

SpectraMax Quant AccuClear Nano dsDNA Assay Kit

The SpectraMax® Quant™ AccuClear™ Nano dsDNA Assay Kit is a part of the SpectraMax Quant family of double-stranded DNA (dsDNA) assay products. Each product is tailored to a specific range of DNA concentrations, and is optimized for use with fluorescence microplate readers such as the SpectraMax® microplate readers. Preconfigured protocols are included in SoftMax® Pro Software to make DNA quantitation analysis with the assay kits part of a simplified workflow.

The SpectraMax Quant AccuClear Nano dsDNA Assay Kit enables quantitation of a wide range of dsDNA concentrations. The assay is linear between 34 pg per well and 250 ng per well in the 96-well microplate format as determined using a fluorescence microplate reader.

Table 1-1: Available Kits

| Assay Kit | Explorer Kit | Bulk Kit |
|--|--------------|----------|
| SpectraMax® Quant™ AccuClear™ Nano dsDNA Assay Kit | R8356 | R8357 |

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SpectraMax Quant AccuClear Nano dsDNA Assay Kit

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Chapter 1: About the SpectraMax Quant AccuClear Nano dsDNA Assay Kit

The SpectraMax Quant AccuClear Nano dsDNA Assay Kit provides a convenient tool for quantitation of a wide range of concentrations of dsDNA samples. The key features of this kit are the following:

- Optimal for a wide range of concentrations of dsDNA samples
- Highly selective for dsDNA over single-stranded DNA or RNA
- Optimized for fluorescence microplate readers, such as SpectraMax® readers
- Simplified data acquisition and analysis with preconfigured protocol in SoftMax® Pro Software

Assay Principles

The SpectraMax Quant AccuClear Nano dsDNA Assay Kit provides an accurate and sensitive method for quantitation of a wide range of DNA concentrations. The kit contains a fluorescent dye that binds to dsDNA. [Figure 1-1](#) shows the fluorescence excitation peak at 468 nm and the emission peak at 507 nm. [Figure 1-2](#) shows that, unlike absorbance-based measurements, AccuClear Nano dye is highly selective for dsDNA over single-stranded DNA (ssDNA) or RNA. As shown in [Example Standard Curve on page 10](#), the assay is linear between 34 pg and 250 ng of dsDNA per well in a 96-well microplate format using microplate readers such as the SpectraMax® i3x Multi-Mode Microplate Reader.

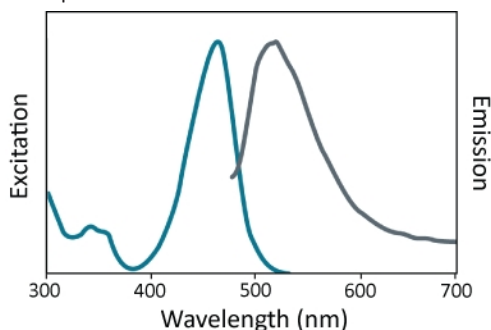


Figure 1-1: SpectraMax Quant AccuClear Nano dsDNA assay dye fluorescent excitation and emission spectra

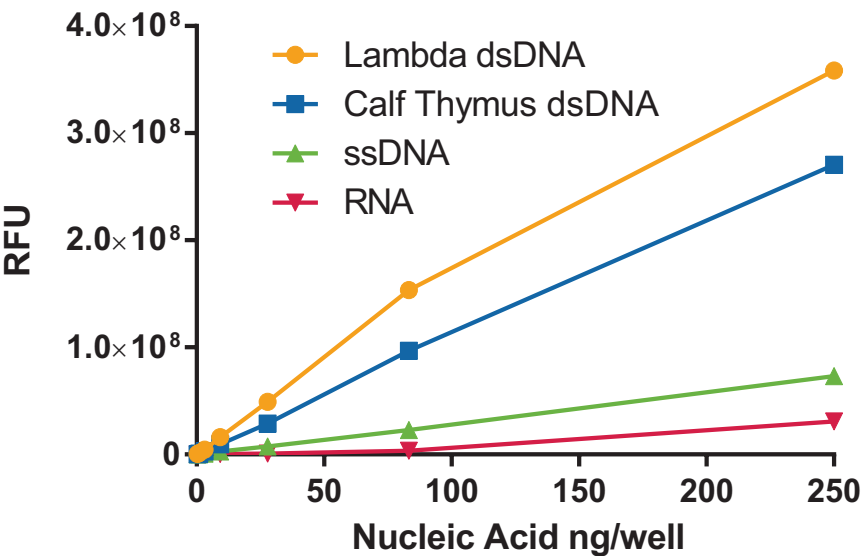


Figure 1-2: SpectraMax Quant AccuClear Nano dsDNA specificity assay

Specificity of SpectraMax Quant AccuClear Nano dsDNA assay is demonstrated by comparing the fluorescent signals collected from the same concentrations of lambda dsDNA, calf thymus dsDNA, ssDNA, and RNA. Plots of relative fluorescence units (RFU) vs. nucleic acid concentration show that the signals are significantly higher for calf thymus dsDNA and lambda dsDNA than for RNA and ssDNA.

Chapter 2: Materials and Equipment

Kit Components

Table 2-1: Components of the SpectraMax Quant AccuClear Nano dsDNA Assay Kit

| Item | Explorer Kit (R8356) | Bulk Kit (R8357) |
|---|----------------------|------------------|
| AccuClear Nano Dye, 100X | 1 x 0.5 mL | 2 x 1 mL |
| AccuClear Nano Buffer, 20X | 2 mL | 10 mL |
| dsDNA standard from calf thymus, 25 ng/ μ L | 1 x 1.0 mL | N/A |
| dsDNA standards from calf thymus: 0, 0.03, 0.1, 0.3, 1.0, 3.0, 10, and 25 ng/ μ L (8 vials) | N/A | 1 x 0.5 mL each |

- The Explorer kit is sufficient for two 96-well microplates.
- The Bulk kit is sufficient for ten 96-well microplates.

The number of microplates is based on the example protocol that is detailed in this document.

Storage and Handling

Store at 4°C. When stored as directed, the kit is stable for at least 6 months from the date it is received.



WARNING! Reagents can contain chemicals that are harmful. Exercise care when handling reagents as described in the related safety data sheet (SDS or MSDS). The safety data sheet is available in the Knowledge Base on the Molecular Devices support web site: www.moleculardevices.com/support

Materials Required but Not Provided

Table 2-2: Reagents and Supplies

| Item | Suggested Vendor |
|-------------------------------------|-------------------------------|
| Solid black microplates (96-well) | Greiner Bio-One or equivalent |
| Deionized water for buffer dilution | |

Compatible Molecular Devices Microplate Readers

- SpectraMax® i3x Multi-Mode Microplate Reader
- SpectraMax® M2 and M2e Multi-Mode Microplate Readers
- SpectraMax® M3 Multi-Mode Microplate Reader
- SpectraMax® M4 Multi-Mode Microplate Reader
- SpectraMax® M5 and M5e Multi-Mode Microplate Readers
- SpectraMax® Paradigm® Multi-Mode Microplate Reader
- FlexStation® 3 Multi-Mode Microplate Reader
- Gemini™ EM and XPS Microplate Readers
- FilterMax™ F3 and F5 Multi-Mode Microplate Readers

Chapter 3: Assay Protocol

Considerations Before you Begin

Optimal assay conditions for different dsDNA types and microplate formats can vary. Molecular Devices recommends verifying the following to determine the optimal conditions for your assay system.

- Because calf thymus DNA is double-stranded, highly polymerized, and approximately 58% AT (42% GC), it can serve as a reference for most plant and animal DNA. Lambda dsDNA yields similar results. You might want to use a standard similar to your unknown samples in DNA length, structure (for example, linear vs. circular), or GC content. Because GC content varies widely depending on the species, a species-specific standard might be appropriate for bacterial DNA.
- Because of variation among microplate readers, optimization of instrument settings might be needed for best assay performance. Instrument settings and other factors that can affect linearity and the fluorescence signal include the following:
 - Excitation and emission wavelengths and bandwidths
 - Cut-off filters
 - Sensitivity (gain) settings
 - Pipetting accuracy
 - Microplate manufacturer
- Several methods for isolation of DNA from cells or organisms are available. As a result, different types of contaminants can be present in the samples which can cause either an increase or a decrease in the fluorescent signal. Table 3-1 shows the effects of common DNA contaminants on the fluorescent signal in the SpectraMax Quant AccuClear Nano dsDNA assay. Triplicate samples of 250 ng dsDNA per well were assayed in the presence of the contaminants at the indicated final concentrations.

Table 3-1: Effects of common DNA contaminants on the fluorescent signal in the SpectraMax Quant AccuClear Nano dsDNA assay

| Compound | Initial concentration in sample | Final concentration in assay (200 µL) | % Change in signal (+/-) |
|--------------------|---------------------------------|---------------------------------------|--------------------------|
| Sodium chloride | 1 M | 50 mM | –14% |
| Magnesium chloride | 100 mM | 5 mM | –16% |
| Sodium acetate | 600 mM | 30 mM | –11% |
| Ammonium acetate | 1 M | 50 mM | –14% |
| Ethanol | 20% | 1.0% | –21% |
| Phenol | 2% | 0.10% | –11% |
| Chloroform | 20% | 1% | –34% |
| SDS | 0.20% | 0.01% | –31% |
| SDS | 0.02% | 0.001% | –9% |
| Triton X-100 | 0.20% | 0.01% | –36% |
| Triton X-100 | 0.02% | 0.001% | –20% |
| Tween-20 | 0.10% | 0.005% | –20% |
| dNTPs | 2 mM | 100 µM | –11% |
| BSA* | 1.0 mg/mL | 0.05 mg/mL | –25% |

*Not compatible with dsDNA quantitation below 10 ng/well.

Fluorescence Microplate Reader Setup with SoftMax Pro Software

Table 3-2 displays typical fluorescence microplate reader settings. In SoftMax® Pro Software, use the preconfigured SpectraMax Quant AccuClear Nano dsDNA protocol that is available in the protocol library in the software or on the protocol sharing web site (www.softmaxpro.org).

Table 3-2: SpectraMax Quant AccuClear Nano dsDNA assay protocol settings

| Parameter | Setting |
|----------------|---|
| Read Mode | Fluorescence |
| Read Type | Endpoint |
| Wavelengths | Excitation: 468 nm with 9 nm bandwidth Emission: 507 nm with 15 nm bandwidth |
| PMT and Optics | PMT Gain: Automatic Flashes per read: 10 Read From Top |

Example of Assay Protocol

The following method was used for generating a standard curve in a 96-well format.

Assay Setup

Use the following procedure to set up the assay:

1. Allow all components to reach room temperature before use.



Tip: AccuClear Nano dye is provided in DMSO, which can freeze during storage at 4°C. All kit components can be placed in a 37°C water bath for rapid warming. Allow solutions to cool to room temperature before using.

2. To minimize reagent loss in the cap, before removing the required volume, shake or vortex each component well, and then centrifuge vials briefly.
3. AccuClear Nano buffer is supplied at 20X. Dilute the buffer to 1X with deionized water on the day of use.
4. For the Bulk kit, use the dsDNA standards that are provided. To prepare a set of standards for the Explorer kit, dilute the 25 ng/μL dsDNA standard in the 1X AccuClear Nano buffer as shown in [Table 3-3: Preparation of dsDNA Standards on page 8](#).



Note: Prepare the standards fresh the day of the assay. Volumes can be scaled as necessary.

Table 3-3: Preparation of dsDNA Standards

| Final Concentration | Standard Volume | 1X AccuClear Nano Buffer Volume |
|---------------------|---|---------------------------------|
| 25 ng/ μ L | 100 μ L of 25 ng/ μ L AccuClear Nano Standard | None |
| 10 ng/ μ L | 40 μ L of 25 ng/ μ L AccuClear Nano Standard | 60 μ L |
| 3 ng/ μ L | 12 μ L of 25 ng/ μ L AccuClear Nano Standard | 88 μ L |
| 1 ng/ μ L | 10 μ L of 10 ng/ μ L | 90 μ L |
| 0.3 ng/ μ L | 10 μ L of 3 ng/ μ L | 90 μ L |
| 0.1 ng/ μ L | 10 μ L of 1 ng/ μ L | 90 μ L |
| 0.03 ng/ μ L | 10 μ L of 0.3 ng/ μ L | 90 μ L |
| 0.01 ng/ μ L | 10 μ L of 0.1 ng/ μ L | 90 μ L |
| 0.003 ng/ μ L | 10 μ L of 0.03 ng/ μ L | 90 μ L |
| 0 ng/ μ L | None | 100 μ L |



Note: When following the assay protocol that is described here, the linear range of the assay is determined to be between 34 pg/well and 250 ng/well. Depending on the microplate reader and assay volume, accuracies of 0.1 pg/well or less might be obtainable.

5. Prepare the working solution as follows on the day of the assay: Dilute the AccuClear Nano dye 1:100 in 1X AccuClear Nano buffer in a plastic container (do not use glass), and then vortex or shake to mix well.



Note: Because 200 μ L of working solution is required for each standard and sample that is to be tested, volumes can be scaled as required. Prepare only as much working solution as you plan to use within 24 hours.

6. For each dsDNA standard or unknown DNA sample that is to be tested do the following: Add 10 μ L of the standard or sample to a well in a black, 96-well microplate, and then add 200 μ L of the working solution and mix.



Note: To test samples in triplicate, prepare three separate wells for each dsDNA standard and three separate wells for each unknown DNA sample.

7. Incubate the microplate at room temperature for 5 minutes in the dark.
8. Measure fluorescence in a fluorescence microplate reader with excitation at 468 nm and emission at 507 nm. See [Fluorescence Microplate Reader Setup with SoftMax Pro Software on page 7](#).



Note: In SoftMax® Pro Software, use the preconfigured SpectraMax Quant AccuClear Nano dsDNA protocol that is available in the protocol library in the software or on the protocol sharing web site (www.softmaxpro.org).

9. Use the standard curve to calculate the concentrations of the unknown DNA samples. See [Example Standard Curve on page 10](#).
-



Note: Because the fluorescence signal decreases over time after the DNA and dye are combined—an approximately 15% decrease after 3 hours and an approximately 30% decrease after 6 hours—Molecular Devices recommends that you measure fluorescence within 1 hour of setting up the assay.



Note: If the fluorescence of any of the unknown samples exceeds the linear range, then further dilute the sample and use 10 μ L of the diluted sample to do the assay. For consistency, use the same volume of sample in all the wells.

Chapter 4: Data Analysis Example

The first step in data analysis is generation of a DNA standard curve that is used to calculate the concentration of unknown DNA samples. A standard curve is generated by plotting the fluorescence values for the DNA standards on the Y-axis and the standard DNA concentrations on the X-axis. A linear curve fit is applied using the drop-down list in the graph section of SoftMax Pro Software. From the standard curve, concentrations of unknown DNA samples are interpolated. A preconfigured assay protocol in the Protocol Library of SoftMax Pro Software enables automatic graphing of standards, and calculation of unknown DNA sample concentrations from the standard curve.

Example Standard Curve

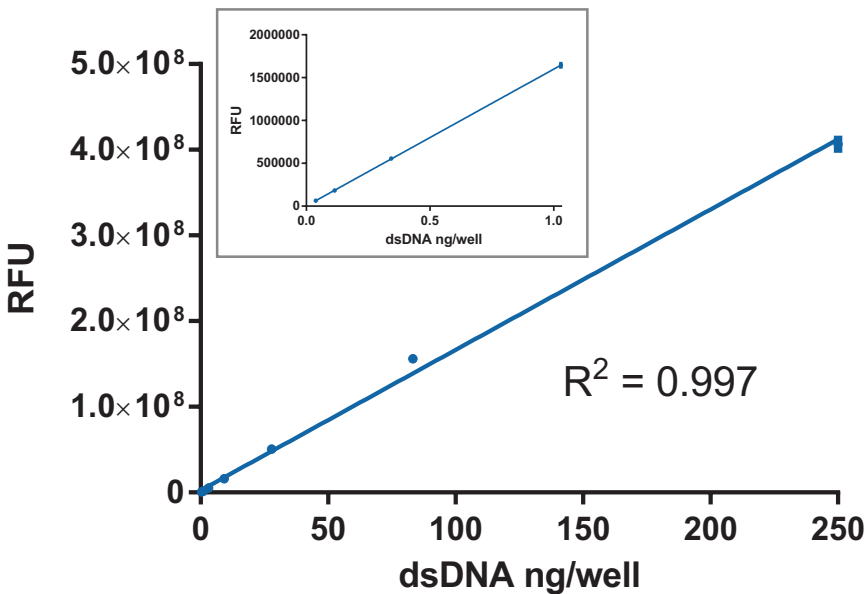


Figure 4-1: SpectraMax Quant AccuClear Nano dsDNA assay standard curve

Linearity of the SpectraMax Quant AccuClear Nano dsDNA assay between 34 ng and 250 ng per well in a 96-well microplate assay with excitation = 468 nm and emission = 507 nm. The inset shows the lower portion of the curve.



Note: The standard curve shown here is for reference only. You must use your own instrument to calculate a standard curve for determining the concentration of DNA in your unknown samples.

Chapter 5: Obtaining Support

Molecular Devices is a leading worldwide manufacturer and distributor of analytical instrumentation, software, and reagents. We are committed to the quality of our products and to fully supporting our customers with the highest possible level of technical service.

Our support web site, www.moleculardevices.com/support, has a link to the Knowledge Base with technical notes, software upgrades, safety data sheets, and other resources. If you do not find the answers you are seeking, follow the links to the Technical Support Service Request Form to send an email message to a pool of technical support representatives.

You can contact your local representative or contact Molecular Devices Technical Support by telephone at 800-635-5577 (U.S. only) or +1 408-747-1700. In Europe call +44 (0) 118 944 8000.

Please have the product name, part number, and lot number available when you call.

SpectraMax Quant Product Family

Table 5-1: SpectraMax Quant Product Family: Available Kits

| Assay Kit | Explorer Kit | Bulk Kit |
|--|--------------|----------|
| SpectraMax® Quant™ AccuBlue™ Pico dsDNA Assay Kit | R8354 | R8355 |
| SpectraMax® Quant™ AccuClear™ Nano dsDNA Assay Kit | R8356 | R8357 |
| SpectraMax® Quant™ AccuBlue™ HiRange dsDNA Assay Kit | R8358 | R8359 |

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