



# Maskless Exposure System

## D-light DL-1000



This system (DL-1000) utilizes a telecentric optics illumination system and a digital micromirror device (DMD) to perform immediate exposure onto photo resist of pattern data as desired, which is designed on a PC screen, without using Photomask. This allows easy and accurate overlay alignment compare to separate optic path observation system.

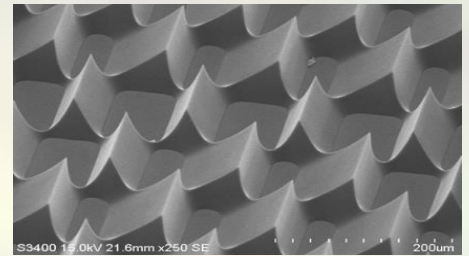
HTL Co India Pvt Ltd.

Registered and Branch Office : No: 616, 2<sup>nd</sup> Floor, 8<sup>th</sup> "B" Main, 26<sup>th</sup> Cross, HSR Layout, 7<sup>th</sup> Sector, Bengaluru: 560 102, Tel :+91-80-41717618

Branch Office : G.P.Trionics Building, Y-17, 2<sup>nd</sup> Floor, EP Block, Sector-V, Saltlake, Kolkata- 700 091 Tel : +91 33 40725050 / 400660147, Fax : +91-33-40715050

## Features:

- Exposure area : ~200mm x 200mm
- Feature size: 2.0µm, 1.0µm, 0.5µm
- Max. exposure speed: 2000 mm<sup>2</sup>/min  
(Feature size: 1µm, Light source: Laser)
- Autofocus / 2nd layer alignment: Coaxial optical system  
>> High robustness and, High accuracy
- Grayscale exposure: 3D patterning



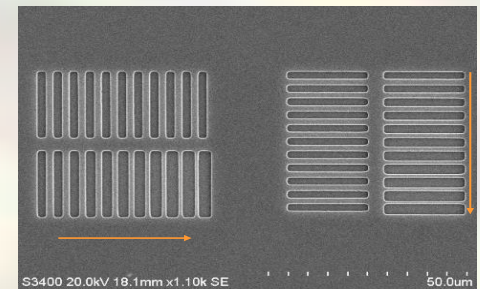
120µm thickness exposure



Amazing 3D exposure ability

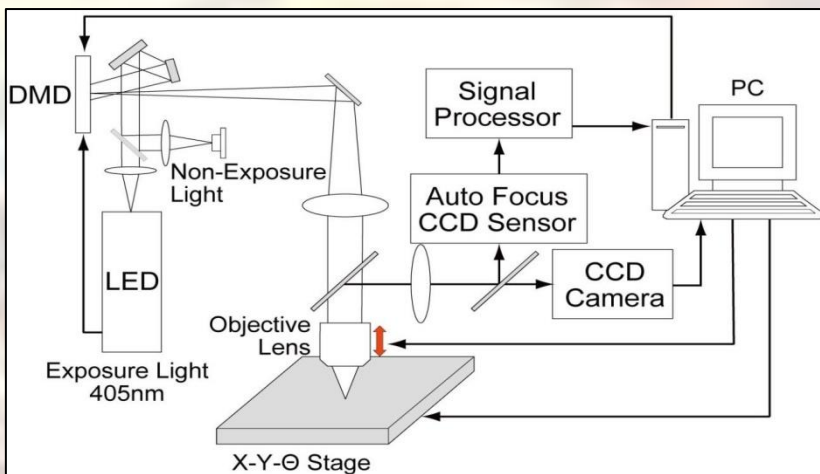
## Typical configuration:

Model name:	DL-1000S2	DL-1000HPA3
■ Feature size:	0.5 µm	1.0 µm
■ Exposure area:	200mm x 200mm	300mm x 300mm
■ Light source:	405nm LED	405nm LD
■ Exposure speed:	> 570mm <sup>2</sup> /min	> 2000mm <sup>2</sup> /min
■ Overlay accuracy:	3σ: <500nm	3σ: <500nm



LINE & SPACE

## Configuration of Exposure System:



## Auto Focus System:

- Real time Image contrast detection method with two cameras, compatible with transparent substrates.
- DL 1000 providing the real-time focus control during exposure.
- DL-1000 Auto Focus: Covers the Warped Surface.

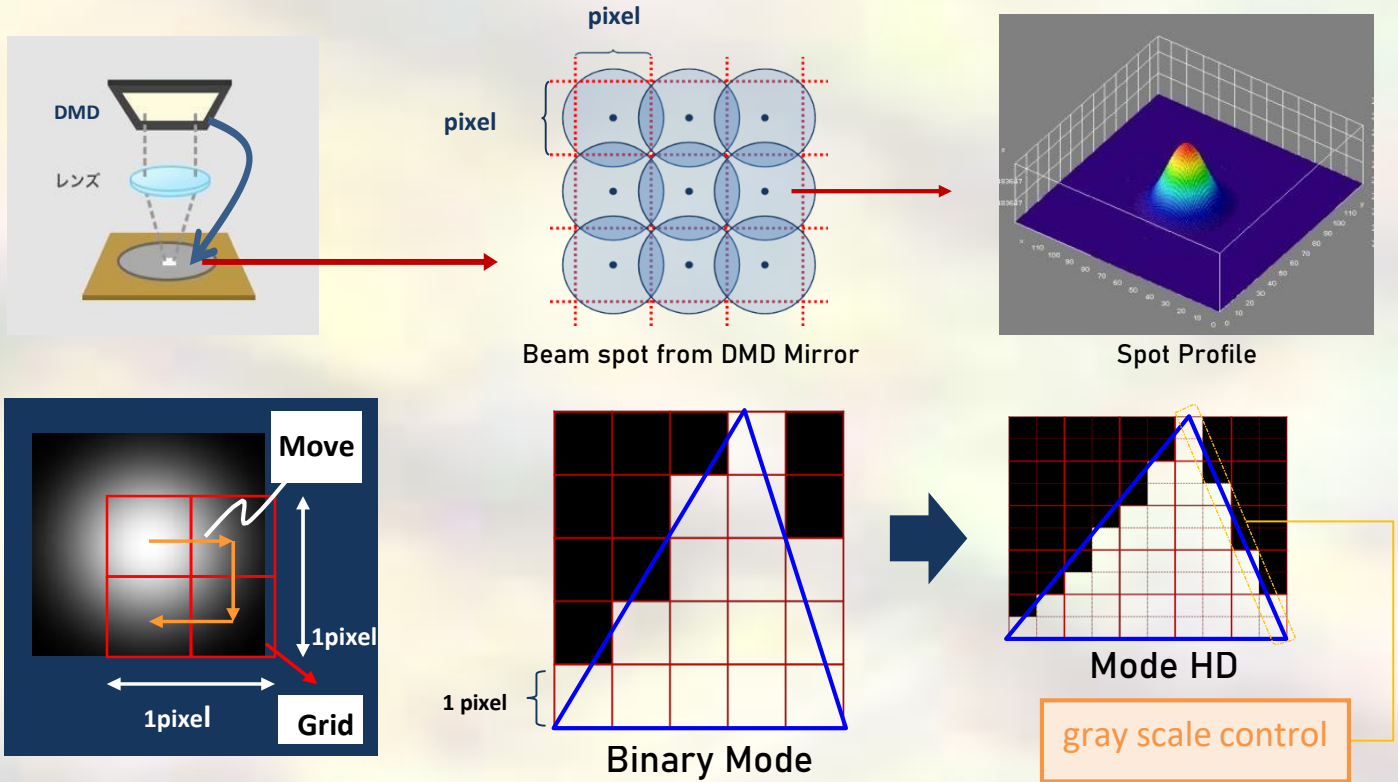
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# High definition (HD) Exposure Mode:



Pixel interpolation: Mechanically Scan of the beam spot position by 1/2 pixel.

## Major NSS Customers Worldwide:

### Company:

- NICHIA, NTT Docomo, TORAY, SONY, TOSHIBA, Fujitsu, Toshiba Machine, TSMC, Murata, other



### National Institute & Universities:

- JAXA (Japan Aerospace Exploration Agency)
- AIST (National Institute of Advance Industrial Scientific Technology), NIMS (National Institute of Material Science),
- RIKEN Research (Natural Science Institute),
- University of Tokyo, University of Osaka, University of Kyoto,
- University of Nagoya (Bio-Nano science, and Nobel Prize Owner: Prof. Amano san)
- Yonsei University (Korea),
- Seoul National University (Korea)
- Meiji University, Shibaura Institute of Technology, others



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## NSS ,Japan (DL-1000 ) V/S Other Worldwide Competitor

Specification	DL-1000 (Normal)	DL-1000 ( High Throughput)	MODEL - MA	MODEL - DW
Make	Nano System Solution , Japan	Nano System Solution , Japan	Other OEM- Maskless Aligner	Other OEM - Direct Writer
Substrate size :	4 " (100mm ) 8"(200mm) , 12" (300mm)		up to 8 inch	Up to 9" x 9"
Substrate thickness :	< 7 mm		0 - 12 mm	0 to 12 mm
Minimum structure size down to :	0.5µm, 1µm, 2µm		0.6 µm & 1.0 µm	Min. 0.6 µm
Maximum exposure area :	100 x 100mm <sup>2</sup> to 300 x 300mm <sup>2</sup>		150 x 150 mm <sup>2</sup>	200 x 200 mm <sup>2</sup>
Sample Holding :	Vacuum		Vacuum	Vacuum
Principle of Exposure Optics:	DMD , Pixel Number (1024 x 768 )		DMD	AOM & AOD
Light source :	LED , 405nm, 1W	Laser Diode (LD ) , 405nm, 10W	Diode lasers: 8 W at 405 nm	Diode laser with 405 nm
Maximum write speed : (Binary Mode )	> 220 (0.5µm )mm <sup>2</sup> /min > 570 ( 1µm ) mm <sup>2</sup> /min > 1,000 (2µm)mm <sup>2</sup> /min	> 650 (0.5µm )mm <sup>2</sup> /min > 2000 ( 1µm ) mm <sup>2</sup> /min > 5200 (2µm)mm <sup>2</sup> /min	Max. write speed 405 nm laser Mode 1: [285 mm <sup>2</sup> /min] Mode 2: [1100 mm <sup>2</sup> /min]	Max. write speed 405 nm laser Mode Hires: [3 mm <sup>2</sup> /min] Mode 3: [150 mm <sup>2</sup> /min]
Maximum write speed : ( HD Mode )	> 200 (0.5µm )mm <sup>2</sup> /min > 540 ( 1µm ) mm <sup>2</sup> /min > 1,000 (2µm)mm <sup>2</sup> /min	> 350 (0.5µm )mm <sup>2</sup> /min > 1200 ( 1µm ) mm <sup>2</sup> /min > 3000(2µm)mm <sup>2</sup> /min		
Real-time autofocus :	Real time Image contrast detection method with 02 cameras , compatible with Transparent substrate		Air-gauge or optical	Air-gauge or optical
Grayscale :	0- 255 gradation , 8 bit ( Modes: 0,64,128,192,255 )		128 gray levels	128 / 255 gray levels respectively
Address grid [nm] :	25nm (0.5µm HD ) , 50nm (1.0 µm HD		Address grid: 40nm	Address grid: 10 nm
Linewidth variation [3σ]:	<100nm (< 70nm target)		100nm	60nm
Edge roughness:	< 50 nm		60 nm	50nm
Autofocus compensation range :	±50µm to ±200µm		180 µm	80µm
Overlay , 2nd layer exposure accuracy:	<500nm		500nm	500nm
Backside alignment (BSA )	YES ( OPTION )		YES ( OPTION )	YES ( OPTION )
Patterning method :	Scanning and Step & Repeat		Raster with Bidirectional , Vector	Raster with Bidirectional , Vector
Environment requirement:	Temperature control spec. 23°C +/- 1°C Humidity: 30~60% (non-condensing) with HEPA FFU system		Set-point between 18°-24°C (65°-75°F) Stability 1°C (1.5°F) or better Humidity 30-50% , variation ± 5%	Set-point between 18°-24°C (65°-75°F) Stability 1°C (1.5°F) or better Humidity 30-50% , variation ± 5%
Alignment Method :	Automatic Image Recognition with Through The Lens (TTL) Optics		Overview camera for alignment and inspection	Overview camera for alignment and inspection
Mask Load Port :	Manual , Autoloader (OPTION )		Manual Loading	AUTO and Manual
Software features :	(GDS render) GDS II → BMP or Scanning data Basic operation, Auto focusing, Alignment (Manual/Auto), Sub-pixel control, Gray scale exposure, Skip function for Non patterning area, Fine Address Grid Unit Control, Recipe Editor		Exposure wizard, resist database, automatic labeling and serialization, Draw Mode for CAD less exposures, substrate tracking / history	Real-time software (OS9) for interferometer, stage and autofocus system, a real-time pixel generator, Conversion software for DXF, CIF, GDSII and Gerber files, design software "LayoutEditor"
Compressed air & Vacuum :	CDA : 6 - 10 bar , Flow : >50 NL/min Vacuum : -80kPa , Flow : >12 L/min		6 - 10 bar, stability ± 0.5 bar	6 - 10 bar, stability ± 0.5 bar
Cleanness :	Class 1000 or better		Class 1000 or better	Class 1000 or better
Electrical :	AC220V 50/60Hz 15A		230 VAC ± 5%, 50/60 Hz, 16A	230 VAC ± 5%, 50/60 Hz, 16A
System Dimensions :	1120(W)mm x 1140(D)mm x 1560(H)mm, Approx. Wt. 1500 kg		Height 1950 mm x width 1300 mm x depth 300 mm, Weight 1100 kg	H x W x D: 1950 mm x 1300 mm x 1100 mm Weight 1000 kg (lithography unit only)

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