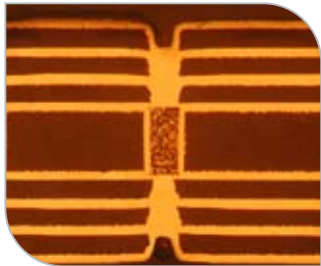


# *Paragon™ Family Laser Direct Imaging Solutions*



# Paragon™ Family

Orbotech's Paragon family of Laser Direct Imaging (LDI) systems provides powerful performance for high-volume imaging of HDI, Flex and Rigid-Flex applications. Paragon leverages Large Scan Optics (LSO) Technology™, and a combination of high LDI throughput and registration accuracy for superior imaging results of even the most challenging PCB applications.



High accuracy leading to minimal offset between layers



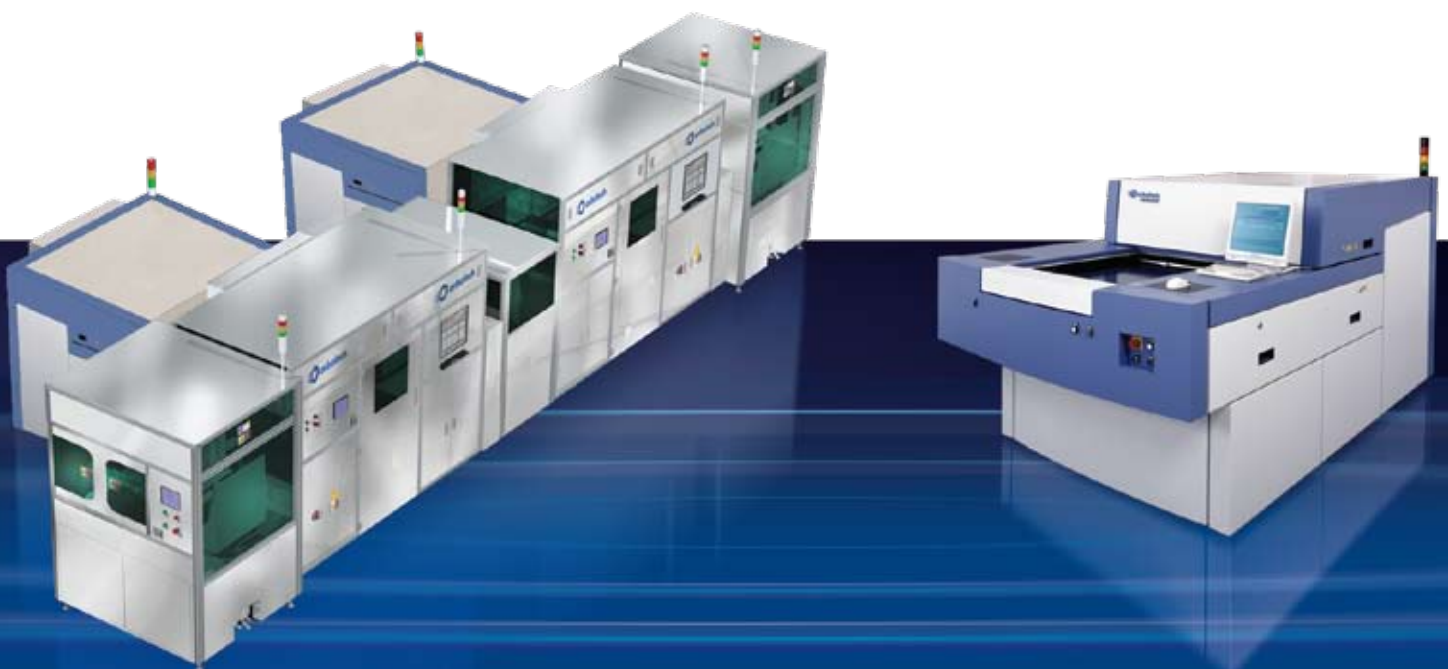
High accuracy registration results in imaging smaller annular rings

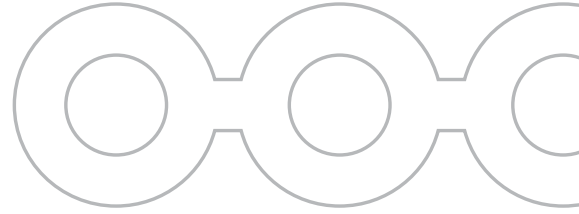


Fine lines down to 25µm/1mil for advanced HDI designs

## Benefits

- Maskless imaging to save time, money and increase image quality
- Tight accuracy down to  $\pm 10\mu\text{m}$  for high-end HDI designs
- Dynamic imaging modes to match panel distortion
- Seamlessly automated with the vendor of your choice, in any configuration
- High depth-of-focus of  $\geq \pm 300\mu\text{m}$  for single scan on Rigid-Flex
- Multiple traceability options on panels
- High resolution down to 25µm/1mil for advanced HDI designs
- Intuitive and user-friendly interface for fast and easy set-up





## No Mask

- Minimizes time-to-market - the shortest imaging process
- Reduces complexity and improves yields by removing the phototool and film preparation processes
- Improves image quality: eliminates contamination or damage caused by the photo-tool
- Saves on phototool costs such as: labor, material, electricity, etc.

## Registration Accuracy

- Side-to-side registration: enables maximum accuracy down to 20 $\mu$ m for inner layers
- Annular ring: down to  $\pm 10\mu$ m accuracy, ensures microvias can be stacked with greater precision
- Tight solder mask clearance and wider solder dams possible

## Dynamic Imaging Modes

- Adjustment per panel: each individual panel can be scaled according to its own distortion
- Different scale factors in one panel: a panel can be subdivided for scaling purposes
- User feedback: the results of each image can be used to improve future image results

### Partial Scaling



CAM Data



The Panel



Imaging

## Seamless Automation

- Fully automated panel handling
- Optimized utilization of machine capabilities
- No damage from panel handling
- Maximum flexibility of configuration and choice of automation vendor

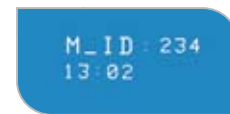
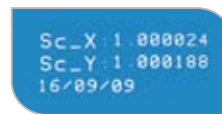
## Depth-of-Focus (D.o.F)

- D.o.F. up to  $\geq \pm 300\mu$ m for overcoming the most challenging surface topography issues
- Single scan for Rigid-Flex, allows uniform imaging of the entire panel

## Traceability

Enables panel tracking and distortion feedback by adding to each panel alphanumeric, 1D barcode or 2D barcode (DMC-Data Matrix Code):

- Serial number stamp
- Date and time stamps
- Scaling stamp
- Machine ID



## Ease-of-use

- Intuitive and user friendly interface for fast and easy set-up
- Recognizes a wide array of different target types
- Option for target generation with integrated UV marker system
- High image quality with both conventional resists and LDI resists

# Specifications:

	Paragon-9800i Inch units	Paragon-9800m Metric units	Paragon-8800Hi Inch units		Paragon-8800Hm Metric units		Paragon-8000i Inch units		Paragon-8000m Metric units	
Resolutions	8000dpi	2.5µm	4000dpi	8000dpi	5µm	2.5µm	4000dpi	8000dpi	5µm	2.5µm
Throughput* (max. prints/hour 18 x 24") 8mJ/cm <sup>2</sup> photoresist	160	132	160		132		160	110	132	84
30mJ/cm <sup>2</sup> photoresist	160	132	105		105		64	64	64	64
50mJ/cm <sup>2</sup> Photoresist	125	125	74		74		42	42	42	42
Minimum Feature Size**	1mil	25µm	2mil	1mil	40µm	25µm	2mil	1mil	40µm	25µm
Edge Roughness	±0.1mil	±2.5µm	±0.2mil	±0.1mil	±5µm	±2.5µm	±0.2mil	±0.1mil	±5µm	±2.5µm
Imaging Wavelength	UV range, 355nm									
Energy Range (mJ/cm <sup>2</sup> )	10-2200		10-2200				8-550	8-1100	8-900	8-1800
Registration Accuracy (FTG)***	±0.4mil	±10µm	Inch models: ±0.5mil Metric models: ±12µm							
Side-to-Side Registration***	0.8mil	20µm	Inch models: 1mil Metric models: 24µm							
Max. Substrate Size	Inch models: 25" x 32" Metric models: 635 x 812mm									
Max. Exposure Area	Inch models: 24" x 32" Metric models: 609 x 812mm									
Substrate Thickness****	Inch models: 0.001" – 0.315" Metric models: 0.025 – 8mm									
Applications	<ul style="list-style-type: none"> <li>• Inner layers and outer layers</li> <li>• Sequential build-up layers</li> <li>• Flex and Rigid-Flex PCBs</li> <li>• Solder mask</li> <li>• IC substrates</li> </ul>									
Standard Configuration	Laser system, OPFX input, RIP server, 4GB Raster memory (2GB for P-8000) and Scaling system									
System Options	<ul style="list-style-type: none"> <li>• Hole-free inner layer registration</li> <li>• Stamping (serialization, scale factor, date/time, 2D barcode)</li> <li>• Wise Scaling (incorporating a variety of production oriented scaling methods)</li> <li>• Group Scaling and stamping</li> <li>• Additional vacuum customization plate</li> <li>• Raster memory up to 4GB (relevant for Paragon-8000)</li> </ul>									

\* 4 targets, 6sec load/unload

\*\* Minimum feature size depends on resolution or photoresist properties

\*\*\* All values are 3σ, full format

\*\*\*\* Including DFR or solder resist thickness

• Paragon LDI systems are class 1 laser products. Laser specification: UV Diode Pumped solid state laser, 355nm, 16 Watt max power

• Specifications are subject to change without notice

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