

# Biochip Production On The Fly: sciFLEXARRAYER S100 is the ultimate high-throughput production machine for automated non-contact ultra-low volume liquid handling

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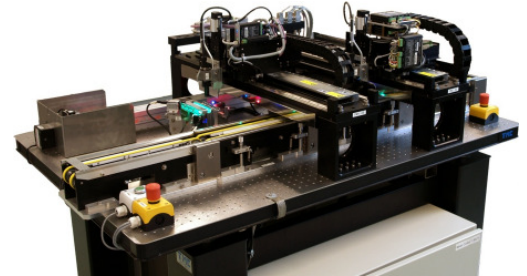
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## Introduction

In biochip based research and development as well as in biochip production, batch-based processes are widely used. Batch processes typically show several disadvantages, with variations in batch-to-batch production quality being the most prominent.

Unlike with our other sciFLEXARRAYER products and with other products available on the market, the targets are moved towards the dispense head mounted on each S100 linear-driven portal and between each S100 portal via a conveyer belt. Each dispense head can be equipped with up to 12 sciSWIFT or sciDROP dispensers. This modularity allows the exact configuration of the system to the production volumes required.

The non-contact dispenser S100 has all the proven advantages of the automated sciFLEXARRAYER product line which allows ultra-low volume liquid handling from pico- to nanoliters.

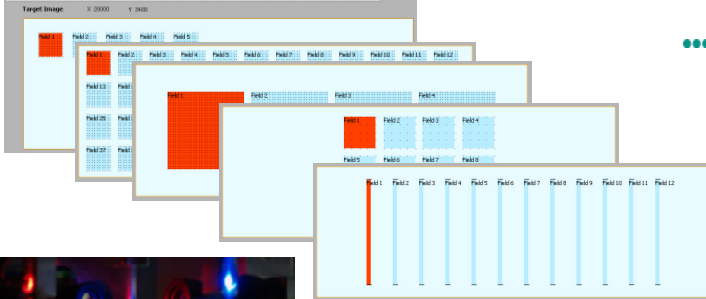


S100 - 2 Portal Production Line

## Work Flow



1. ARRAY DESIGN: The chip layout to be dispensed on the substrate must first be designed. Scienion has developed a software tool to help create any type of array with no limitations as to design. Both arrays and lines can be designed.



2. CLEANING (only sciDROP): Before aspiration, the nozzles must first be cleaned. For the outside surface, the nozzles can be cleaned independently of each other using our FDA (Food and Drug Administration) compatible wash station. For the inside surface, the nozzles are cleaned by flushing them through with system liquid using the syringe pumps. Each nozzle can be actuated with high frequency pulses for better cleaning of both the inside and outside of the glass capillary.



3. ASPIRATION (only sciDROP): After cleaning, the sample is then aspirated from the source plate, normally an MTP plate (96 or 384) or Eppi. The distance between nozzles is 9 mm. The source plate can be cooled or warmed.



4. DROP DETECTION: For quality control, a live 3D camera image is taken of the droplet to analyse its position. This ensures high precision during production

5. SUBSTRATE TRANSPORT: The substrates are transported under a spotting portal via a conveyer belt. A S100 can have up to 12 spotting portals, each with up to 12 dispensers. All portals work independently from one another.



6. PRODUCTION: The substrate is aligned (< 20 μm) by a head camera under each portal. The dispensers can be actuated either sequentially or in parallel. Each sample is spotted precisely onto the substrate without contact to the surface. Production speed is dependent on the array design, but the S100 can normally spot a substrate in under 10 seconds.

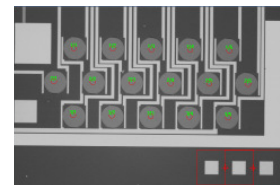
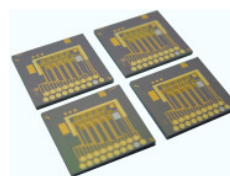
## Process Speed

	1 Portal	2 Portals	4 Portals	12 Portals
<b>Serial Spotting Mode</b>				
1 Nozzle/Portal	10 multiple spots/s	20 spots/s	40 spots/s	120 spots/s
5 Nozzles/Portal	5 samples spots/s	10 samples spots/s	20 samples spots/s	60 samples spots/s
12 Nozzles/Portal	12 samples spots/2s	24 samples spots/2s	48 samples spots/2s	144 samples spots/2s
<b>Parallel Spotting Mode</b>				
5 Nozzles/Portal Parallel	50 spots/s (5x10)	100 spots/s (10x10)	240 spots/s (24x10)	600 spots/s (60x10)
12 Nozzles/Portal Parallel	120 spots/s (12x10)	240 spots/s (24x10)	480 spots/s (48x10)	1440 spots/s (144x10)

## Substrate Alignment\*\*

To ensure accurate spotting onto the target substrate, an alignment system is required for finding the orientation of the substrate. This alignment system includes a camera mounted vertically onto the Z drive of the XYZ portal. There are two methods for target alignment:

1. The substrate has no structure or reference markers (fiducials): in this case the substrate carrier must contain two fiducials - one fiducial for the position and one for the rotation angle.
2. The substrate has a recognisable structure which can be detected by the head camera.



## Dispense Technique

The S100 can handle both sciDROP and sciSWIFT dispensers. Both dispensers are based on Scienion's piezo-actuated picoliter dispense technology.

The sciDROP is a flexible sample dispenser which can aspirate and dispense different samples during a production run using syringe pumps and tubing.

The sciSWIFT\* is a pre-filled picoliter dispenser which does not require a syringe pump or tubing. It can also be used simultaneously as a storage device for samples and reagents over long periods.

Both dispenser types are easy to set-up on the S100 and can also be used in combination.

## Quality Control

The head camera can also be used for QC. After spotting, the camera analyses the existence and quality of the spotted pattern.

