



## *Company Backgrounder*

### Overview

FUJIFILM Dimatix, Inc., a wholly owned subsidiary of FUJIFILM Corporation and the world's leading supplier of piezoelectric drop-on-demand inkjet products used for industrial applications, is driving a revolution in inkjet technology to support a new generation of products used for print production, industrial product decoration, and materials deposition.

The company applies its innovative inkjet technologies and world-class fabrication techniques in the design and manufacture of inkjet printheads, assemblies, components and systems designed to jet a wide range of fluids in precise amounts onto all types of surfaces, including flexible substrates.

FUJIFILM Dimatix customers include OEMs, system integrators and organizations that use the company's state of the art inkjet products or engineering services in building cutting-edge systems or devising manufacturing processes for application in diverse markets worldwide, including graphics, electronics, flat-panel displays, the life sciences, chemistry, 3-D mechanics, optics, food decoration and photovoltaics.

FUJIFILM Dimatix invests heavily in inkjet technology, maintaining one of the most capable inkjet R&D groups in the world, with over one third of its staff actively engaged in product engineering. Over many years, the company has been awarded numerous patents and has developed multiple generations of best-in-class drop-on-demand inkjet printheads.

Founded as Spectra, Inc. in 1984, the company was renamed Dimatix in 2005 to reflect its expansion into digital materials deposition, and was acquired by FUJIFILM Corporation in 2006.

### Locations

FUJIFILM Dimatix is headquartered in Santa Clara, California and maintains product development and manufacturing facilities in Santa Clara, California and Lebanon, New Hampshire. The company sells and supports its products worldwide through offices in North America, Europe, Singapore, Taiwan, Korea, Japan and China.

### Technology

FUJIFILM Dimatix piezoelectric drop-on-demand inkjet printheads are recognized the world over for their ability to sustainably jet ink and many other fluids at high frequencies without trading off drop placement accuracy. This precision at production speed allows every jet on the printhead to operate at high throughput rates with exceptional drop placement accuracy. Known for their high duty cycles and long life, the company's patented printhead products also support the broadest range of ink and fluid types, enabling OEMs and systems integrators to design advanced systems that are fast, reliable and economical.

The following proprietary core technologies make FUJIFILM Dimatix piezoelectric inkjet products distinctive:

- Our **non-shared wall, shear mode actuation** of the piezoelectric material allows us to dedicate to each channel a piezoelectric actuator that is physically isolated from the fluid path. Separating the PZT actuators from often-aggressive jetting fluids allows our printheads to jet a wider variety of fluids used in diverse applications and markets. Our inherently low cross-talk enables all the jets on FUJIFILM Dimatix printheads to be individually addressable – able to fire droplets simultaneously and at high frequencies, straight and true to their intended targets. These critical design differences enable jetting system designs that are faster, more productive and more reliable.
- Our **VersaDrop™ jetting technology** enables each of several hundred nozzles in one or more printhead arrays to deliver from 10 to 30 or 30 to 80 picoliters (pL) in each drop of ink. In its simplest implementation, all the nozzles of a printhead or jet module could be programmed to fire the same size drop on every cycle, allowing a single system design to handle a wide range of common printing resolutions. VersaDrop™ technology also supports grayscale capability. By programming specific channels to fire different size drops at different times, the technology can be used to print job components requiring more tonal expression or higher resolution while operating at the printer's rated speed.
- Our **Shaped Piezo Silicon™** technology uses MicroElectroMechanical Systems (MEMS) fabrication techniques to develop printhead families that are significantly smaller and more versatile. These silicon MEMS-based printhead products provide more precise control over nozzle shape, and absolute position on the silicon die permits higher drop placement accuracy over greater throw distances. The robust silicon structure lends itself to solid, reliable operation and long service life – all of which are desirable attributes for building new printer architectures and opening up new applications.
- Our **deaeration technology** removes air bubbles from the fluid supply reservoir to ensure fast, reliable machine startup and sustained, high frequency jetting required for high-speed printing and fluid materials deposition.

### Printhead Products

FUJIFILM Dimatix pioneered industrial inkjet technology in 1984 with the inception of its first generation printhead, which was used for wide-format printing, display graphics, and industrial marking and coding. Today, the company's products comprise seven product families: Spectra® Galaxy, Spectra® Nova, Spectra® S-Class, Spectra® Skywalker, Q-Class, Spectra® Polaris and SAMBA™. These products can be configured as printhead assemblies, or in some cases, as printhead arrays or basic jetting modules.

#### **Spectra® Galaxy and Nova**

The Spectra® Galaxy and Spectra® Nova printheads provide 256 inline, individually addressable nozzles with droplet sizes of 30 to 80 pL. These support a wide range of viscous fluids including hot melt, solvent-based, aqueous and UV-curable inks used in graphics, marking, textile manufacturing and other applications.

#### **Spectra® S-Class**

The Spectra® S-Class family provides 128 inline, individually addressable nozzles with droplet sizes from 30 to 80 pL. Three different printhead designs: the SL-128 (80 pL), the SM-128 (50 pL), and the SE-128 (30 pL) are suitable for a broad range of graphics applications.

### **Spectra® Skywalker**

The Spectra® Skywalker JA 128/50 is a high performance printhead with 128 individually addressable inline nozzles producing a droplet size of 50 pL. It is designed for OEMS to develop high-speed, value priced systems for printing wide-format graphics using solvent-based inks.

### **Q-Class**

The Q-Class is FUJIFILM Dimatix' new piezoelectric drop-on-demand inkjet platform around which a new family of printheads and head arrays for high speed scanning and single pass printer architectures is being built. The low crosstalk and excellent channel-to-channel uniformity of their advanced carbon-silicon hybrid construction allows Q-Class printheads to deliver unparalleled jetting straightness at firing frequencies up to 50kHz while supporting both binary and grayscale VersaDrop™ operation. Their high chemical resistance and precision enables reliable jetting of UV-curable, organic solvent and aqueous ink formulations onto a broad range of substrates.

- **Sapphire**

Sapphire hybrid printhead provide 256 inline, individually addressable nozzles with fundamental droplet sizes of 10 and 30 pL. Two different printhead designs – the Sapphire QS-256/30 (30 pL) and the Spectra® Sapphire QS-256/10 (10 pL) – are suited to jetting solvent-based and UV-curable inks across a broad range of graphics applications. Both models support myriad VersaDrop™ operating modes with unprecedented throughput.

- **ScanPAQ 2.5 Head Array**

The first high-level assembly of Sapphire printheads is the ScanPAQ 2.5 Head Array, a ready-to-integrate quad printhead assembly in a 2.5 inch print width, providing 1024 nozzles each able to deliver a desired amount of fluid in each ink droplet at unprecedented throughput rates.

### **Spectra® Polaris**

Featuring a field-repairable design, the Spectra® Polaris PQ-512/15 inkjet printhead taps Q-Class hybrid construction and combines it with VersaDrop™ binary jetting to deliver 15- to 30-picoliter ink drop sizes from 512 individually addressable inkjet nozzles at continuous frequencies up to 45 kHz with exceptional straightness. Its flexible fluid interface, allowing single or two-color operation with a broad range of inks including UV-curable inks and aggressive organic solvents, make the Spectra® Polaris PQ-512/15 suitable for a broad range of commercial and industrial printing applications at resolutions to 1000 dpi.

### **SAMBA™ Printhead Technology**

Developed jointly by FUJIFILM Dimatix and FUJIFILM Corporation, SAMBA™ printhead technology utilizes Dimatix' proprietary silicon MEMS fabrication methods, VersaDrop™ multi-pulsing jetting capability and Meniscus Replenishment Technology. Collectively, these technologies and other innovations enable printhead nozzles to be arranged in a matrix array with improved meniscus formation and ink recirculation to provide unparalleled stability, uniformity, maintainability and scalability in a compact package.

SAMBA™ printhead technology delivers the breakthrough quality, speed and scalability required for wide-width single pass production inkjet printing and materials deposition applications. The first implementation of SAMBA™ inkjet technology is in a parallelogram-shaped "printhead on a chip" that measures a mere 45 mm deep, packs 2048 jets per

module at 1200 dot-per-inch spacing, and is capable of pulsing fluids in industry-first native drop volume of 2 picoliters at up to 100 kHz – the highest jetting frequencies yet developed.

### Materials Deposition Products

FUJIFILM Dimatix also offers precision printhead products and systems for micro-jetting picoliter-sized droplets of a broad range of functional fluids – from liquid silver to organic "inks" – onto all types of surfaces, from flat panel displays and flexible electronic circuits to DNA arrays for the biosciences.

The **Dimatix Materials Printer (DMP)** is a line of materials deposition systems designed for micro-precision jetting of a variety of functional fluids onto virtually any surface. DMP systems employ single-use cartridges that researchers can fill with their own fluid materials to minimize waste of expensive fluid materials and reduce the cost and complexity associated with traditional product development and prototyping.

- The **DMP-2800** is a turnkey bench-top materials deposition system designed to facilitate developing and testing manufacturing processes as well as product prototypes. It features micro-precision jetting of a variety of functional fluids onto virtually any surface including plastic, glass, ceramics, and silicon, as well as flexible substrates from membranes, gels and thin films to paper products. The DMP-2800 can build and define patterns over an area of 200 x 300 mm and on substrates up to 25 mm thick.
- The **DMP-3000** is a complete materials deposition system ideally suited to meet the needs of printed electronics research and development activities. It features a printable area of 300 x 300 mm and maintains a positional accuracy and repeatability of  $\pm 5 \mu\text{m}$  and  $\pm 1 \mu\text{m}$ , respectively. The DMP-3000 also features the ability to jet a wide range of functional fluids in drop sizes from 1 pL to 35 pL using multiple FUJIFILM Dimatix fluid deposition printheads and cartridges interchangeably.

The **Dimatix Materials Cartridge** is a cartridge-based inkjet printhead used with DMP systems and available in 1 pL and 10 pL drop volumes. Based on FUJIFILM Dimatix' proprietary Shaped Piezo Silicon™ MEMS technology, the 16-jet Dimatix Materials Cartridge is designed for high-resolution, non-contact jetting of functional fluids in a broad range of applications.

The industry-first 1 pL cartridge can deposit features as small as 20  $\mu\text{m}$  (20 millionths of a meter) to fabricate products such as organic thin-film transistors (TFTs) and printed circuits. In biotechnology, the Dimatix Materials Cartridge allows researchers to closely pack large numbers of elements in DNA arrays, to permit more accurate and efficient analyses. FUJIFILM Dimatix has shipped more than 50,000 Dimatix Materials Cartridges since its introduction.

The **SX3 Printhead** is a highly compact and lightweight hybrid jetting assembly designed specifically for micro-fluid deposition. The SX3 delivers a precise 10 pL drop size through 128 inline jets that can be individually tuned. A silicon nozzle plate with a non-wetting coating is compatible with the aggressive fluids used in electronics and other fabrication applications.

The **SE3 Printhead** similar to the SX3 is a compact and lightweight hybrid jetting assembly designed for precise drop placement of a slightly larger drop. The SE3 delivers a 35 pL calibrated drop size through 128 inline jets that can be individually tuned. The silicon

nozzle plate has a non-wetting coating and is compatible with the aggressive fluids used in electronics and other fabrication applications.

### Technology Integration Solutions

FUJIFILM Dimatix formed Dimatix Technology Integration (DTI) in 2002 as an engineering group to assist industrial end-users whose unique requirements were not addressed by commercially available inkjet printing systems.

To support a diverse set of industrial customers, DTI today provides a range of engineering services and inkjet systems based on FUJIFILM Dimatix' proprietary printhead technology. These products and services enhance our customer's manufacturing processes, giving them a competitive edge.

### **Engineering Services**

DTI is staffed by focused teams of mechanical, electrical, chemical and software engineers to help companies integrate FUJIFILM Dimatix inkjet technology into their unique manufacturing processes.

These services can range from conducting initial feasibility work, to providing broad assistance in designing, building and supporting production solutions based on FUJIFILM Dimatix' proprietary printhead technology.

Many of the systems DTI designs, builds and supports are unique as a result of being embedded in manufacturers' production lines. These "secondary processes" often add value to the customer's product, or enhance their production process – or both.

Components include controllers, head clusters, electronic triggers, loading mechanisms, and custom fluids. The DTI group also offers complete production systems for sale. These include configurations of **Merlin™** controllers for driving industrial systems designed for non-impact variable imaging and decoration of food products using edible food grade colorants.

For food decoration – which is a DTI strength – DTI offers a line of specially formulated FDA-compliant and Kosher certified **Tapestry™ Food Colorants**, which are designed and certified to print on a variety of food products, including chocolate.

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For more information, visit [www.dimatix.com](http://www.dimatix.com).

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