



## Vessel Calcium, Diameter & Flow Recording System

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IonOptix has developed its **Vessel Calcium & Dimensioning Recording System** over many years of collaboration with top vascular researchers. We take pride in a line of precision products that are application driven and built to meet the needs of a demanding research environment. Since its inception in 1990 IonOptix has installed hundreds of high performance, turn-key systems in research laboratories worldwide.

Our new [VesAcq](#) dimensioning software offers a simpler user-interface, more precise control and enhanced functionality to acquire vessel diameter. Some new features and improvements over simple contrast-based edge detection are:

**Multiple ROIs** - allow measurement of up to four regions along the vessel at the same time.

**Line averaging** - unlike convention "edge detection", where contrast information is evaluated on a single line, VesAcq averages contrast over all of the lines within a user-defined region to minimize the contribution of contrast that doesn't occur over all lines. Images no longer need to be super-saturated to drown out the contrast from remnants of blood, fat, folding, etc., making your measurements simpler and more reliable.

**Auto-gained contrast** - simplifying the user interface, contrast information is automatically maximized within the contrast window to enable precise control of thresholds.

*Real-time calculations of:*

- Inner/outer **diameter**
- Left/right/average **wall thickness**
- Inner/outer/cross-sectional **area**
- Media/lumen ratio**

The endothelial response to flow-induced stress (e.g., the generation and secretion of nitric oxide) is an important modulator of vascular tone and function, linking vasodilation and constriction to the dynamics of fluid flow. IonWizard's [FloAcq](#) acquisition module is the first to perform real-time calculations of important indicators of arterial flow, including shear stress. The following lists some FloAcq outputs and how they could be applied to the characterization of vascular physiology and function:

**Mean pressure**

**Flow velocity**

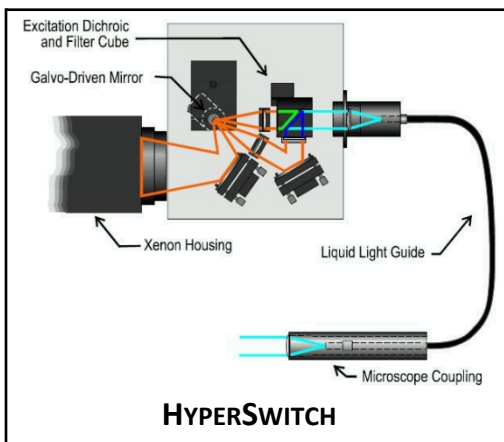
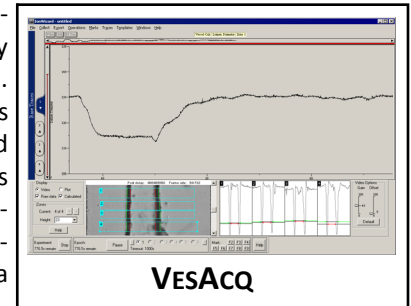
**Vessel wall shear stress** - a characterization of the frictional drag exerted on arterial walls during flow. Many physiological functions are influenced and promoted by this biomechanical force. Normal levels of shear stress serve to maintain wall physiology. High shear stress triggers vascular dilation in order to regulate the mechanical forces exerted on arterial walls.

**Vascular resistance** - a definition of the force opposing the movement of solution through a vessel. It is inversely related to the vessel diameter. A greater vascular resistance will require a greater degree of vasodilation in order to maintain constant pressure within the vessel.

**Reynolds number (Re)** - describes whether the flow is either turbulent or laminar. A large Re suggests turbulence, where nonaxial flow instabilities such as vortices result from high flow volume, high temperature, high flow velocity, branch points, etc. At low Re, where flow is dominated by viscous forces, laminar flow will move in parallel velocities throughout the lumen of the vessel.

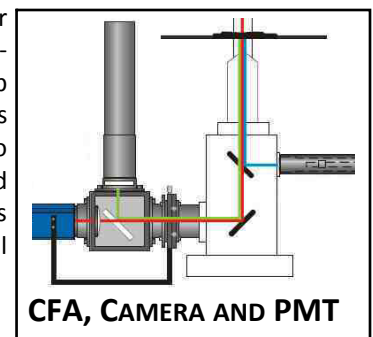
# ION OPTIX

The list of components comprising a complete, integrated workstation can be extensive. Our complete systems are built from components designed to work seamlessly with one another, providing completely synchronous and accurate data acquisition. Our systems begin with [IonWizard](#), our core software. IonWizard's central functions is expanded through the [VesAcq](#), [FloAcq](#) and [PMTAcq](#) acquisition modules to record inner and outer vessel diameter, shear stress and ratiometric fluorescence data, as well as many other dimensioning and flow related parameters. IonWizard communicates directly with two root devices, the video acquisition camera and our fluorescence system interface ([FSI](#)). Our vessel systems come equipped with the VesCam, a USB-interfacing CCD video system for visualizing and dimensioning vessels. The fluorescence system interface provides a hub for communicating with all peripheral hardware devices, synchronizing data acquisition through a suite of analog and digital connections. The FSI also synchronizes the control of our fluorescence excitation light source with collection from emission sensors, an essential component of accurate ratiometric fluorescence measurements. Depending on your choice of pressure myography hardware, IonWizard will perform root level communication enabling control of inlet and outlet pressures.



Cellular calcium levels rise and fall on millisecond time scales. For dual excitation indicator dyes such as Fura-2, the fluorescence excitation light source must switch between excitation wavelengths with speed and precision. The IonOptix [HyperSwitch](#) uses a galvanometer-driven mirror to steer light between two light paths. With sub-millisecond switching times, the HyperSwitch offers 250 true ratios per second. The HyperSwitch comes equipped with a Xenon arc lamp for nearly uniform light intensity in the near ultraviolet and visible spectrum. The HyperSwitch delivers fluorescence illumination to your microscope through an efficient liquid light guide and a microscope-specific adapter, precision-machined at our facility. For detecting and quantifying fluorescence emission, we furnish systems with one or more [photomultiplier tubes](#) (PMTs). The PMT offers broader dynamic range, faster acquisition rates and greater sensitivity to light (compared to CCD- based sensors).

To enable simultaneous vessel dimensioning and calcium acquisition we equip every fluorescence recording workstation with our framing adapter ([CFA](#)). The CFA hosts several optical elements for filtering and directing light to the appropriate device. It also holds an aperture for physically framing the image, preventing unwanted background light from contributing to the fluorescent signal. Coupling the appropriate optical filters with our CFA, camera and PMT, our systems offer precise, real-time calcium and vessel dimensioning measurements.

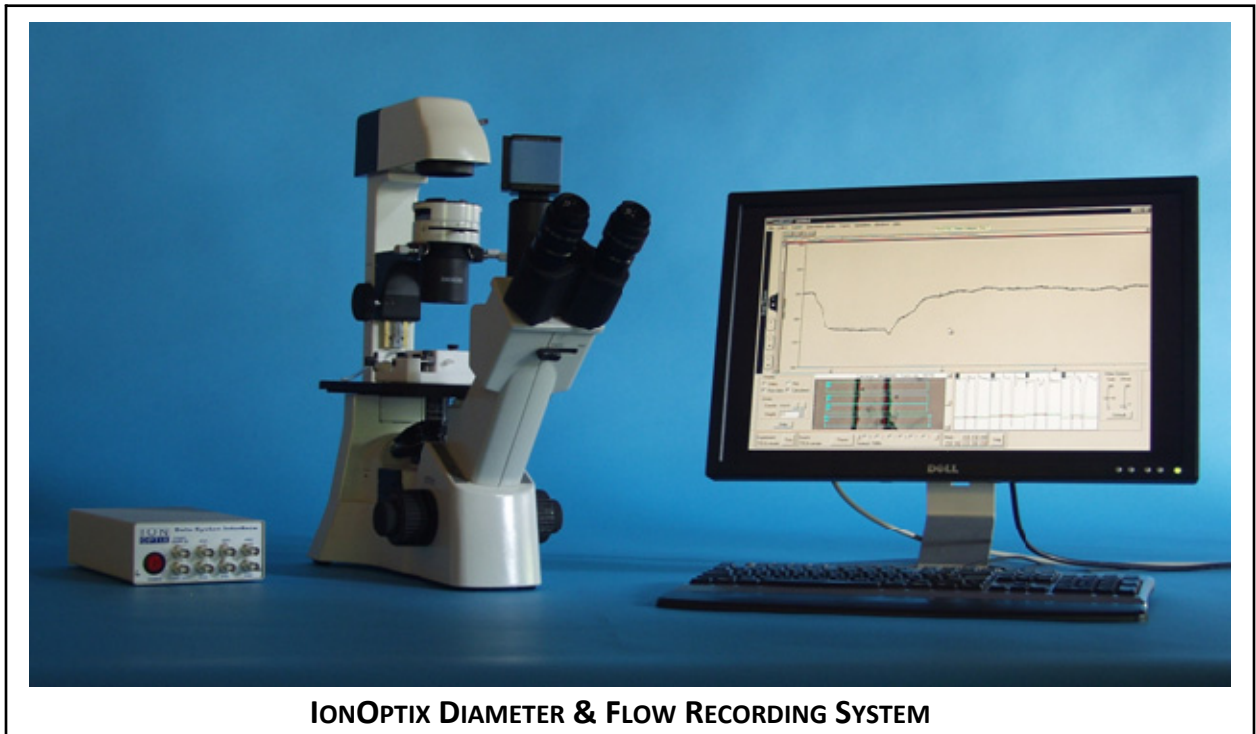


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Using our interface, the [FSI](#), and a system that allows the pressurization of microvessels, sold by [DMT](#) or [Living Systems](#), we can provide real-time recording of all vessel myograph outputs, for example pressure, force, temperature and pH, as well as diameter and flow. We'll work with the manufacturer your myograph system to provide an integrated workstation capable of accurate, synchronized data acquisition.

No system would be complete without a microscope. We can equip your microscope with all the necessary couplings to attach your IonOptix hardware or we can supply the microscope as well. We offer a high quality [Motic inverted microscope](#) configured to our specifications. Our microscope package offers upscale features such as uniform Koehler illumination and infinity corrected optics and high UV transmittance objectives at a reasonable price. Our microscope package guarantees you'll have the right equipment for precise measurements.

Equipped with the latest computers, we assemble and test all components at our facility before shipping. Every system includes a visit to your lab for installation and training. When we install our complete systems we use your preparations to help get you started as quickly as possible. And when you need assistance we offer unlimited phone and email support for the lifetime of your system.





*Standard Components:*

**Software**

[IonWizard-Core and Analysis](#)

[VesAcq Vessel Dimensioning Acquisition Module](#)

[FloAcq Vessel Flow Characteristics Acquisition Module](#)

[PMTAcq Fluorescence Photometric Acquisition Module](#)

**Light Sources**

[HyperSwitch Light Source](#)

**Cameras and PMTs**

[VesCam: USB-Interfacing CCD Video System](#)

[PMT Sub-System](#)

[Cell Framing Adapter](#)

**Interfaces**

[Fluorescence System Interface](#)

**Microscope**

[IonOptix/ Motic Fluorescence Microscope Package](#)

*Optional Components:*

**Light Sources**

[µStep Light Source](#) (replaces HyperSwitch Light Source for slower filter switching)

**Cameras and PMTs**

[MyoCam-S Digital CCD Video Camera](#) (replaces VesCam Video System for faster acquisition)

Please visit us at [www.IonOptix.com](http://www.IonOptix.com) for more information.

Email your IonOptix representative at [info@ionoptix.com](mailto:info@ionoptix.com) and have them tailor a system specifically to your application.