis for multiple data sets simplifies evaluation. A unique algorithm calculates a variety of peak properties, including number of peaks and size, height, width, and area of each peak. Comprehensive data reports are easily generated and saved or exported to meet individual documentation needs. Process profiles standardize sample processing and minimize the need for additional user training.

### Benefits of QIAxcel ScreenGel Software:

- User management options prevent unauthorized access
- Guided run setup and convenient analysis
- Intuitive use with drag-and-drop navigation
- Effortless, customized documentation of results saves time
- Electronic data documentation supporting 21 CFR part 11 compliance

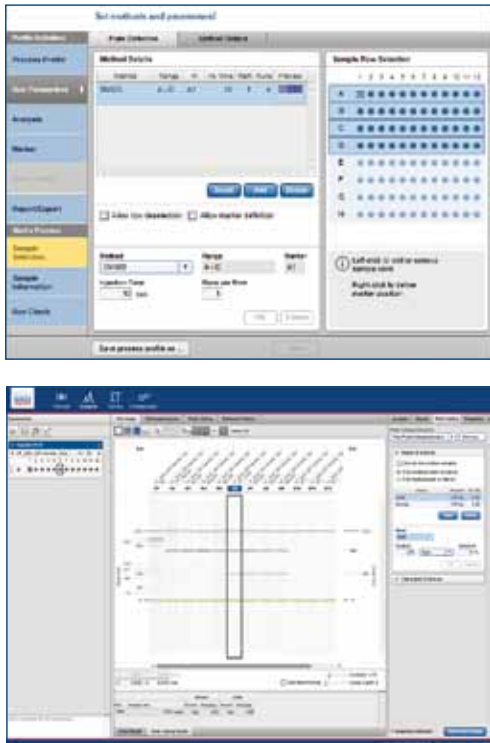


Figure 14. Easy-to-use software features.

## Easy setup and start

Starting your experiment is easy using the Process Wizard (Figure 14). This convenient feature enables guided setup and allows you to define run parameters and preselect DNA size markers. Reagent lot number information can be included and samples can be selected with a single click of the mouse. Run checks can also be easily performed.

## Your experiment at a glance

Experiment Explorer allows users to display and analyze samples according to individual preferences. Samples can be easily selected with just a click of the mouse. Simple drag-and-drop features can be used to visualize samples. A high degree of flexibility enables multiple data sets to be combined. Versatile analysis features allow convenient processing of data. As an additional safety feature for setting up of a reference marker table and subsequent sample size determination, optical comparison of expected fragment pattern versus detected fragment pattern is possible and automatic alerts are generated if fragments are missing.

## Effortless, customized documentation of results and convenient data import and export

The software enables configurable reports to be generated. Cartridge ID and calibration status can be included and data can be electronically documented. Data are available in **.csv** and **.xml** formats, enabling easy transfer to other databases and systems such as LIMS. Integrated XSLT (Extensible Stylesheet Language Transformations) enables transformation of XML documents into multiple formats including XML documents with different structures, HTML for Web pages, plain text, PDF files, PostScript, or PNG files (Figure 15).

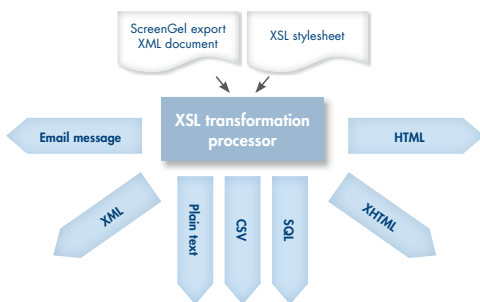


Figure 15. Highly flexible data export. ScreenGel Software enables data export in a wide variety of formats for easy data sharing and display.

## Support of 21 CFR part 11 compliance

QIAXcel ScreenGel Software includes specific features that support the technical requirements of 21 CFR part 11 regulations. Security features such as the following are available:

- Password-protected login to prevent unauthorized access and data manipulation
- Audit trail documentation for configuration files and system events
- Automatic saving and archiving of write-protected raw data

## Ordering Information

Product	Contents	Cat. no.
QIAxcel Advanced System	Capillary electrophoresis device, including computer and QIAxcel ScreenGel Software, 1-year warranty on parts and labor	9001941
Warranty PLUS 2 Basic, QIAxcel Advanced	3-year warranty, 5-working day response time, all labor, travel, and repair parts	9241202
QIAxcel DNA High Resolution Kit (1200)*	QIAxcel DNA High Resolution Gel Cartridge, Buffers, Mineral Oil, QX Intensity Calibration Marker, 12-Tube Strips	929002
QIAxcel DNA Screening Kit (2400)*	QIAxcel DNA Screening Gel Cartridge, Buffers, Mineral Oil, QX Intensity Calibration Marker, 12-Tube Strips	929004
QIAxcel DNA Fast Analysis Kit (3000)	QIAxcel DNA Fast Analysis Cartridge, Buffers, Mineral Oil, QX Intensity Calibration Marker, QX DNA Size Marker 50 bp – 1.5 kb, QX Alignment Marker 15 bp/3 kb, 12-Tube Strips	929008
QIAxcel RNA Quality Control Kit v2.0 (1200)	QIAxcel RNA Quality Control Cartridge, Buffers, Mineral Oil, QX Intensity Calibration Marker, QX RNA Alignment Marker, QX RNA Size Marker 200–6000 nt, QX RNA Denaturation Buffer, 12-Tube Strips	929104
QIAxcel ScreenGel Software	Separate license for use of QIAxcel ScreenGel software on an additional computer	9021163
QIAxcel ScreenGel Software (10)	Ten licenses for use of QIAxcel ScreenGel software on additional computers	9021165

\* QX DNA Size Markers and QX Alignment Marker are not provided with the QIAxcel DNA High Resolution Kit or the QIAxcel DNA Screening Kit and need to be ordered separately.

For up-to-date licensing information and product-specific disclaimers, see the respective QIAGEN kit handbook or user manual. QIAGEN kit handbooks and user manuals are available at [www.qiagen.com](http://www.qiagen.com) or can be requested from QIAGEN Technical Services or your local distributor.

**Visit [www.qiagen.com/instrument-benefits](http://www.qiagen.com/instrument-benefits) and discover how the QIAxcel Advanced System can benefit your electrophoresis applications!**

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**Canada** = Orders 800-572-9613 = Fax 800-713-5951 = Technical 800-DNA-PREP (800-362-7737)

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**Denmark** = Orders 80-885945 = Fax 80-885944 = Technical 80-885942

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**Japan** = Telephone 03-6890-7300 = Fax 03-5547-0818 = Technical 03-6890-7300

**Korea (South)** = Orders 080-000-7146 = Fax 02-2626-5703 = Technical 080-000-7145

**Luxembourg** = Orders 8002-2076 = Fax 8002-2073 = Technical 8002-2067

**Malaysia** = Orders 603-7981-5510 = Fax 603-7981-5511 = Technical 1800-806-469

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