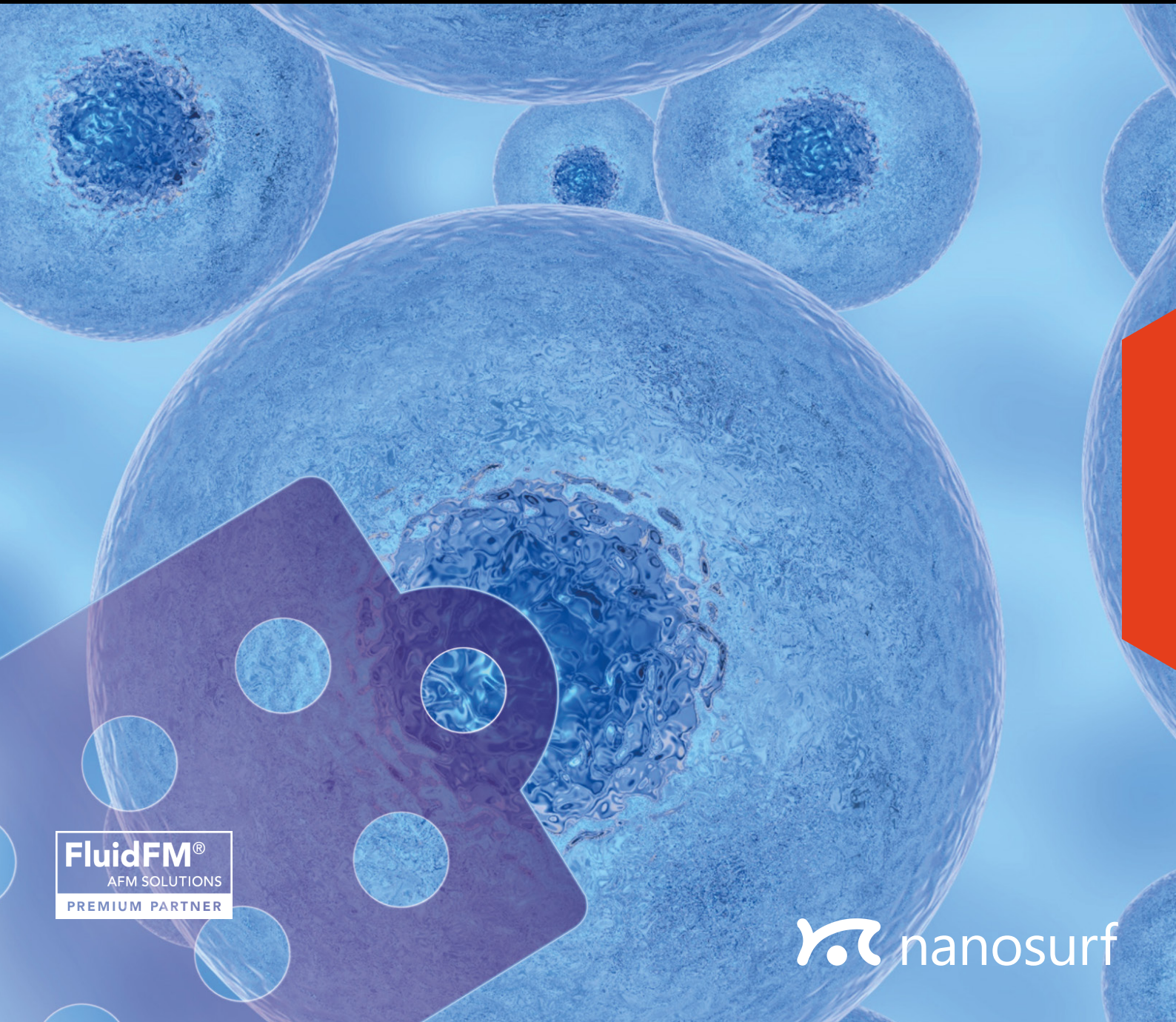


# FluidFM<sup>®</sup> probe microscopy

Market leading experience in  
FluidFM for AFM



**FluidFM<sup>®</sup>**  
AFM SOLUTIONS  
PREMIUM PARTNER

 nanosurf

# The established microfluidic tool for nanomanipulation and single-cell biology

FluidFM® probe microscope (FPM) combines the force sensitivity and positional accuracy of the Nanosurf DriveAFM, FlexAFM or CoreAFM with FluidFM® technology by Cytosurge to allow a whole range of exciting applications in single-cell biology and nanoscience.

The FlexAFM with FluidFM® system was launched in 2011. As Cytosurge's initial cooperation partner for this innovative technology, Nanosurf has the longest experience providing AFM systems with the FluidFM® add-on.

## Highly accurate pressure, force, and position control with optical sample access

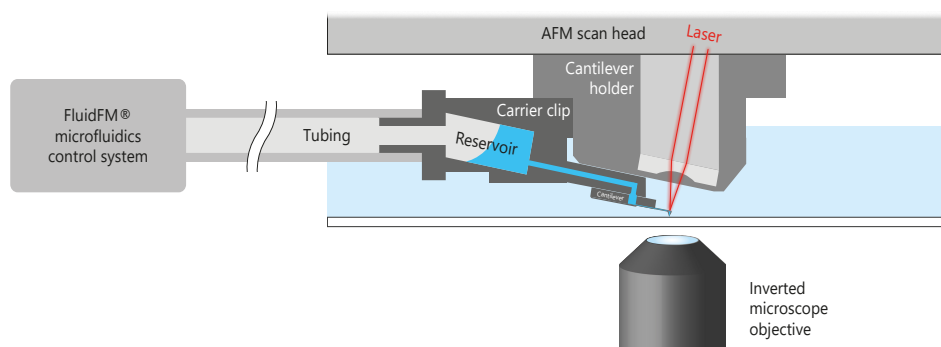
FluidFM® microfluidics control system

Available for three Nanosurf AFM platforms

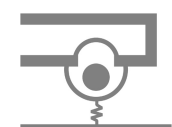
Different levels of software integration available

Compatible with major inverted microscope brands with DriveAFM and FlexAFM

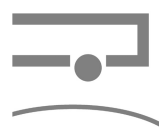
Compatible with DIMO, the digital inverted microscope of Nanosurf that integrates in the AFM



The versatility of FluidFM becomes evident from the broad universe of possible measurement and manipulation possibilities:



single cell adhesion



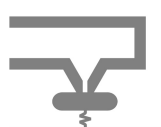
colloidal spectroscopy



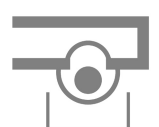
single cell injection



spotting



single bacteria adhesion



single cell isolation



single cell extraction



nanolithography



PicoBalance



SICM

## Different FluidFM® probes: hollow cantilevers designed for specific applications

FluidFM® micropipettes: tipless cantilevers with opening at the cantilever end

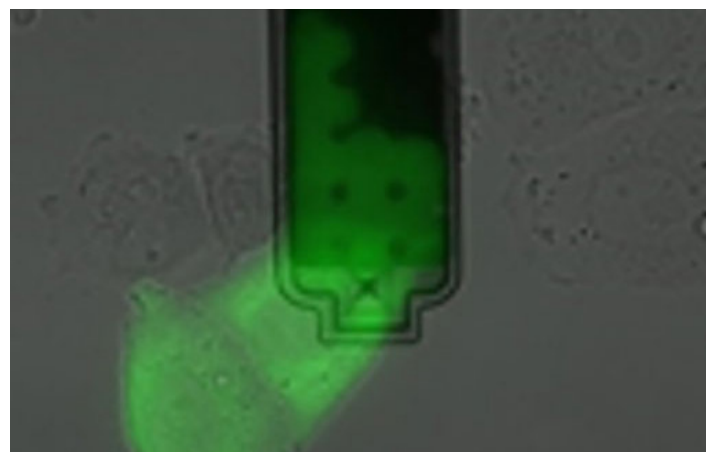
FluidFM® nanopipettes: cantilevers with opening at the tip apex

FluidFM® syringes: cantilevers with the opening at the side of the tip

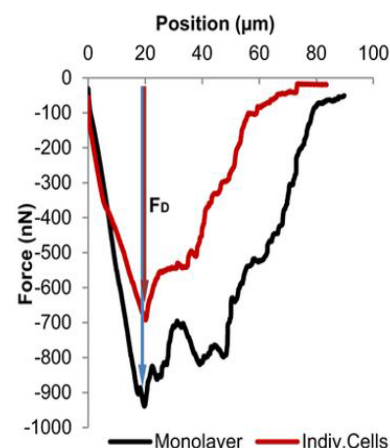
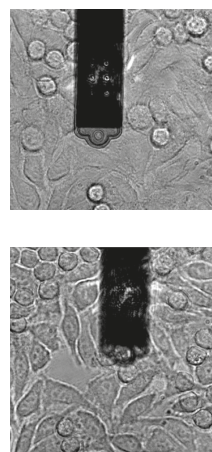
FluidFM® rapid prototyping probes: cantilevers with closed pyramidal tips, ready for FIB milling

## Pioneering research within reach

FPM is more than AFM with hollow cantilevers. It allows higher experimental throughput and provides a wide range of applications. The FPM being a tool to conduct innovative research at the frontiers of science has led to a vast amount of original research papers.



Extraction of sub-picoliter sample of nucleoplasm and cytoplasm from live cells without killing them [Cell 166, 506]. Single-cell extracts were analyzed by TEM, protein assays, PCR and mass spectrometry [Anal. Chem. 89, 5017]. This illustrates the power of FluidFM to study cell processes at the single-cell level thus enabling the study of the heterogeneity of cells.



Single cell adhesion studies on human endothelial cells from the umbilical artery reveal strong intercellular forces. **Left:** Confluent layer of cells, where one is pulled out by FluidFM. **Right:** Typical single cell force curves of individual cells or cells in a confluent layer, depicting the increase in adhesion force by cell-cell interactions [Scientific Reports 7, 46152].

# Compatible AFM systems

You can perform FluidFM® on different Nanosurf AFM platforms, depending on your laboratory environment, current system setup, and requirements. Use Nanosurf’s flagship DriveAFM, the compact CoreAFM, or the FlexAFM system. Particularly for cell adhesion experiments, when the internal Z-range of the AFM platform is not sufficient, a long range sample stage can be added that is activated in the standard software.

The DriveAFM and FlexAFM can be combined with the major inverted microscope brands, providing a wide range of optical techniques, including TIRF or STED. Alternatively, inverted optical access can be provided with DIMO, Nanosurf’s digital inverted microscope option that can be integrated in the Isostage 300 active damping table. This option is available for all platforms.



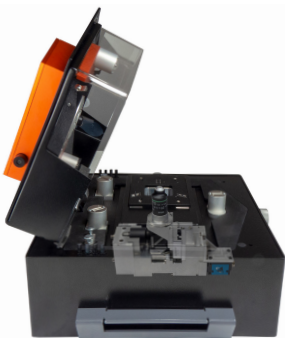
## DriveAFM

The 20  $\mu\text{m}$  Z-range of the DriveAFM is the largest available, enabling many FPM spectroscopic measurements and manipulations on living cells as is. The DriveAFM can be placed on an inverted microscope, to combine FluidFM and AFM with high-end optics. Alternatively, as stand alone system, a DIMO can be integrated in the active damping stage, providing basic bright field and fluorescence microscopy. DriveAFM is compatible with the patented PicoBalance technology, that uses photothermal excitation to accurately measure the resonance frequency of a cantilever in liquid with high mass and temporal resolution. With FPM particles and cells can be reversibly attached to the FluidFM probe for their mass determination.



## FlexAFM

The Flex-FPM setup is the optimal choice for scientists who don’t need the DriveAFM performance, but still want to combine the flexibility and handiness of the Nanosurf FlexAFM with their preferred inverted microscope. FlexAFM was the first available platform for FluidFM and has >50 publications on its name. With its compatibility with high-end inverted microscopes the FlexAFM offers more flexibility compared to CoreAFM for correlative studies with advanced optical techniques.

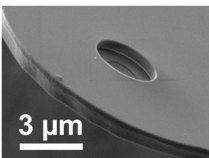


## CoreAFM

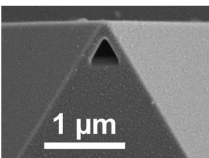
FPM can be performed on the CoreAFM with DIMO with hardly any constraints. The digital inverted microscope option provides you with a bottom up optical view of your samples, with bright field or fluorescence contrast. This allows you to easily view cells, maneuver the cantilever, carry out single cell procedures, and observe spotting and nanolithography progress.

### Pressure system specifications

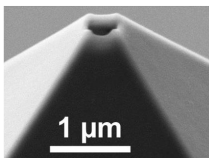
|                                      |                                     |
|--------------------------------------|-------------------------------------|
| Pressure range                       | –800 to 1000 mbar                   |
| Pressure precision                   | better than 2.5% of full range      |
| Min. output pressure step (< 0 mbar) | 0.1% of max negative pressure range |
| Min. output pressure step (> 0 mbar) | 0.1% of max positive pressure range |
| Power consumption                    | < 32 W                              |



**FluidFM Micropipette**  
Opening: 2, 4, and 8  $\mu\text{m}$  at cantilever end  
Spring constant: 0.3 – 4 N/m



**FluidFM rapid prototyping probe**  
Opening: 30 nm or more, user-defined  
Spring constant: 0.6 or 2 N/m



**FluidFM Micropipette**  
Opening: 300 nm at tip apex  
Spring constant: 0.6 or 2 N/m



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