

nXcella – a counting chamber designed for DHM

nXcella is a proprietary sample carrier platform for the analysis of liquid samples such as cell culture suspensions and body fluids. With only 10 μ L of sample and the Fluidlab analyzer, it enables automated, label-free cell counting and classification using digital holographic microscopy (DHM). nXcella is the ideal ready-to-use consumable for laboratories looking for faster, hygienic, and cost-efficient analysis.

The nXcella sample carrier is designed to provide mechanical robustness, reliable fluidic performance, and high optical quality (Fig. 1). Integrated microfluidic features enable controlled sample handling within the carrier.

A dedicated bypass structure serves as a safety mechanism by accommodating excess sample volume and preventing leakage into the analyzer, thereby improving hygiene and reducing the risk of cross-contamination between measurements.

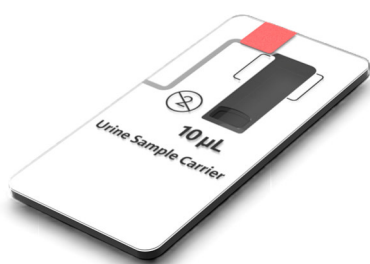


Figure 1. nXcella sample carrier for the analysis of liquid samples.

The microfluidic design and material properties have been carefully optimized to ensure uniform sample distribution and reproducible measurement conditions.

Owing to its simple architecture, the sample carrier can be manufactured cost-effectively using a roll-to-roll process, enabling scalable high-volume production.

nXcella has been successfully validated and tested for a wide range of liquid samples, including life science applications such as Jurkat cells and peripheral blood mononuclear cells (PBMCs), as well as body fluids used in clinical diagnostics, including urine and processed blood samples. Performance evaluations demonstrate accurate and precise analytical results across these applications.

Reliable measurements require a representative particle distribution within a precisely defined sample volume. nXcella achieves this through optimized microfluidic behavior and highly controlled chamber dimensions.

The consistent chamber height of 100 μ m defines the analyzed volume and is essential for measurement reproducibility. Compared with competing products, nXcella delivers tighter dimensional



tolerances below $\pm 5 \mu\text{m}$, contributing to superior analytical consistency (Fig. 2).

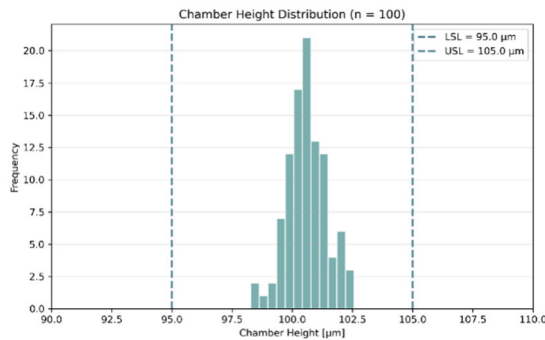


Figure 2. Chamber height distribution (mean = $100.6 \mu\text{m}$; CV = 0.8%) demonstrating an excellent process capability ($Ppk = 1.82$).

A major development challenge was the realization of a plastic sample carrier with optical properties comparable to those of glass. Unlike conventional counting chambers, digital holographic microscopy (DHM) places stringent demands on the optical quality of the consumable. Since the coherent illumination interacts with all structures

along the optical path, surface irregularities, material inhomogeneities, and refractive index variations can adversely affect image reconstruction and analysis accuracy. nXcella was therefore specifically engineered to combine the manufacturing and cost advantages of plastics with glass-like optical performance, ensuring reliable hologram acquisition and robust automated image analysis.

Overall, nXcella provides a ready-to-use consumable that combines simple handling, hygienic operation, and low-cost sample analysis. Together with the Fluidlab analyzer, it offers laboratories a compact and automated workflow for label-free cell counting and classification