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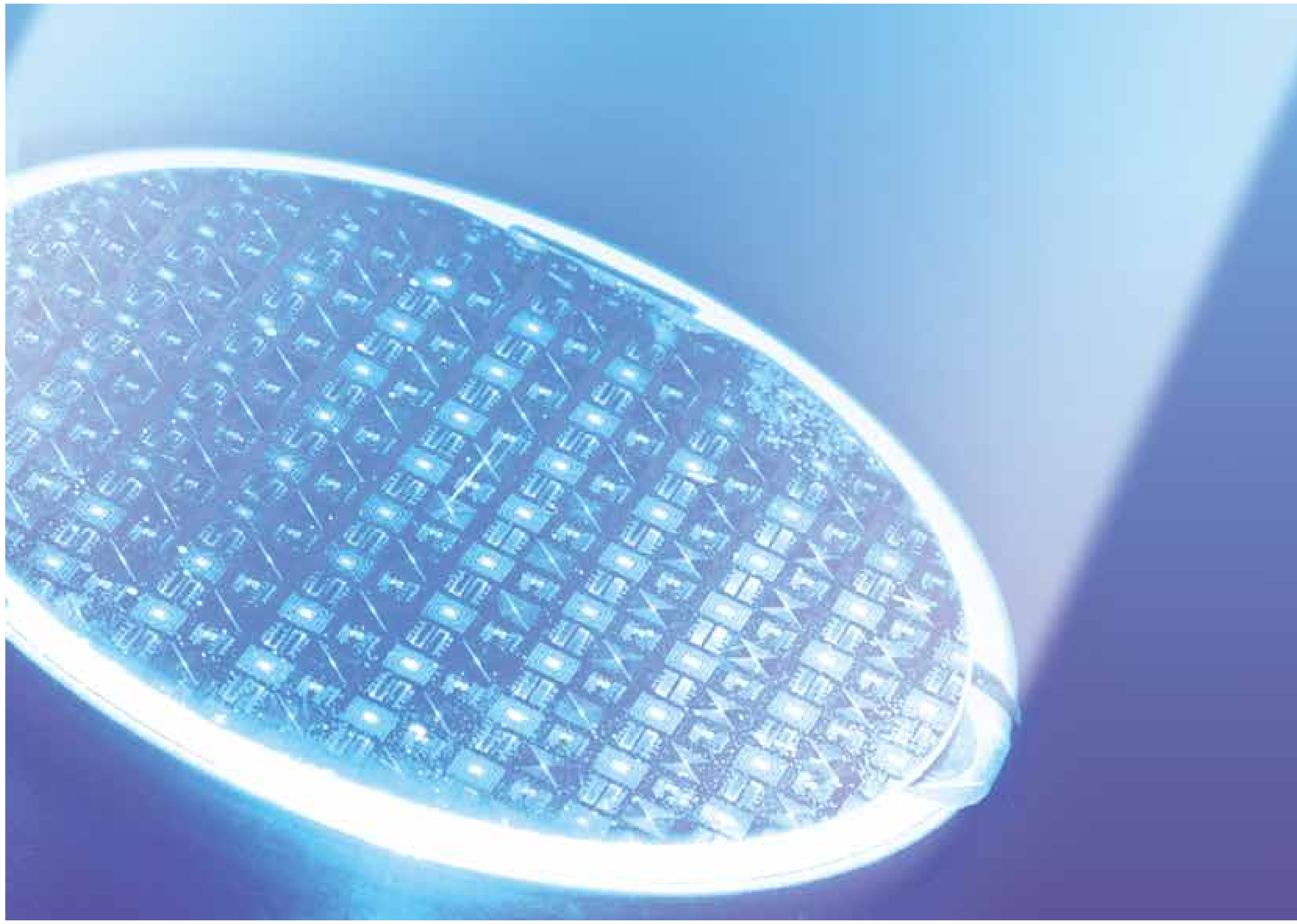
2303K①-1000Ei①

USHIO *Applying Light to Life*



UX-Series

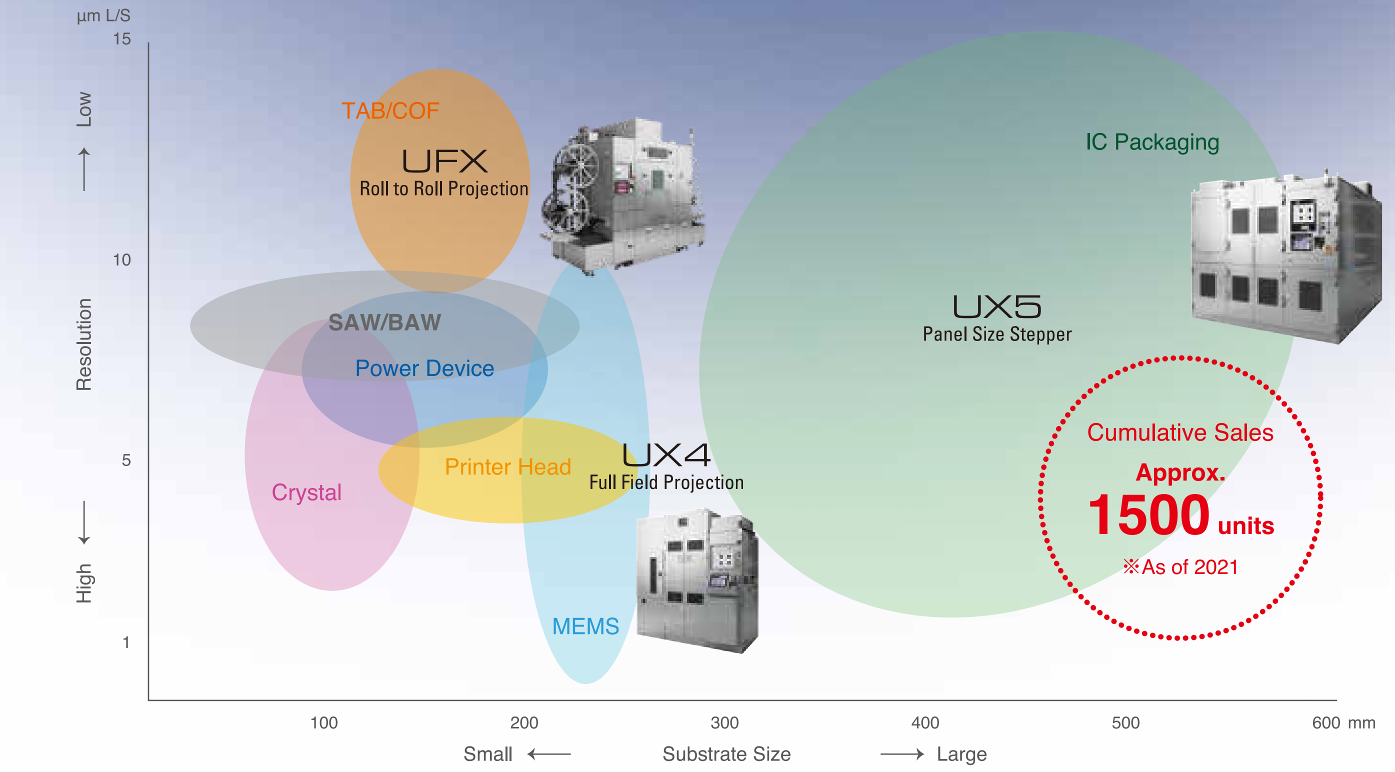
Ushio Lithography Tool

A New Option for Lithography

UX-Series

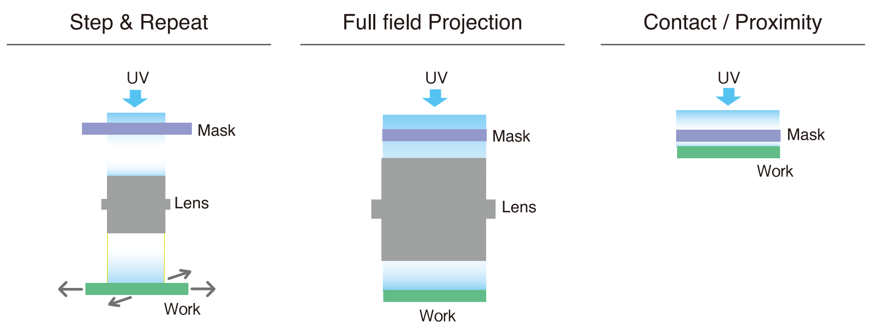
UX-series is a modular lithography tool that meets current requirements and enables customer tool update in the future.
Deep focus and large shot area enable high productivity and improved yields.
As devices evolve and change,
the UX-series will help reduce cost of capital investment
by enabling implementation of production systems that are optimized for various requirements,
such as changes in alignment accuracy, resolution, and workpiece size.

■ Application Map



Contents

■ Exposure Type

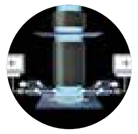


Integrated Platform

Light Source

Optics

Projection Lens



Alignment

Mask Handling

Work Handling

Light Source Technology

Optimized Lamp for Ushio Lithography Tool

Ushio provide high-energy, highly stable UV light sources for a variety of exposure systems, such as stepper systems for manufacturing semiconductors and LCDs. For our lithography tools "UX Series", we developed light sources with lithography tools, therefore systems to mount the light sources using dedicated designs that allow full use of their optical system features.

Optics Technology

Ideal Light

The illumination optical system efficiently condenses the light radiated from the lamp and illuminates the mask at high uniformity and with high parallelism. The special coating that covers each mirror surface allows selection of an exposure wavelength and elimination of heat rays.

Ushio's illumination optical system technology began in 1960's with development of the solar simulator for a space chamber. Since then, we at Ushio have provided illumination optical systems for a variety of exposure systems for manufacturing semiconductors and LCDs, and have been approaching the perfection of illumination optical systems for exposure systems.

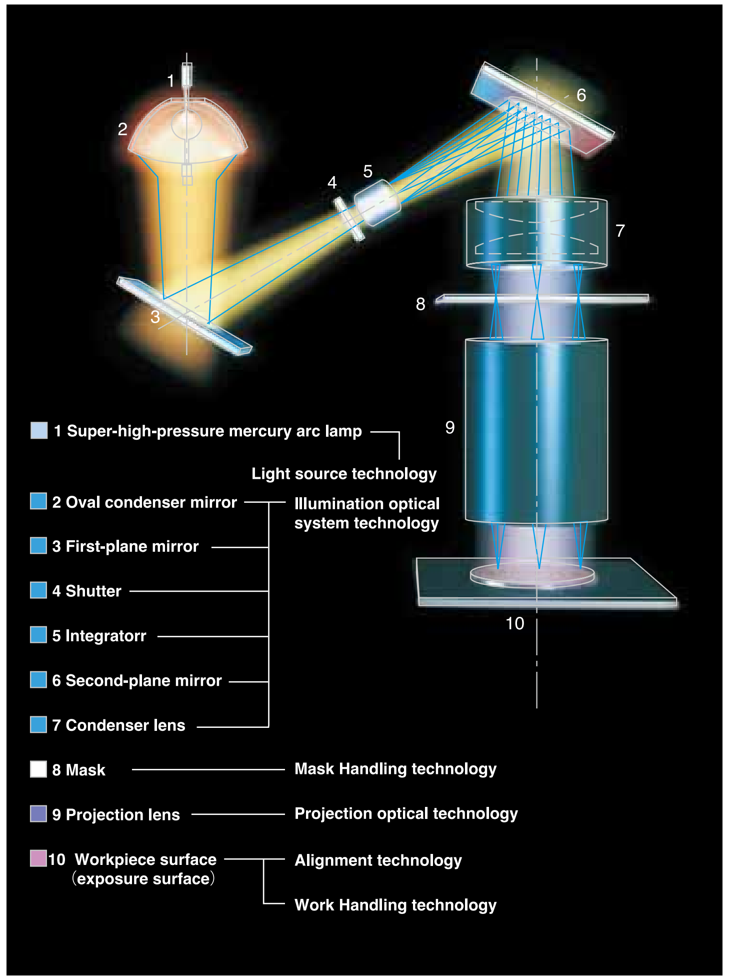
We used Ushio's accumulated know-how and rich experience to develop an illumination optical system for the UX Series that supplies parallel light ideal for each process application to the projection optical system with a wide range of lamp outputs and exposure wavelengths.

Projection Lens Technology

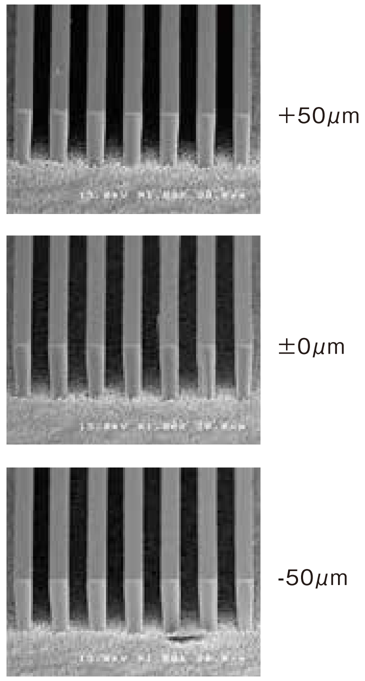
"Deep Focus" & "No Mask Contamination"

We at Ushio observed that the projection lithography tool causes no damage to the mask because it allows no contact between the mask and workpiece. Using this advantage, we developed the optical system that allows exposure of a large area with low distortion, something not possible with the conventional system.

■ Optical System Diagram of 1:1 Projection Exposure System



■ Deep Focus

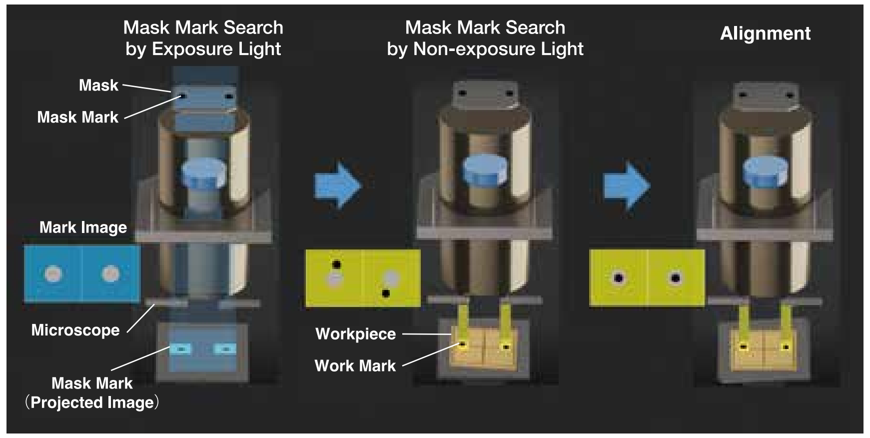


L/S=7/9μm

Alignment Technology

High Alignment Accuracy

Employs a unique TTL(through-the-lens) method of non-exposure-wavelength alignment. This method detects individual alignment marks on the mask and workpiece by using the following procedure to aligns them by fixing each mark on the xy-coordinate axes through image processing.



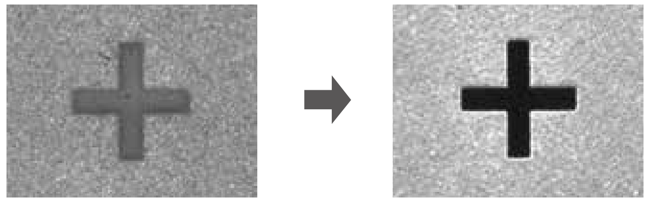
Workpiece Alignment Mark

Easily detects workpiece marks even using a mask with a small opening fully coated with chrome by observing the mask and workpiece individually.

Eliminates drop of contrast caused by observation through the mask, thus enabling alignment with clear marks.

Allows clarity of alignment marks with low contrast due to an underlayer to be enhanced by selecting the illumination method (bright-field or dark-field illumination) and wavelength.

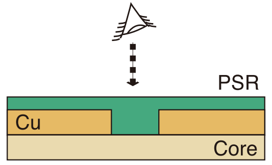
■ Visual recognition samples of alignment marks.



Bright-field illumination

Dark-field illumination

【Conditions】



PSR : DSR-2200 KP-19 (TAMURA)
Thickness : 15-20μm
Screen Coating

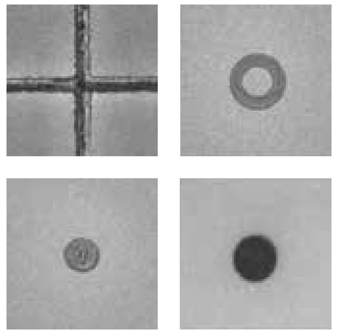
Variable Projection Magnification

Expansion or shrinkage of a pattern caused by expansion or shrinkage of the substrate can be detected, allowing automatic adjustment of projection magnification by up to ±0.1%. This feature prevents an overlay shift and achieves perfect registration.

Pattern matching method

Allows alignment of various wiring patterns by registering them with image recognition without using dedicated alignment marks.

Enables selection of various auto-alignment algorithms (reference method, center-of-gravity detection, and multipoint alignment) corresponding to alignment marks.

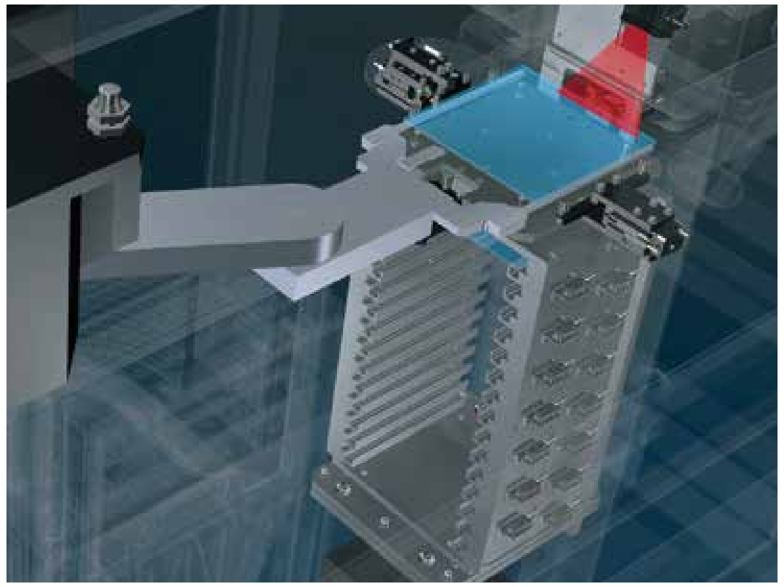


Mask Handling Technology

Quick change of Products can be provided by options of Mask Loader and Library Designed by Ushio.

Mask Loader can also prevent the human error as breaking or mistaking of the mask.

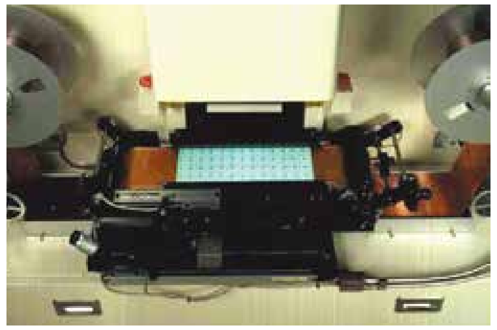
Mask within a Mask-case can also help to keep clean during bringing and storing.



Workpiece Transfer Technology

Ushio's large-area projection lithography tools utilize high-precision transfer systems that can handle a variety of workpieces, such as Si wafers, flexible boards, and printed-circuit boards.

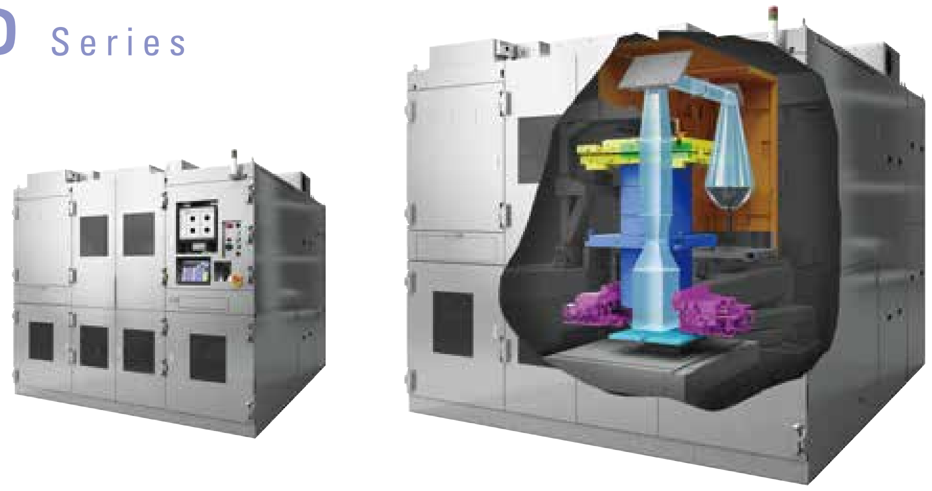
They are also provided with UV stages for full-wafer exposure using a large exposure field, and for step-and-repeat exposure on a large workpiece, thus meeting a variety of exposure needs and supporting efficient and stable processes.



Lithography tool for IC packaging

Step & Repeat for Advanced Packaging substrate

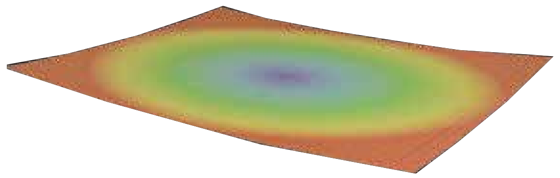
UX-5 Series

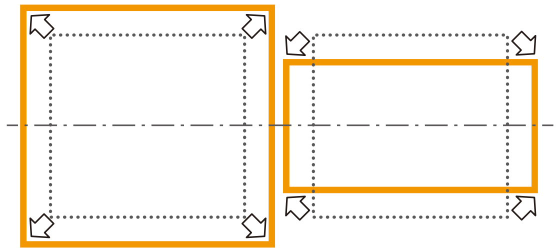


Model	UX-5881SC	UX-5894SC	UX-58112SC
Exposure Area	□250mm		
Panel Size	SEMI Standards 510×515mm		
Resolution	16μm L/S	5μm L/S	3μm L/S
Exposure Wavelength	ih Line	i Line	i Line

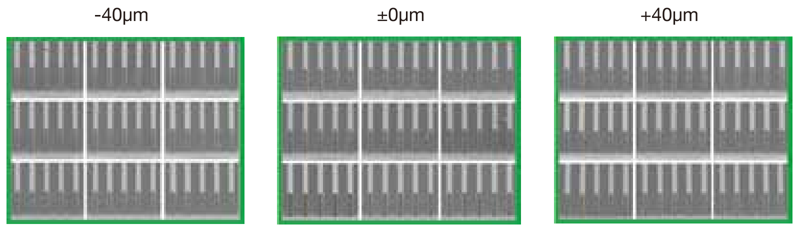
Optimal design based on extensive delivery record for organic substrates

Auto scaling function adjusts for panel distortion





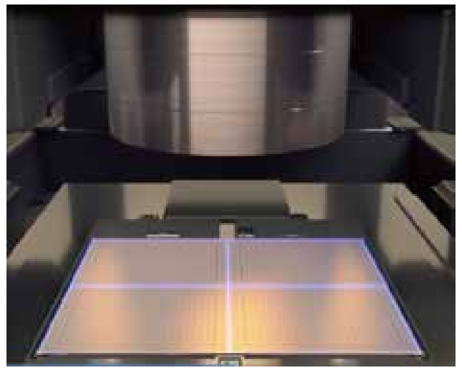
Stable pattern formation due to Large Depth of Focus



Tool: UX-5894SC Resist pattern: L/S 4/6μm
Photoresist type: Resonac RY-5815 (development product), 15μm thickness

High productivity with large shot area

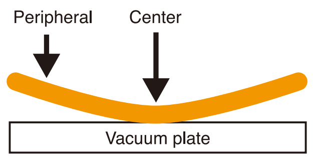
- High productivity with 4 shots per full-size panel
- 30sec tact time per panels（standard : 510x515mm）



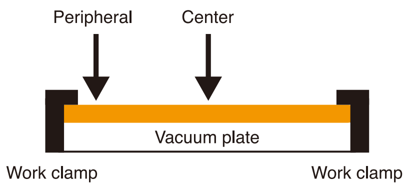
Helping customers increase process margins

Workpiece clamping and stage suction ensure workpiece flatness

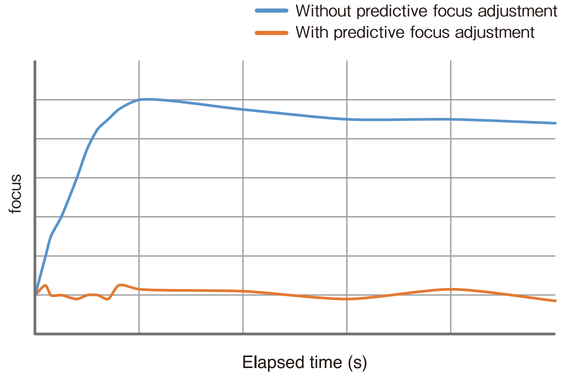
■ Amount of warp
before applying suction



■ Warp is eliminated by clamping the substrate with workpiece clamps and applying suction to the UV stage.



Focus Estimate System（FSC）prevents focusing errors, reduces manual work

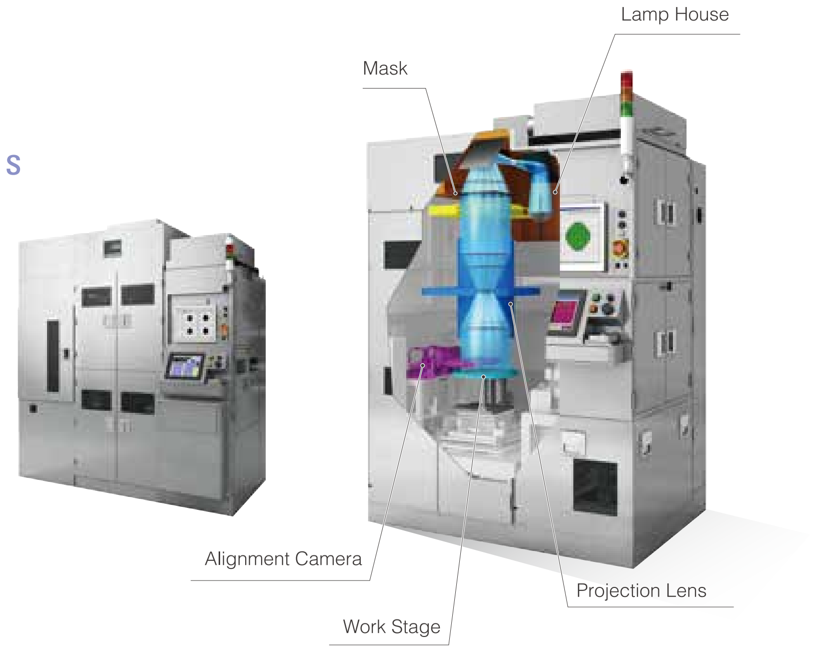


UX-Series Line-up

Lithography tool for wafers (Sensor, Electronic Component, Quartz, Power Device)

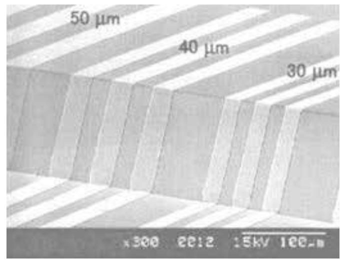
Full Field Projection Lithography tool

UX-4 Series

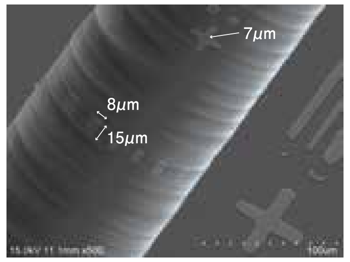


Model	UX-4486SC	UX-44101SC	UX-4423SC	UX-4459SC	UX-4440SC	UX-4438SC	UX-4458SC	UX-4477SC
Mask Size	□5inch		□7inch, □5inch			□9inch, □7inch		
Wafer Size	ϕ4inch		ϕ6inch, ϕ4inch			ϕ8inch, ϕ6inch		
Resolution	7µm L/S	2µm L/S	9µm L/S	6µm L/S	5µm L/S	12µm L/S	6µm L/S	4µm L/S
Overall alignment accuracy	±1.0µm	±1.0µm	±1.0µm	±1.0µm	±2.0µm	±1.0µm	±1.0µm	±1.0µm
Exposure Wavelength	ihg Line	i Line	ihg Line	i Line	i Line	ihg Line	i Line	i Line
Throughput	120WPH							
Option	Back-Side Alignment, IR Alignment, Mask Loader and Library, Supports specialized wafers							

High Resolution on the Different Levels.



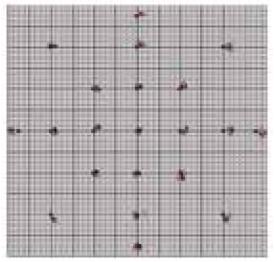
Three-dimensional Lithography



Three-dimensional photolithography technology for a fiber substrate using a microfabricated exposure module
Zhang, Yi（Ph.D.）
Senior Research Scientist
Hetero Convergence Research Team
Research Center for Ubiquitous MEMS and Micro Engineering（UMEMSME）
National Institute of Advanced Industrial Science and Technology（AIST）

Overlay：Top Side ±1.0µm　Back Side ±1.5µm

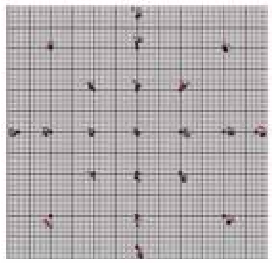
Top Side Alignment



<1.0µm

Max	0.90
Mean	0.41
3Sigma	0.58
Mean+3σ	0.99

Back Side Alignment



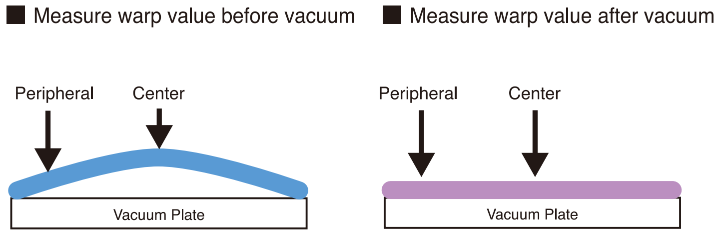
<1.5µm

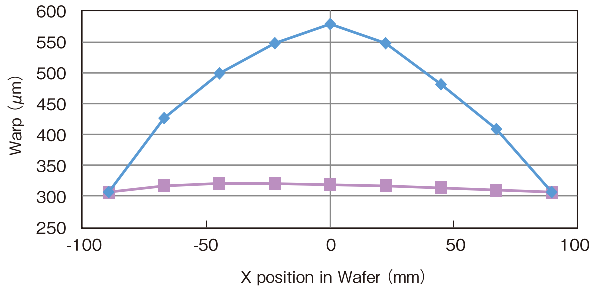
Max	1.10
Mean	0.50
3Sigma	0.72
Mean+3σ	1.22

Options for power device applications

Wafer with outer support ring	Focus adjustment function for 3D structure wafer
Variety of wafer style	Thin Si wafer, compound wafer
Back side alignment	Double device applicable

Warped Wafer Vacuum

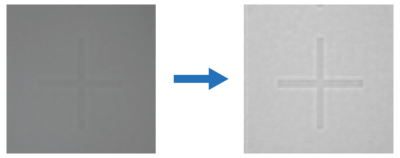




Low Contrast Alignment Mark

Mark Visibly Improvement（ITO, PR Uneven coating）

Before　After



Plenty of Options for MEMS

Large Depth of Focus	Same resolution on different levels or Spherical surface.
High Alignment Accuracy	Options of alignment with notch or orientation flat on wafer.
Handling Options	Bernouil handling and capability to handle penetrated wafer or warped wafer.

UX-Series Line-up

Lithography tool for flexible substrates

Roll to Roll Projection Lithography tools

UFX Series

Model	UFX-2123	UFX-2477	UFX-2894
Exposure Area	□100mm	□140mm	□250mm
Tape Width	～105mm	156/158mm	250mm
Resolution	9μm L/S	4μm L/S	5μm L/S
Exposure Wavelength	ihg Line	i Line	i Line

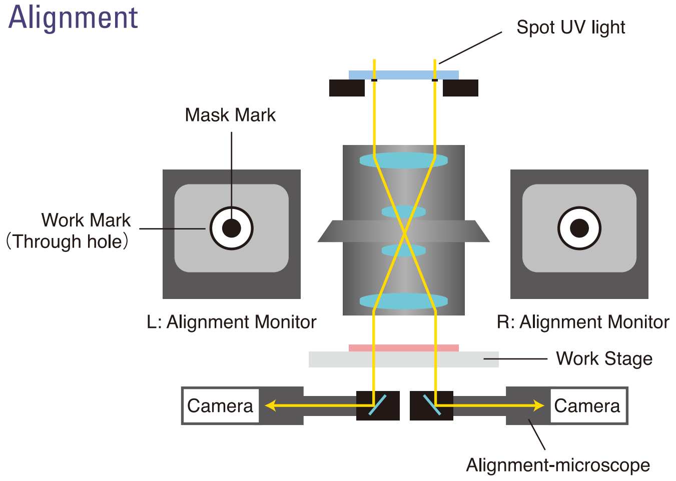
Features

- Accommodates wide, thin tape
- Employs large-diameter projection lens
- Deep focus
- Auto-zoom function

Applications

- COF
- T-BGA
- FPC
- Touch Panel
- Two Metal COF
- TAB

Throug Hole Alignment



Lithography tool for R&D

Full Field Projection Lithography tool

UX-2 Series

Model	UX-2340SM	UX-23101SC
Exposure Area	ϕ150mm	□70mm
Resolution	5μm L/S	2μm L/S
Exposure Wavelength	i Line	i Line

※There are more line-up for various work size and resolutions besides the table above.

Features

- Manual alignment
- Non-contact one-shot exposure, no mask cleaning required
- Large depth of focus, can be used for stepped exposures

Applications

- Photosensitive material development
- Device development

Contact/Proximity Lithography tool

Contact/proximity lithography tools are provided by Ushio Lighting, Inc., an Ushio group company.

Automatic and manual systems

UPE Series

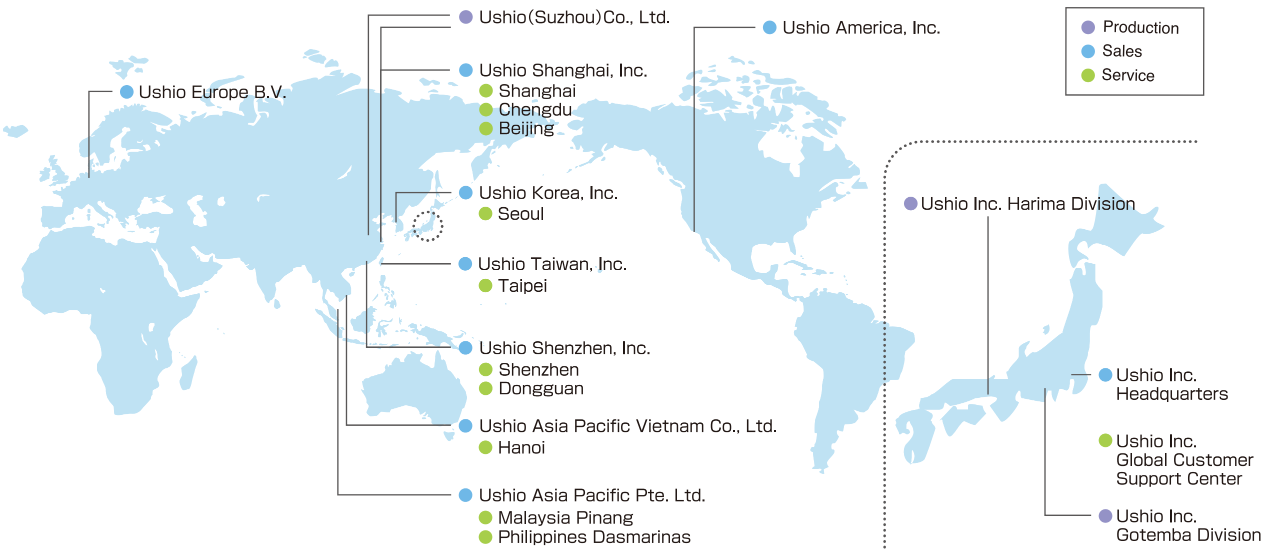
【For inquiries】
Ushio Lighting, Inc.

RBM Higashi Yaesu Bldg., 2-9-1 Hatchobori, Chuo-ku,Tokyo 104-0032
TEL：+81 3-3552-8277（Direct） MAIL: uli-sales-hikarisystem@ushiolighting.co.jp

Support Organization

Ushio Group provide support program such as spare parts sales, tool maintenance, relocation, modification or calibration.
Customer support center in Japan collaborate with worldwide service office to provide quick and convenient support.
We support preventing your tool from any troubles by proposing preventive maintenance program.
Please use our support program for comfortable operation and optimization for market and technical needs change.

Location



Support program

Spareparts sales and Shipping	Measurement Devices Calibration	Tool Relocation
Periodical and Preventive Maintenance	Major Support Program	Sales of Power Supply Unit built in tools.
Trouble Shooting	Tool Modification	Unit Repairment

If you need more information of our products or support program/
please contact your local sales/service office listed on the back cover or send an e-mail from following URL.

https://www.ushio.co.jp/en/support/

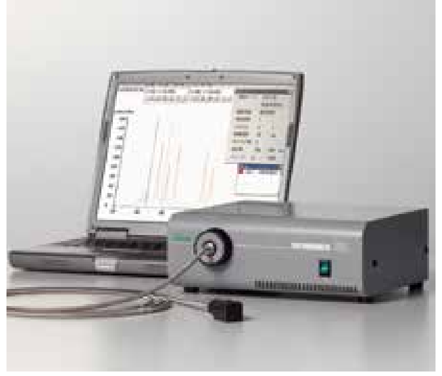
Others

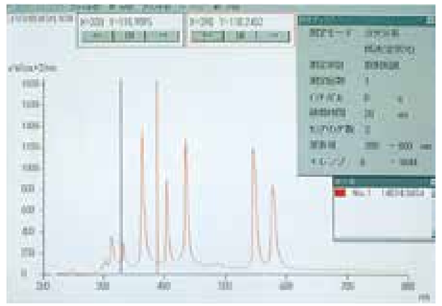
Accumulated UV Meter UIT-250

- Allows measurement of the temperatures, or five wavelength ranges（with central wavelengths of 172 nm, 254 nm, 313 nm, 365 nm, and 405 nm）by simply replacing the detector unit.
- Versatile enough to measure irradiance, peak irradiance, accumulated light amount, irradiance distribution,spot-light irradiance, and temperature distribution.
- Built-in memory allows measurement of irradiance distribution for up to 4 minutes.
- Compatible with Extension Cables (main unit ~ photoreceptor: 2m as standard option)
- Effective / Invalid Change of an Auto Power-Off Function
- PC Serial Communication Functions

UV Irradiance Meter UIT-201

- Allows measurement of the temperatures of two wavelength regions（with central wavelengths of 365 nm, and 405 nm）by simply replacing the detector unit
- Switching functions : UIT can select power source by AAA battery x 3 or external (AC Adapter : option)
- Compatible with extension cables（main unit ~ photoreceptor : 2m as standard option）





Spectral Radiometer USR-45

- **Measurement of Absolute Values**
  This enables absolute values of spectrum energy to be displayed.
- **Minimal Scattering Light**
  Minimizes amount of scattering light to achieve high accurate measurement.
- **Wide Light Range : Flash Light**
  Flash light can be measured, not only ambient light and AC light.
- **Wide Dynamic Range**
  Supports wide range of measurements from weak light to intense.
- **Measurement of Dispersive Continuous Light is Possible**
  The angular properties have been improved significantly with the unique optical system. Diagonal incident light is taken in without using an integrating sphere.
- **Measurement of High Irradiance LED is Possible**
  The high-accuracy dispersion board enables measurement of high lighting intensities.（120 mW/cm^2/nm※）

※ A reference value at 365 nm