

Sciclone iNL-10

Intelligent Liquid Handling System



*Uncompromising Liquid
Handling Performance*

Overview

The Sciclone *iNL-10* is the first generation of *intelligent liquid handling* technologies. It is based on the Zymark Sciclone platform and offers superior liquid handling performance from nanoliters to microliters. Using a MEM's microflowmeter with a built-in feedback control loop. Liquid flow is measured in real time during all liquid handling operations providing exceptional accuracy and precision. This technology enables the *iNL-10* to:

- Aspirate measured volumes of source liquid
- Measure source liquid level
- Dispense measured volumes of source or system fluid with or without direct contact
- Wash cannulas thoroughly using *flow-through* technology
- Handle a large dynamic range: 10nL to 100 μ L
- Vary flow rate up to 10 μ L/sec
- Report actual volume aspirated and dispensed
- Perform a wide variety of self diagnostics functions

Each channel can operate independently, offering the capability to perform one-step serial dilutions, normalization, IC-50s, and other multi-parameter experiments at very high throughput.

96 intelligent channels

The heart of the system is the self-diagnosing microflowmeter feedback controlled liquid handling system applied to each of 96 independent channels. One hundred and ten microprocessors monitor in real time the performance and make “on the fly” adjustments to compensate for variations like temperature, viscosity, that would degrade the low volume performance of other approaches.



Sciclone *iNL-10* platform



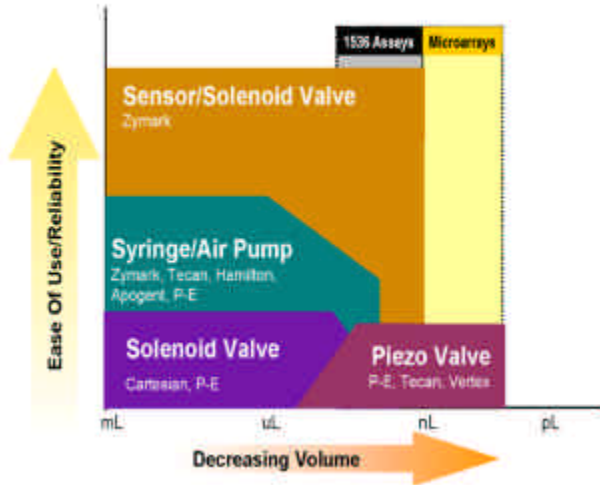
96 channel head with flow meters



Silicon-based flow sensor

Microflowmeter based technology

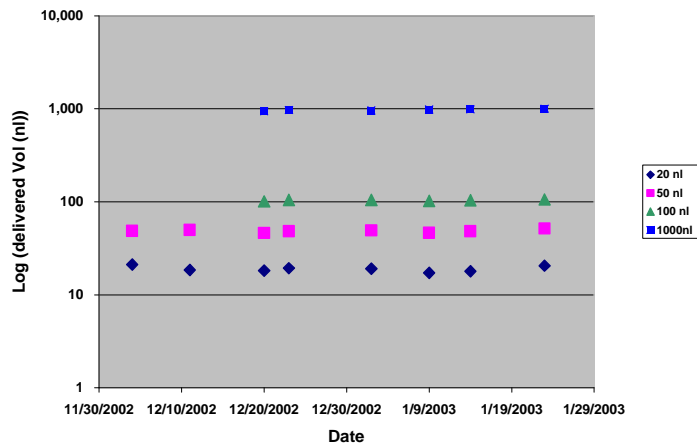
The *iNL-10* liquid handling technology uses an active microflowmeter sensor coupled with a solenoid valve to actuate the flow of liquid. This technology was chosen to give the best performance and reliability when handling very low volumes, as well as to provide a large dynamic volume range. When operating at nanoliter volumes other liquid displacement approaches such as piezo, syringe pump, and solenoid inertial dispensing systems are extremely sensitive to minor variations in temperature/viscosity, system compliance, and mechanical tolerances. These sensitivities greatly reduce accuracy, precision, and long-term reliability.



	Syringe	Solenoid	Piezo	Flowmeter
Factors impacting system accuracy precision and reliability				
Mechanical Tolerances	X	X	X	
Compressibility	X	X	X	
Clogging	X	X	X	
Orifice Uniformity	X	X	X	
Viscosity effects	X	X	X	

Reliability and ease of use without compromising volumetric range

Flowmeter dramatically improves performance over other technologies



60 day Calibration stability

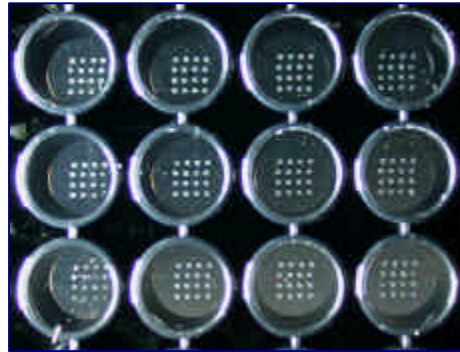


Non-contact dispensing with pinpoint accuracy and speed

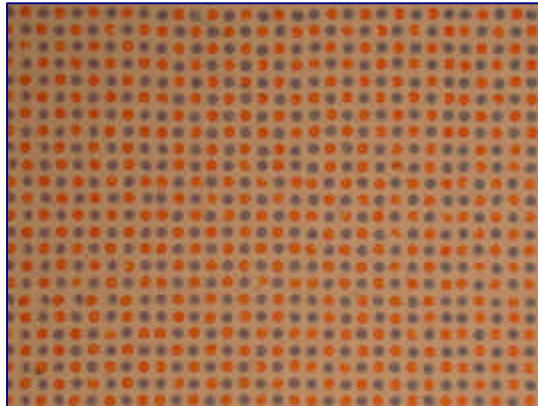
The ceramic nozzles can “shoot” liquids with pinpoint accuracy. It can operate the 96 independent channels individually or simultaneously with lightning speed. The system is compatible with 384-, and 1536-well format, making this technology amenable to precise arraying of nucleic acids, polypeptides, and other solutions.



**Ceramic nozzles
direct flow**



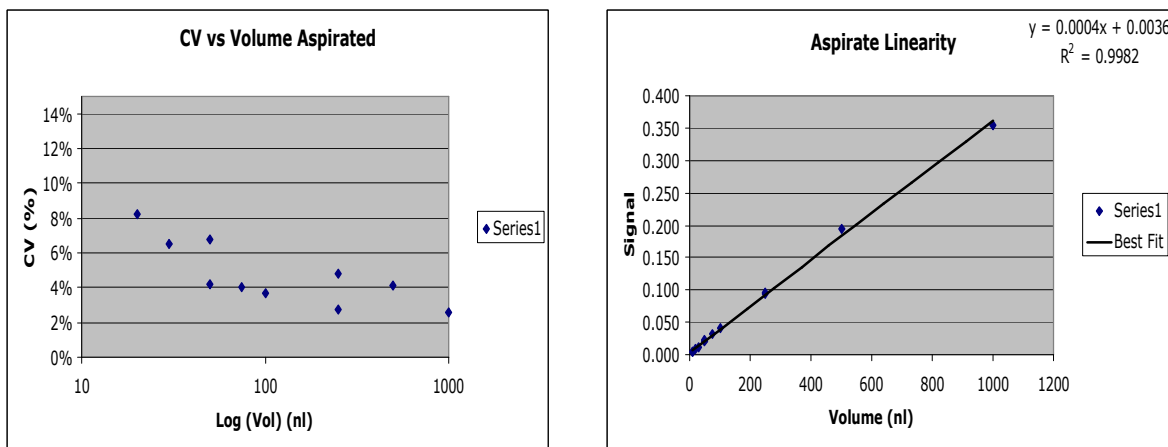
**20nL of protein solution, 0.9mm
spacing printed in a 96 well plate**



**96 spots, 40nL volume
in 140 milliseconds**

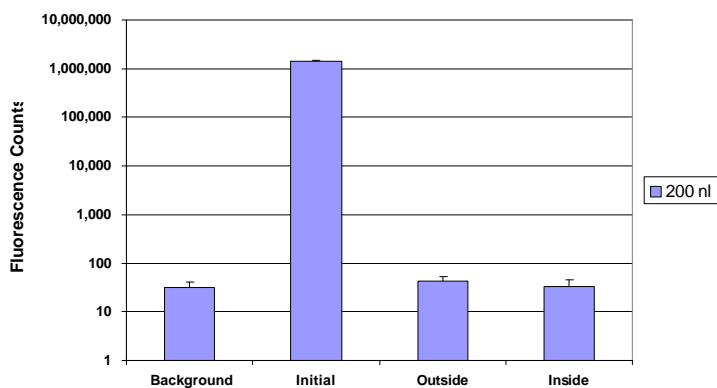
Unparalleled volumetric performance

The microflowmeter feedback control system ensures optimal accuracy and precision through a broad volume range. The design of the fluidic pathway and displacement system minimize the dead volume. The entire sample volume that is aspirated can be dispensed: there is no sample wasted. In addition, the system liquid can flow through the cannulas acting as a wash solvent, permitting rapid and extremely efficient washing.



Typical performance data

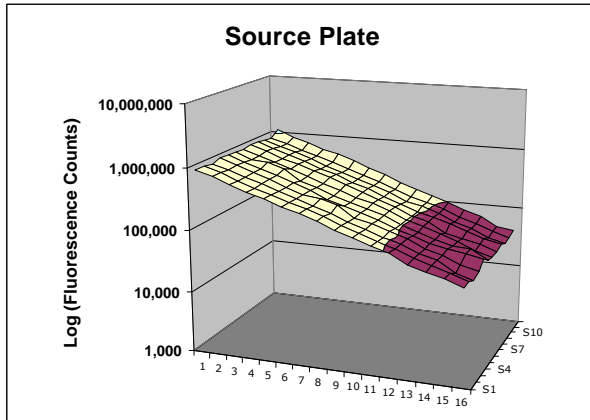
Carryover of 1mM Fluorescein



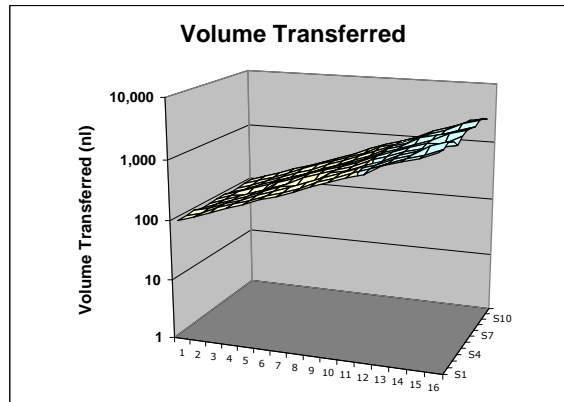
Efficient cannula washing: signal return to baseline after 1 wash cycle

96 independent channel control

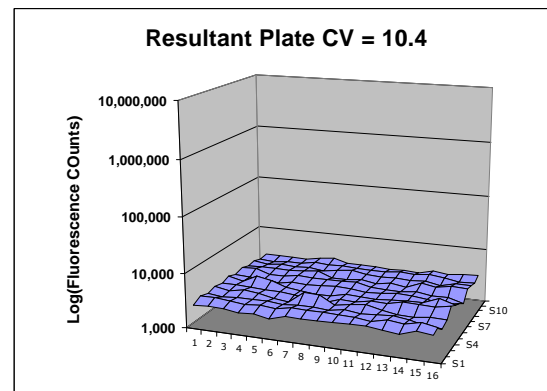
The ability to control all 96 channels independently provides a tremendous amount of application flexibility and speed. For example, the system can perform one-step serial dilutions, normalization, IC-50s, and multi-parameter experiments at very high throughput. The example below illustrates normalization of fluorescence concentration in each well of a 96 well plate. The dilution was performed in *a single step*.



Initial concentration gradient in source plate



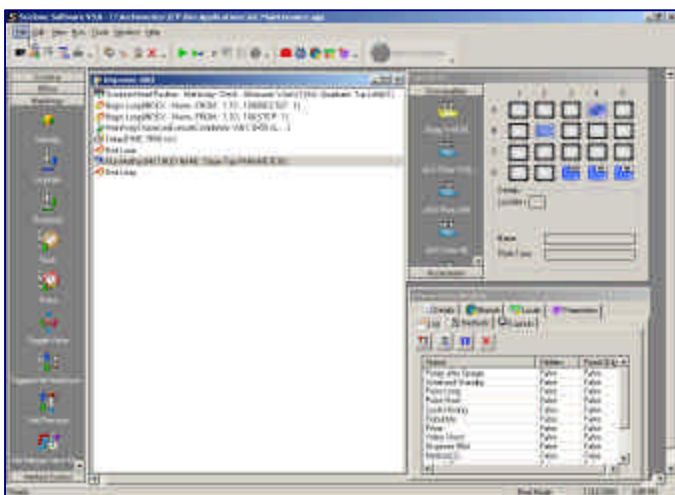
Volume transferred to dilution plate



Normalized concentration

Functionality backed with state of the art user interface

The user interface makes it easy to write and edit methods. Even the most complex routines are simple to script using the method set-up editor. Predefined liquid handling routines are available for insertion. By “dragging” icons of consumables to specific deck layout locations you can easily define the deck configuration. The *consumable library* stores all the information the system will need to perform each method properly. In addition, a *collision avoidance* system keeps track of the objects on the deck to eliminate the possibility of a collision. The performance data from every fluidic transaction can be recorded in a data table where it can be viewed and exported to a spreadsheet.



Method set-up and editing screen

A screenshot of the "Data" dialog box in the software. It features a table with 8 rows (A-H) and 12 columns (1-12). Below the table are "Excel Sheet" options (Import Data, Export Data, Close Sheet) and "Execution Options" (Execute completely, Don't set mode and trigger, Don't trigger).

	1	2	3	4	5	6	7	8	9	10	11	12
A	116	137	133	127	123	132	131	129	128	138	124	126
B	176	206	197	194	193	196	174	194	193	194	200	197
C	249	307	320	296	299	313	317	296	315	308	301	306
D	412	472	479	466	452	492	503	496	411	478	444	449
E	664	769	803	780	724	731	738	728	709	753	720	717
F	1030	1130	1157	1141	1173	1174	1206	1168	1107	1114	1123	1059
G	1573	1648	1626	1731	1949	1824	1831	1898	1765	1766	1790	1824
H	2446	2616	2934	2585	2779	2677	2635	2132	2776	3147	2718	2702

Data collected during a run

For more information or a demonstration of the Sciclone *iNL-10*,
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