

# White Paper



May 2016

## High-speed Inkjet Innovation: Delphax elan 500

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InfoTrends

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## Executive Summary

High-speed color inkjet products have entered the market and are operating at high productivity and low running cost levels. They have mostly been successful in continuous-feed designs that cost more than a million dollars. That being said, a new class of products is entering the market at lower price points. This is opening up opportunities for print service providers in new and exciting ways.

One example of this class of products is the Delphax elan 500, a cut-sheet color inkjet printer capable of handling sheets sizes much larger than most production color digital print products. The elan 500 is disruptive because of its capital acquisition and running costs, its unique format, its speed, and its suitability for a range of print applications.

## Key Findings

- InfoTrends defines the ‘Zone of Disruption’ as the class of high-speed and cost-effective color inkjet products with acquisition prices less than \$1 million USD, high levels of productivity, and a running cost model below that of toner-based products.
- With a list price of \$595,000 and speeds up to 500 letter images per minute, the Delphax elan 500 fits squarely in the Zone of Disruption.
- Early elan 500 users, like Prime Data, Inc. (an innovative Canadian provider of data-driven marketing services), have leveraged the product’s capabilities to automate production, thereby eliminating pre-printed offset shells and taking advantage of the ability to use variable color in innovative ways.
- The larger format size of the Delphax elan 500 opens up some production and application opportunities that are not possible with smaller format devices (for example, two-up impositions of legal size direct mail pieces).
- In addition to format, other key differentiators of the elan 500 include its high-speed Memjet inkjet print heads, its optional ability to print up to six colors or effects (including MICR), and its configurability for special applications.

## Recommendations

- Users interested in inkjet need to identify the right application fit. Inkjet technology has significant advantages for direct mail, financial documents (like bills and statements), and books, particularly on uncoated papers with lower ink coverage. Innovative users are also finding other applications to help drive volume.
- Print service providers should take advantage of the benefits of high-volume color digital print for offset pre-printed shell replacement, effective use of variable content, and the ability to produce applications, either on demand or just-in-time.
- Print service providers using inkjet need to work closely with their customers (and the designers who submit files) to ensure that they understand the production requirements.

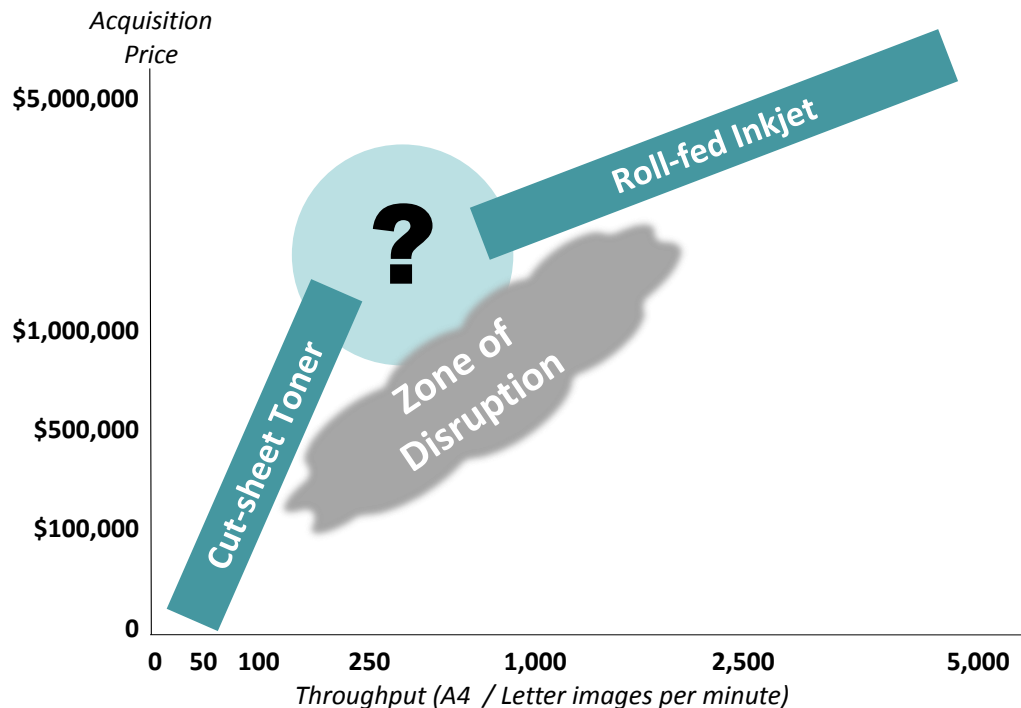
## Introduction

The high speed and productivity of a new class of inkjet printing systems are transforming the digital print market. The first inkjet products were very high-volume continuous-feed (i.e., roll-fed) systems capable of producing tens of millions of impressions per month. These devices have had a huge impact on the market, but not too many companies can afford the large capital acquisition cost associated with them (nor do they have the volume to support them). Recently, more affordable systems are entering the market, with acquisition prices and running costs that make them very attractive to a range of users. In this sponsored white paper, InfoTrends explores the market trends driving users to cost-effective inkjet solutions like the Delphax elan 500.

## Cut-sheet Color Inkjet and the Zone of Disruption

The speeds and productivity levels of continuous-feed color inkjet systems are indeed very impressive. In fact, they are comparable to the speed of sheet-fed offset presses. Getting to that level of productivity has symbolical importance, because it means that digital print has moved to a new level beyond simple short runs and quick turnaround work. This has created two classes of digital print with a divide in between.

**Figure 1: The Zone of Disruption**



Source: InfoTrends

When typical color digital printing systems are graphed, with acquisition cost on one axis and throughput on the other, two main categories are clearly delineated: (1) cut-sheet toner and (2) continuous-feed inkjet. Devices in the cut-sheet toner category typically have speeds of less than 200 images per minute (ipm) and are used for low to mid-

volume short-run, quick turnaround, and print-on-demand work. Devices in the continuous-feed inkjet category today can produce up to 600 dpi resolution (and sometimes higher) at high speed and very high volume. There is a gap of unmet need between these two areas, and underneath that gap is an area that InfoTrends calls the 'Zone of Disruption.'

Within the Zone of Disruption there are major opportunities for high-speed color inkjet products that have high levels of productivity, competitive running cost, and an acquisition price less than \$1 million. These opportunities are:

- **Offset preprint replacement**– Just as monochrome electrophotographic continuous-feed printers are being replaced by color inkjet ones, so too is there a comparable opportunity with cut-sheet. There is a large installed base of monochrome electrophotographic products that are focused mainly on mail applications, such as transactional print and direct marketing. Many of these sites are using offset-printed shells (i.e., pre-printed forms) for the color component of the document and are then 'lasering' on the variable data. This is a technology nightmare for the monochrome cut-sheet toner devices, since ink from the pre-printed shells may transfer to imaging or fusing components, causing service issues. To be able to print 'white paper in, full color out' with compelling cost metrics, using inkjet, avoids this dilemma. In addition, it eliminates the logistic nightmare of keeping preprinted stock up-to-date and in sufficient quantities.
- **Cost effective production of mixed black & white and color content** – End users balk at paying a premium for documents printed on color devices, particularly when the document may include significant subsections of monochrome content. The ability to produce monochrome, light coverage color, and full color pages cost-effectively, using a single device, is very desirable in the production market. It has happened already for continuous feed. Now is the time for it to happen for cut sheet.
- **On demand / Just in time production** – Digital print is very well suited to the on-demand or just-in-time production of promotional and publication applications, yet the run lengths, volume levels, and range of required substrates can make it difficult to address these workflows with continuous feed devices. A cut-sheet inkjet device could bring a strong level of application flexibility to on-demand and just-in-time production workflows at more competitive cost levels than color electrophotography.
- **Filling the cost / productivity gap** – Products with a relatively low cost of acquisition, but which have a high level of productivity, have a disruptive opportunity between the high end of cut-sheet color electrophotographic products and the low end of continuous-feed color inkjet systems. The key is that the system's cost, productivity, and quality levels should be appropriate for the target application.

## Enter the Delphax elan 500

First shown in concept design at drupa in 2012, the Delphax elan 500 is a production color inkjet system capable of speeds of up to 500 letter-sized images per minute. With a larger maximum sheet size<sup>1</sup> than most competitive products, the elan 500 can print multi-up impositions at a range of sizes. The core of the imaging technology is provided by Delphax's partner Memjet, which makes the thermal inkjet printheads and water-based dye inks for the elan 500. The system is designed so that inks can be replaced while the device is running. A 5,000-sheet feeder and a 5,000-sheet stacker provide input and output capacity suitable for high-volume production. On average, the fully-loaded sheet feeder provides approximately 39 minutes of continuous running. The sheet feeder was developed by Delphax partner BDT, whose Tornado airflow-based media handling technology supports a variety of substrate types, sizes, and weights.

**Figure 2: The Delphax elan 500**



*Photo courtesy of Delphax*

The front-end system for the Delphax elan 500 is capable of outputting full-color data to support the device's 500 page-per-minute speed. At 1,600 by 800 dot-per-inch resolution, this amounts to almost 600 MB of image data per second. Addressing this amount of data is a challenge. In the past, systems may have pre-rasterized the jobs or used templated methods to merge variable data with static elements. In designing the front-end system for elan, Delphax's goal was to allow the processing of any job (even single copy publishing applications) at the system speed, without any need to cache data. To this end, Delphax worked with Global Graphics, whose Harlequin Host Renderer (HHR) raster image processor (RIP) is at the core of the system's PDF interpretation. (The product supports PDF, PDF/X, and PDF/VT). The distributed processing system for elan uses multiple RIPs that run in parallel to provide image data at the printer's rated speed. A typical configuration for elan's front-end system can contain between five and nine RIP engines (the number depends upon the application type and user needs). The system is scalable. More RIPs can be added, as required by the customer.

Another aspect of the front-end is the System Administrator, which manages the scheduling of the production run, load balances between multiple elan systems, and

<sup>1</sup> At 18 by 26 inches (457 by 660 millimeters), its maximum sheet size is somewhat larger than SRA2. See the Appendix for an overview of sheet sizes for digital print.

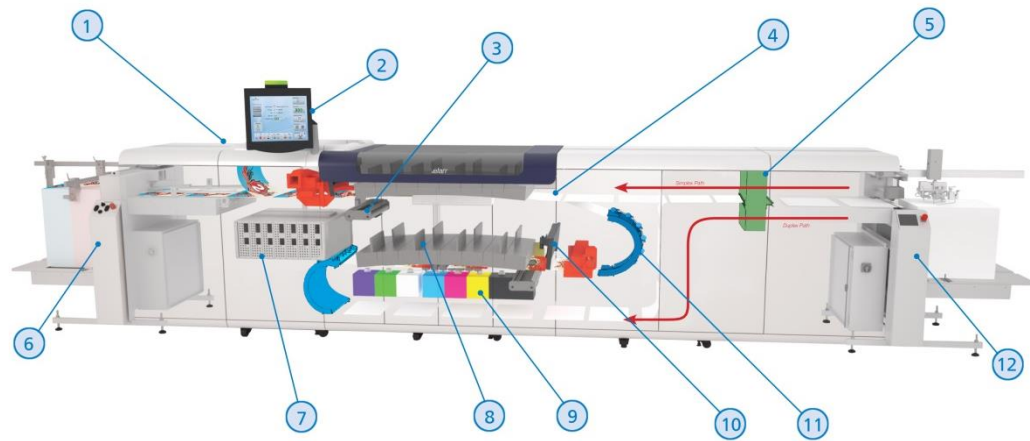
facilitates the storage of configuration information and media profiles. This is a browser-based application that is the hub of the production/pre-press interface. The System Administrator allows each prepress team to define key aspects of a job, and thereby automate its production. This can be achieved through the job submission interface or can be automated via hot folders to allow a hands-off workflow. Delphax also provides media profiling tools and training for its users.

Options include:

- Support for a 5<sup>th</sup> and 6<sup>th</sup> print station for spot colors and special effects, including MICR
- A primer option to expand substrate compatibility is currently under development
- Third-party support for other data stream requirements, including AFP, IPDS, PCL, Metacode, VIPP, and PostScript through integration with third party solutions

Target markets for the elan 500 include transactional and TransPromo documents, books, direct mail, security documents, as well as graphic arts applications like sell sheets, brochures, booklets, reports, and posters.

**Figure 3: A Cut-away Shot of the Delphax elan 500**



- |                                 |                          |                              |                                  |
|---------------------------------|--------------------------|------------------------------|----------------------------------|
| 1. Proof tray                   | 2. Press console         | 3. Transport cleaning system | 4. Electrostatic paper transport |
| 5. Paper cleaning system        | 6. High-capacity stacker | 7. Scalable RIP platform     | 8. Print engine                  |
| 9. High-capacity ink containers | 10. Camera system        | 11. Paper registration       | 12. High-capacity feeder         |

*Image courtesy of Delphax*

In addition, Delphax’s research and development team continues to work on innovations. As one example, Delphax anticipates that system improvements in the controller will enable higher speed capability for the product platform in the not-too-distant future.

**Table 1: Delphax elan 500 Specifications**

<b>Metric</b>	<b>Description</b>
System Type	Cut-sheet color inkjet printer supporting up to six colors (CMYK plus two spot colors or MICR)
Speed	Up to 500 letter ipm
Duty Cycle	Up to five million letter images per month
Printheads and Process Speed	Memjet thermal inkjet heads supporting two speed settings: High Quality: 1,600 by 1,600 dot per inch (dpi) at 350 mm/sec Normal Quality: 1,600 by 800 dpi at 700 mm/sec
Ink Type and Drop Size	Aqueous (water-based) dye, 1.4 picoliters
Maximum Print Width	17.36" (441 mm) continuous (Heads can be separated for two smaller discontinuous 8.77" (222.7 mm) print widths)
Media Weight Range	Simplex Paper Path: 75 to 350 gsm (20 lb. bond to 130 lb. cover) Duplex Paper Path: 75 to 240 gsm (20 lb. bond to 90 lb. cover) Note: Lighter weight materials may be used, subject to testing.
Maximum Sheet Size	18" x 26" (457 mm x 660 mm) Larger format is possible as a custom configuration
Minimum Sheet Size	8" x 8" (203.2 mm x 203.2 mm)
Input Capacity	Up to 5,000 sheets (75 gsm) with the high-capacity feeder Optional: Roll to sheet feeder Third party multi-bin solutions available upon request
Maximum Output Capacity	Up to 5,000 sheets (75 gsm) with the high-capacity stacker Optional: Shingle conveyor and/ or slitter Third party solutions such as folders, binders, and UV coaters available upon request
Size	5' x 24' x 4' (1.5 m x 7.3 m x 1.2 m) Height x Length x Depth (with feeder and stacker)
Weight	4,409 lb. (2,000 kg.)
Digital Front End	Global Graphics HHR RIP technology with Delphax elan real-time RIP for PDF workflow Support for AFP, IPDS, PCL, Metacode, VIPP, PostScript, and other datastreams through integration with third-party solutions
System List Price	\$595,000
Configuration Includes:	Digital front end, four-color print engine, high-capacity stacker, and high-capacity feeder



### Strengths, Weaknesses, Opportunities, and Threats

When looking at any production digital print device, InfoTrends discerns the product’s strengths, weaknesses, opportunities, and threats (SWOT).

**Table 2: SWOT Analysis of the Delphax elan 500**

Strength	Weakness
<ul style="list-style-type: none"> <li>• Affordable inkjet in the Zone of Disruption</li> <li>• High speed up to 500 letter images per minute</li> <li>• 1,600 dot-per-inch resolution and the quality levels associated with that</li> <li>• Format flexibility, including sheets up to 18” x 26” (SRA2+)</li> <li>• Compact footprint</li> <li>• Up to six colors, including MICR</li> </ul>	<ul style="list-style-type: none"> <li>• The elan 500’s inkjet head array is not wide enough for those users that require the full B2 format</li> <li>• Lack of a pigment-based ink (though one is in development)</li> </ul>
Opportunity	Threat
<ul style="list-style-type: none"> <li>• Monochrome to color conversion; pre-printed form replacement; cost-effective mixed color and black &amp; white output</li> <li>• Process automation</li> <li>• Meeting the needs of users who do not need continuous-feed inkjet</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing competition in the Zone of Disruption</li> </ul>

### An Early User of the Delphax elan 500: Prime Data, Inc.

One of the first Delphax elan 500 customers, and the first in Canada, is Prime Data, Inc., which is located in Aurora, Ontario (near Toronto). Prime Data is an innovative provider of data-driven marketing solutions. Founded in 1998, Prime Data works with a variety of businesses (including technology companies, marketing agencies, and franchises) and not-for-profits (hospitals and environmental groups) to leverage analytics-based variable communications. These campaigns are then measured for success, so that Prime Data’s customers can be assured of building and extending their client and donor relationships.



Prior to the arrival of the elan 500, if a variable data print job was long, the printing of the static color shells had to be jobbed out. Prime Data does have a four-color Presstek 52DI direct-to-plate waterless offset press that they can print short to mid-range runs on, but

that is for static print only. Black-only variable data was added using monochrome toner Konica Minolta devices.

Prime Data wanted to be able to provide its customers with better campaign return-on-investment (ROI), with affordable inkjet full-color variable data printing for markets like fundraising, automotive, healthcare, and other verticals requiring relationship-driven communications. Moving to a one-step process without pre-printed offset color shells opens up the path to easier and timelier fully variable printed campaigns. In addition, given that run lengths in Canada tend to be relatively short compared to the United States, the need for a highly productive digital color method was important, in order to be able to serve Canadian clients effectively. It was also important to be able to provide variable color.

Steve Falk, the company's President and owner, was intrigued by the technology developments surrounding high-speed color inkjet systems, but he was not inclined to pay a large price to acquire such a system. He wanted affordable inkjet. His research brought him to Delphax, which has a facility in nearby Mississauga, Ontario. The result: variable data color inkjet printing arrived at Prime Data in June of 2015, with the installation of a new Delphax elan 500. Among the many entertaining and informative videos produced by Prime Data is [one that documents the installation of this device](#).

Prime Data's impetus for selecting the elan 500 was their fund-raising clientele. For these clients' campaigns, Prime Data previously used pre-printed offset shells and then added monochrome variable data, using a toner-based printer. The use of pre-printed shells limited the flexibility of the process, diminished overall creativity, and restricted Prime Data's ability to test improved personalization concepts. The use of these shells added days to the process of executing a mail campaign. In [another Prime Data video](#), the company shows how a five-day process could be compressed into a single morning using variable data inkjet, thus eliminating pre-printed offset shells.

Delphax's elan 500 supports a maximum sheet size of 18" x 26" (457 mm x 660 mm) and a maximum print width of 17.36" (441 mm). For Prime Data, it is the print width that is essential. A significant portion of the company's output is printed on 14" by 17" sheets that it then cuts to size. This allows two legal-size (8.5" by 14") sheets to be printed side by side. This format lends itself to designs with a letter-size (8.5" by 11") page with a tear-off coupon. Prime Data also prints a fair amount of output in 11" by 17" or 12" by 18" sizes. The paper weight used is typically 60 lb. offset stock. With premium papers, some very high quality levels are possible on the elan 500. Nevertheless, non-profits do not want their donors questioning what might appear to be extravagant printing, and therefore the highest quality papers and printing are not typically chosen by Prime Data customers. In addition, Prime Data believes that, if a customer is undertaking a data-driven campaign,

it is the effective use of data to personalize a message that has the biggest impact on results, not the print quality.

For Prime Data and its customers, the importance of print in fund-raising campaigns is underscored by recent data from [the Blackbaud report on charitable giving](#). This data notes that less than 8% of donations are given online.

Prime Data's clients like to use the full color variable. The company already had monochrome and color electrophotographic digital print, which they continue to use. In part, these devices are there for redundancy and peak volume times, but there are also some higher coverage applications on coated stocks that are currently better suited for color electrophotography (particularly if the runs are shorter and variable). For its inkjet output, the typical total CMYK coverage is about 15%. Run lengths for campaigns run the gamut, from 10,000 to 200,000, with many in the range between 30,000 and 40,000 pieces. Prime Data does finishing off-line for functions like slitting, trimming, perforating, folding, sealing, and insertion. Tables on wheels are used to move the print piles from the printer to the finishing stations.

Prime Data has trained existing employees to run the elan 500, including their Presstek DI operator and one of their monochrome digital print operators. Steve Falk notes that it is important for the operator to have a good understanding of prepress and flight checking, since the nature of Prime Data's business means that twenty to thirty graphic designers are providing work on a monthly basis. Not all of these third-party designers are up to speed on what it takes to create a true print-ready file, so the operator has to be able to manipulate the files that are sent.

"Burst" capacity for high-volume production is also important for Prime Data, since the job volume tends to be cyclical, with much of the volume coming in abbreviated production windows. For example, it tends to be busier in the fall and early in the year, while the summer is relatively quiet. The ability to use variable color effectively on the front and back sides of printed campaigns, without having to pre-print versions of shells, is another advantage that full-color digital has over the use of pre-printed shells.

Prime Data is a direct mail leader in the Canadian market. In 2012, the company was designated as a Canada Post Expert Partner. In 2015, the company was awarded the Top Performer Award for Excellence in Direct Mail Growth. Upon presenting the Top Performer award, Deepak Chopra, the CEO of Canada Post, described Steve Falk as "One of the best, if not the best, evangelists of the power of mail in moving hearts." Prime Data is a good example of what Canada Post calls "[Smartmail Marketing: The Science of Activation](#)." Canada Post describes Smartmail Marketing as a powerful mix of the physicality of print, the power of data, and the connectivity of multiple media channels.

Regarding the future of Prime Data, Steve Falk sees opportunity in the way that print can be responsive to digital customer relationships. Traditional digital marketing strategies

are struggling. With the increasing use of ad blockers and low open rates in email, there are new opportunities for print and mail to communicate in the marketing ecosystem. To achieve this requires companies with the ability to maximize workflow, with automation to aggregate volume and produce innovative campaigns. For Prime Data, the addition of its Delphax elan 500 puts it in a strong position to meet the needs of these growing data-driven variable color print opportunities.

### **InfoTrends' Opinion**

Inkjet technologies are having a disruptive effect on the market because of their speed, productivity, and running cost. This advances the capabilities of digital print to higher volume applications with a broader impact. The speed and running cost will move some volume, from toner-based devices to inkjet ones, but, more importantly, this trend allows users to transition from black & white volume to color, to create more effective and personalized promotional and transactional documents, to streamline production through automated processes, and to manufacture print with efficient, just-in-time methods. Offering these values of digital print at an affordable acquisition price is an important change in the status quo. By entering the Zone of Disruption with the elan 500, Delphax is opening up new opportunities for end users who previously could not take part in the inkjet revolution. It is an important step, and one that users like Prime Data are leveraging to help their customers succeed.

This material is prepared specifically for clients of InfoTrends, Inc. The opinions expressed represent our interpretation and analysis of information generally available to the public or released by responsible individuals in the subject companies. We believe that the sources of information on which our material is based are reliable and we have applied our best professional judgment to the data obtained.

## Appendix

Most cut-sheet digital printing has been for smaller paper sizes, generally B3 or smaller. This table below identifies the sizes of the B1 and B2 format standards, and also includes press terminology that is commonly associated with those formats. With a maximum sheet size of 18" x 26" (457 mm x 660 mm) and a maximum print width of 17.36" (441 mm), the Delphax elan 500 supports a paper size much larger than B3, yet somewhat smaller than B2.

**Table A-1: The B1, B2, and B3 Standard Formats and Terminology**

Name	Size (mm)	Size (inches)	Terminology
B1	707 x 1,000	27.8 x 39.4	8-up, 40-inch
B2	500 x 707	19.7 x 27.8	4-up, 29-inch
B3	353 x 500	13.9 x 19.7	2-up, 20-inch

There are also some sizes that are commonly associated with digital printing, since they are related to sizes typically used on that class of devices.

**Table A-2: Common Digital Print Formats**

Name	Size (mm)	Size (inches)
A4	210 x 297	8.27 x 11.69
Letter	216 x 279	8.5 x 11
Legal	216 x 356	8.5 x 14
A3	297 x 420	11.69 x 16.54
Ledger/Tabloid	279 x 432	11 x 17
Arch B	305 x 457	12 x 18

*Note: Some vendors use the term A3+ to describe paper size larger than A3 and including up to 12" by 18", or even larger.*

With the introduction of products like the Delphax elan, some cut-sheet digital print offerings now support sizes approaching B2 and even larger.

SRA2 is the standard size that is closest to the maximum sheet size supported by the Delphax elan 500. The elan's format is somewhat larger than SRA2.

**Table A-3: SRA2 and the Delphax elan Maximum Sheet Size**

Name	Size (mm)	Size (inches)
SRA2	450 x 640	17.7 x 25.2
Delphax elan	457 x 660	18 x 26

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