NanoDispense™ heads deliver precision liquid dispense and measurement capability in small compact packages. You can incorporate them into your own instruments or use them as standalone instruments. They are the heart of the FTA1000 A Class of modular drop shape instrumentation.

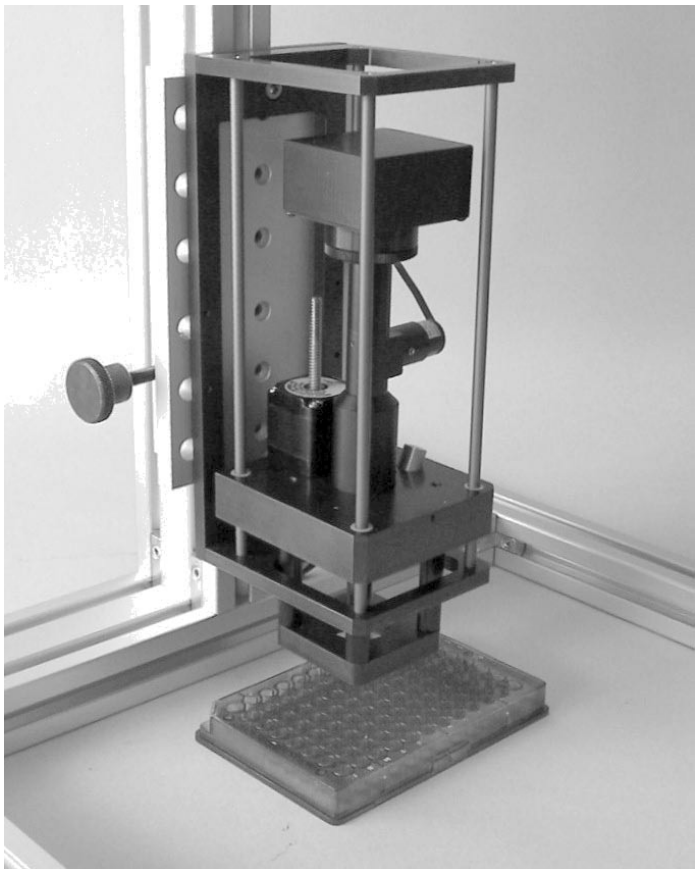
Each instrument is constructed from your choice of *controller*, *pump*, and *head*. The head actually dispenses the liquid and captures all the data. But the supporting actors, the pump and the controller, can be located remotely. This helps machine designers minimize robot requirements.

All NanoDispense heads contain a miniature microscope and video camera. The video images are processed by the controller to control pumps and the built-in Z axis that positions the tip above the sample. This real time video processing is the secret to the unique capabilities of these heads.

The choice of heads means you can use this concept to solve many precision dispense and contact angle measurement problems. You can mix and match heads and pumps with your controller. The A Class includes

• Top View Contact Angle: measure contact angles by dispensing a fixed liquid volume and then measuring sessile drop diameter on the surface. This is the only known way of measuring contact angles in depressions or wells where the drop can not be viewed from the side. This method also works for drops that have angles ≈1° and are impractical from side view. The figure at the upper right shows a head positioned over a 96-well microtiter plate. We have examples of measuring at the bottom of these wells.

• Side View Contact Angle: classic side view contact angle measurement for those occasions where you want to deploy the measurement on a robotic head or the factory floor.



Top View head on manual positioner

• Small Drop Dispense: piezo-electric jetting (like an ink-jet printer) dispense of all common room temperature fluids. Volume is primarily set by jet orifice size. Common volumes are in the 20 to 60 picoliter range. Larger volumes built up at rate of 1000 drops per second. Fully automatic.

• Hot Polymer Dispense: piezo-electric jetting of polymers at temperatures up to 240C.

• Molten Solder Dispense: piezo-electric jetting of solders at temperatures up to 240C. Nitrogen blanket maintained around dispense area to prevent oxidation.

Controller: NanoDispense systems use single board computers running a Linux OS with a real-time application interface. This solves many security, cost, and deployment problems associated with Windows®. The controller can be located some distance from the dispense head or they can be integrated in a single extruded aluminum strut frame.

Host Interfaces: NanoDispense systems incorporate a variety of interface possibilities. We are dedicated to being as OS-agnostic as possible to allow the most flexibility for our customers. We support serial and ethernet communications (including wireless) and communicate with a number of different protocols: RS-232, SOAP, HTTP, FTP, etc.

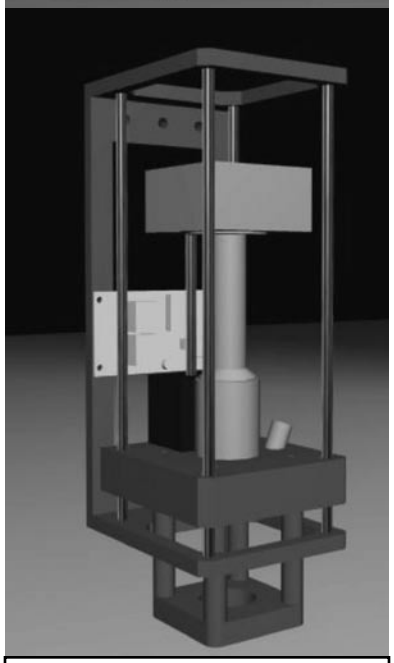
Operator Interfaces: The controller contains a 2×24 character LCD display and a keypad. These allow the operator to run the instrument locally and record numeric data. The primary limitation of this is that no images can be shown. If you add a local monitor, or perhaps touchscreen monitor, then you can see images of drops as they are dispensed. The touchscreen also gives you an easier to use graphics interface than the menu based LCD display.

Drop Volumes: We separate classic microliter drops from small nano and picoliter drops. NanoDispense heads can dispense both types but under different circumstances. Microliter drops are large enough to have their shape distorted by gravity and to *fall off* tips. Nano and picoliter drops are not distorted by gravity and stick to tips rather than falling off. They must be actively detached. Contact angle drops are normally microliter drops but their volume might be only 1µl. Top view drops must have limited volume to not spread outside the image's field of view when the contact angle is low.

Precision dispense drops are whatever volume you request, of course. The limit on the lower end is the intrinsic dispense volume of the jetting device. Roughly speaking, this is the volume of a spherical drop with the diameter of the jetter's orifice. Practical orifice diameters are from 20 to 100 microns. This gives you the following digital volumes:

Diameter	Spherical Volume	Diameter	Spherical Volume
20µm	4.2pl	60µm	113pl
30µm	14.1pl	70µm	180pl
40µm	33.5pl	80µm	268pl
50µm	65pl	100µm	524pl

Multiples of the digitial volume are obtained by sequential dispense at 1000 drops per second. Therefore, if the desired volume does not require more than, say, 50 digital drops, the desired volume is dispensed almost at once and appears as a single sessile drop on the target surface. Larger drops are handled by forming a classic pendant drop on the tip and then detaching it to the surface. These can reach into the microliter range.



First Ten Angstroms, Inc.
465 Dinwiddie Street
Portsmouth, Virginia 23704

1.757.393.1584
www.firsttenangstroms.com
sales@firsttenangstroms.com