

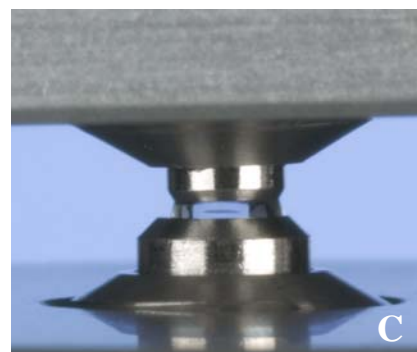
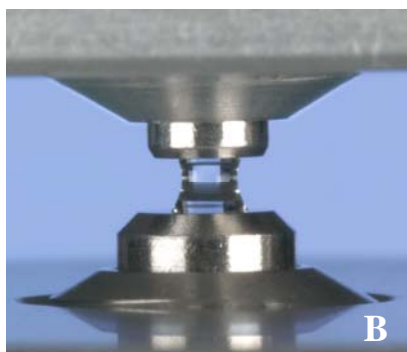
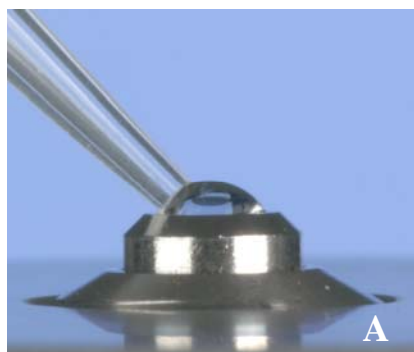
## Comparison of the NanoDrop 1000 and Microcell Cuvettes

### Introduction

The Thermo Scientific NanoDrop™ 1000 spectrophotometer and the microcell cuvette (if combined with a conventional spectrophotometer) are two options for today's research scientists to measure the absorbance of small volume samples of nucleic acids and proteins. The microcell cuvette is currently being marketed under several names including TrayCell, Labelguard and nanoCell. This document will discuss key features and provide comparison data obtained with both systems.

### NanoDrop 1000 Description

The NanoDrop 1000 is a full-spectrum UV/Vis spectrophotometer designed to measure 1ul samples without the use of cuvettes or capillaries. The sample is first pipetted directly onto the measurement surface (figure A). Surface tension then holds the sample in place between the two optical surfaces while the absorbance measurement is made. For each sample, a separate measurement is always made at both the 1.0mm pathlength (figure B) and the 0.2mm pathlength (figure C). Based on the measured sample absorbance, the software automatically determines which pathlength to use for concentration calculations. Cleanup is performed by simply wiping both the upper and lower measurement surfaces with a standard dry laboratory wipe.



### Microcell Cuvette Description

The microcell cuvette, similar in size and shape to a classical 1 cm cuvette, uses embedded fibers to conduct incident and transmitted light to and from a chamber at the top of the cuvette. The sample is pipetted onto a measurement window and a special cap is placed over the sample to create the pathlength. Lower concentrations require 3-5 ul of sample and the use of a 1.0mm cap. Higher concentrations require 0.7-4 ul of sample and the use of a 0.2mm cap.

### Ease of Use

Cleaning the sample from the NanoDrop 1000 takes approximately 5 seconds using an ordinary laboratory wipe. The polished sample surfaces are remarkably smooth, making a quick swipe all that is necessary to remove the entire sample and prevent sample carryover. The microcell cuvette requires more care to remove all of the sample since the sample actually sits in a recessed pocket within the cuvette. Clean-up of both the cap and measurement window requires meticulously removing the sample with a cotton swipe or lab wipe. In addition, canned air is recommended to dry the inside surfaces.

The microcell cuvette systems require the user to have some advance knowledge of each sample concentration in order to select which of the two caps will be needed to make an accurate measurement. The NanoDrop 1000, however, automatically makes measurements using both the 0.2 mm and 1 mm pathlengths for every sample. This unique feature of the NanoDrop 1000 allows a wide dynamic range of sample concentration (2 ng/ul to 3700 ng/ul for dsDNA) to be assessed with just 1 ul of sample.

## Performance Data

Accuracy and reproducibility data from experiments conducted by NanoDrop Technologies are shown in the table below. In general, the NanoDrop 1000 and the Agilent 8453 spectrophotometer equipped with a Labelguard (microcell) cuvette demonstrate comparable performance for the high concentration samples. The NanoDrop 1000, however, demonstrated superior performance for low concentration samples. Most importantly, the NanoDrop software **automatically measured the entire sample range with no user intervention.**

Table 1. Comparison data of the NanoDrop 1000 and a conventional spectrophotometer using a microcell cuvette.

*Reference Concentration	NanoDrop 1000		Microcell cuvette 1 mm Cap		Microcell cuvette 0.2 mm Cap	
	dsDNA ng/ul	Reproducibility (%CV, N=10)	dsDNA ng/ul	Reproducibility (%CV, N=10)	dsDNA ng/ul	Reproducibility (%CV, N=10)
3.5	3.4	9	4.7	38	Cannot measure in this range	
6.2	5.7	13	7.9	13		
13.7	12.8	6	14.9	8		
27	26.8	3	27.7	2		
53.9	52.8	2	54.2	3		
105	102.5	1	103.4	1		
524	510.5	1	514.2	5	520.2	4
1156	1110	0.6	Cannot measure in this range		1158	2
2110	1964	0.2			2067	4
3204	2960	0.2			3027	5
4017	3721	0.2			4090	3

\*As measured with standard 2.0 mm cuvette on Agilent 8453 spectrophotometer

## Summary

The key differences between the NanoDrop 1000 and a traditional spectrophotometer equipped with a microcell cuvette are shown in Table 2. The microcell cuvette system necessitates that the user have some prior knowledge of the sample concentration in order to select the appropriate cap. In addition, the 1.0 mm cap requires a minimum of 3.0 ul to make measurements for concentrations lower than 125 ng/ul. The 0.2 mm cap, used for higher concentrations, requires a sample volume of 0.7 ul. For comparison, the NanoDrop 1000 can measure high concentration samples with as little as 0.3 ul with no user intervention.

In conclusion, the NanoDrop 1000 requires just 1 ul of sample for all measurements and automatically utilizes the correct path length for every sample concentration. NanoDrop Technologies' patented retention system not only enables quality absorbance measurements with just 1 ul, but its ease-of-use makes it a preferred option to conventional spectrophotometers outfitted with either traditional or microcell cuvettes.

Table 2. Summary of Key Features

	Microcell Cuvette		
	NanoDrop 1000	1.0 mm cap	0.2 mm cap
Sample Size	1.0 ul/0.3 ul*	3-5 ul***	0.7-4 ul***
Minimum Concentration (dsDNA)	2 ng/ul	5 ng/ul****	125 ng/ul***
Maximum Concentration (dsDNA)	3700 ng/ul	850 ng/ul***	4250 ng/ul***
Automatic path switching	Yes	No	
Cleaning time	5 seconds	Comparable to standard cuvette	
Sample recovery possible	Yes	Yes	
Sample through-put	150 samples/hour	36/hour**	

\* A 0.3 ul sample is all that is required high concentration measurements. High Abs data may be reviewed using the Data Viewer module.

\*\* Using one cap for all measurements \*\*\* As specified by Hellma product brochure \*\*\*\* As specified by Thermo product brochure

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