

Video Rate Atomic Force Microscope

**in**infinitesima



**VideoAFM™**

The next generation VideoAFM™ is capable of delivering real-time images at video frame rates. Infinitesima has integrated a large sample capability into the VideoAFM™ using ScanningLever™ technology. The Real-Time AFM™ capabilities of the VideoAFM™ provide the ability to observe processes in millisecond resolution and explore large areas at unprecedented rates. Images are collected, processed, displayed and recorded simultaneously, making the VideoAFM™ the first truly interactive SPM.

The VideoAFM™ is designed as a simple 'plug-in' device for conventional AFMs offering all the advantages of high speed imaging without affecting the functionality of the microscope. Extensive research and experience in high-speed scanning have led to the development of the VideoAFM™. The technique introduces a number of step-like changes to an established field, which have given rise to unprecedented increases in both speed and imaging capability.

It's just like using an optical microscope, a single area of the sample can be imaged to follow a dynamic process, or large areas can be explored before zooming in on features of interest for a more detailed investigation.

The VideoAFM™ is fast establishing an entirely new method of performing research in nanotechnology as well as opening new avenues of research. The instrument allows researchers to view dynamic processes and scan large areas; it also achieves nanometer resolution at very low force allowing delicate samples such as molten polymer and DNA to be viewed.

### **Large sample size**

Infinitesima's VideoAFM™ Scanning Lever™ technology has overcome sample size restrictions typically imposed by high-speed scanning.

### **Large area visualisation**

View large areas while retaining high resolution.

### **Real-time interaction**

Use your AFM like an optical microscope. You can zoom and explore large areas simply by translating the AFM stage.

### **True video output**

Video-rate images are produced at 15 or 25 frames per second with the ability to record and save as a video file.

### **Visualize Processes**

Observe dynamic processes such as polymer crystallisation in real-time.

### **Simple installation**

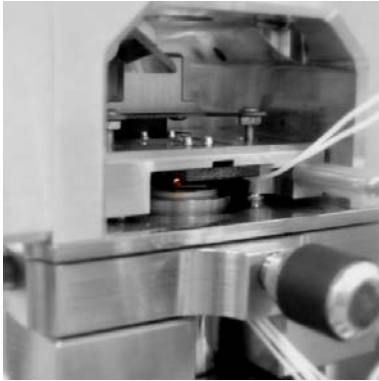
The VideoAFM™ is compatible with the majority of scanning probe platforms and can be installed quickly and easily.

# **The VideoAFM™ - Next Generation**

## **Real-Time AFM™ Imaging**



Video Rate Atomic Force Microscope  
**VideoAFM™**



**WHAT IS IT?**

The VideoAFM™ is an independent device which sits inside your AFM and enables image capture at 25 frames per second – video rate.

With the new next generation VideoAFM™, the sample size is increased and the high speed imaging allows searching and inspection over large areas with nanometre resolution. Once an area of interest is found,

conventional operation of the AFM can be performed at the same location.

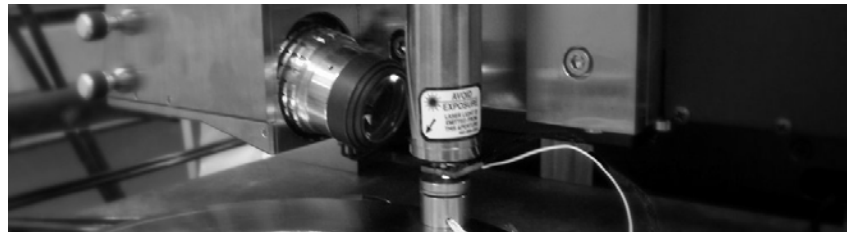
**EASY TO SETUP**

It's simple to set-up and use. The VideoAFM™ attaches to your conventional AFM in a clean and simple manner, requiring only one electrical connection to the deflection signal. Simply place the VideoAFM™ scan head within the AFM and load the scanning lever into the tip holder. There

is no need to take the AFM out of service.

**FLEXIBLE DESIGN**

The VideoAFM™ has been designed to be modular by nature. Future upgrades can simply slot into a spare bay at the back of the machine. There are also USB connections both on the workstation and keyboard allowing easy access to the data. An integral DVD writer allows data backup and archiving.



▲ VideoAFM™ stage and tip scanner mounted beneath the Dimension 3100™; top left VideoAFM™ mounted within a Multimode™, both instruments by Veeco Instruments, CA

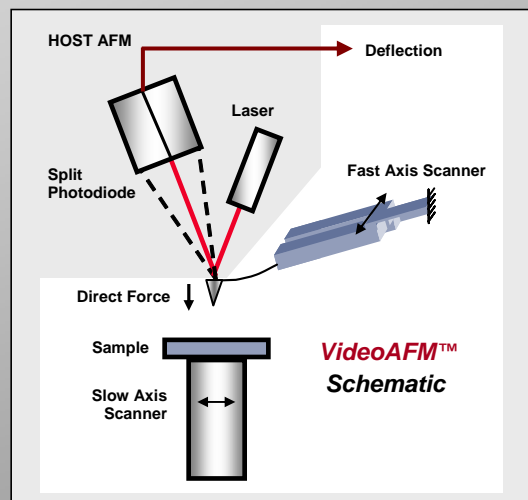
**HOW DOES IT WORK?**

The key to Infinesima's revolutionary VideoAFM™ technology is the combination of two major advances in high speed imaging. These are resonant scanning and Infinesima's novel cantilevers with integrated Direct Force™.

The scanner in a conventional AFM is limited by the onset of mechanical resonances and thermal instability. Infinesima's resonant scanning technology circumvents this by utilising rather than avoiding these resonances, enabling line rates of over 10,000 Hz.

By supplying a force directly to the tip of the cantilever, the tip is able to track the surface of the sample, with a low and constant interaction force, at high tip velocities required for video-rate imaging.

These advances enable the VideoAFM™ to overcome the limitations inherent in conventional AFM.





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# VideoAFM™



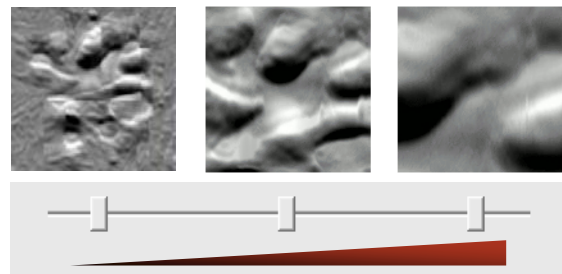
▲ Standard test sample grid on Veeco Multimode™; ▲ Search over millimeters via mechanical positioners or motorized platter

## REAL TIME ZOOM

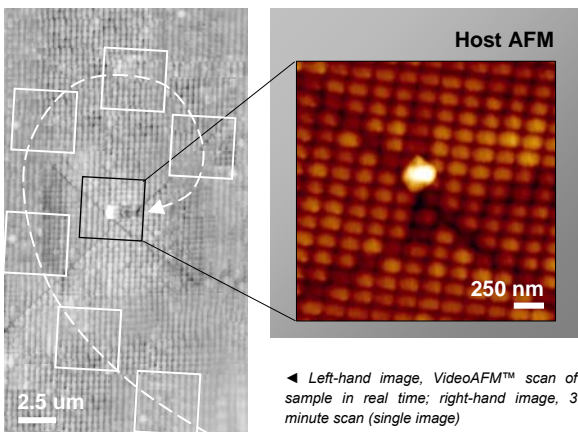
For example, just like an optical microscope, a single control allows the user to adjust the magnification and zoom in on areas of interest. This powerful interactive zoom feature is unique to the VideoAFM™ and maintains full image resolution throughout. Inintesima have strived to ensure the user interface is simple and intuitive to use. The VideoAFM™ gives you immediate visual feedback.

## LARGE SAMPLE SIZE

The next generation VideoAFM™ adds the large sample capability, by making the tip the resonant scanner. Users can now explore the VideoAFM™ capabilities on standard samples, further increasing the ease of use of the instrument. Standard sample discs of 15 mm diameter enable the VideoAFM™ to be used routinely.



▲ True-Resolution ZOOM; zoom in dynamically without loss of resolution



◀ Left-hand image, VideoAFM™ scan of sample in real time; right-hand image, 3 minute scan (single image)

## SEARCH & MEASURE

Samples can be inspected with nanometer resolution, in real-time, as if under an optical microscope. Once an area of interest is found, traditional AFM scanning can begin without the disruption of having to change microscope tips and losing the area being studied or disturbing the measurement in any way. The high speed scanning is frozen at the click of a mouse button and started again just as easily.

The tiled image (left) is composed of many frames of a movie taken whilst searching around the sample for an area of interest. When found, the VideoAFM™ can be stopped, allowing a slow scan to be taken for analysis. Traditionally this kind of searching would take many hours, if at all possible.

## ONE-TOUCH RECORD

The one button record feature is simple and easy to use. Direct streaming to industry standard AVI movie allows you control over what data you save to disk. Just hit record, then review your full 15 or 25 frames per second to access the full spatial and high time resolution delivered by the VideoAFM™. Data can be collected continuously for over 30 minutes.





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Movie courtesy of J.Hobbs at University of Sheffield, UK

## DYNAMIC PROCESSES

The VideoAFM™ can follow molecular processes with millisecond resolution. The frames to the left are from a movie showing polymer crystal growth over a period of 3 seconds. More than 50 complete frames were captured and growth rates measured.

J.K. Hobbs *et al.* Polymer 46 (2005) 10226–10236.

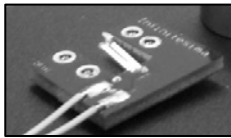
◀ Image window 1.8 x 1.8 microns, 256 x 256 pixels

## VIDEOAFM™ INTERFACING



◀ VideoAFM™ Scan Head

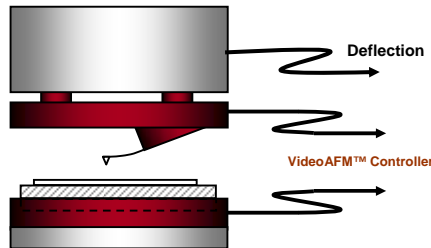
▼ VideoAFM™ Scanning Lever



Host AFM

Tip scanner

Sample stage  
(optional heater)



▼ VideoAFM™ Liquid Head



### Workstation Specifications

- Data capture, control and real-time processing system
- Real-time image processing capabilities (e.g. image flattening and contrast control)
- Proprietary expansion module interface enabling future proofing and flexible upgrade path
- Microsoft Windows XP Pro based VideoAFM™ control software
- CD/DVD Rewritable drive with NERO™ CD/DVD Burning Software
- 17" Flat screen, Keyboard, Mouse

### Workstation Electrical Specifications

Power Supply	IEC connector, 210-250 V ac, 50 Hz or 105-125 V ac, 60 Hz (450 W)
Other manufacturer's controller connector	37-way D type DIN (Male)
Other manufacturer's microscope connector	37-way D type DIN (Female)
Sensor Input	BNC (Female)
Direct Force Output	BNC (Female)

### Workstation Mechanical Specifications

Dimensions	47.5 cm x 47.5 cm x 18.0 cm (optional rack mount kit)
Weight	20 kg

### Sample Stage Specifications

#### Standard Sample

- Sample size of up to 15 mm dia. (10 g) or larger (on request)  
e.g. standard 15 mm dia. sample stubs
- Image window up to 3 µm x 3 µm
- Explorable area limited by range of scanner of host AFM
- Air environment operation only

### VideoAFM Systems

V102.10	VideoAFM™ Air Environment
V102.20	VideoAFM™ Liquid Environment
V103.10	VideoAFM™ (Next Generation)
V103.20	VideoAFM™ (Liquid & Next Generation)

### VideoAFM Consumable

VC102.33	ScanningLevers™ (pack of 10) Scanning levers with probes for samples in air (probe with std. SiNi tip)
VC102.12	Air Microscanners (pack of 10) Microscanners for sample mounting in air
VC102.22	Liquid Microscanners (pack of 10) Microscanners for sample mounting in liquid
VC102.13	Air levers (pack of 10) Levers with probes for samples in air (probe with std. SiNi tip)
VC102.23	Liquid levers (pack of 10) Levers with probes for samples in liquid (probe with std. SiNi tip)
VC102.90	Glass sample mounting blocks (pack of 100) 0.8 x 0.8 x 0.6 mm glass cubes. Cover glass, flamed finish surface
VC102.91	Silicon sample mounting blocks (pack of 100) .8 x 0.8 x 0.6 mm silicon cubes.

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**INFNITESIMA LTD**  
WWW.INFNITESIMA.COM

OCFI, MILL STREET  
OXFORD, OX2 0JX, UK

PHONE +44.1865.811.171  
INFO @INFNITESIMA.COM