

**TAMARACK**

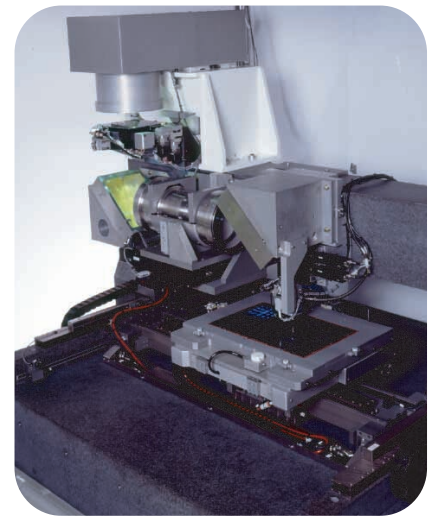
# Model 400 Large Area Step and Repeat i-line Exposure System

Tamarack's newest projection lithography platform is designed to address the increasingly stringent requirements of the high density interconnect (HDI) industry. Combines the high yield benefits of projection lithography with the local alignment accuracy of a step and repeat mechanism, and rugged dependability of Tamarack designed equipment.

The system is supplied with a large field variable magnification lens and can be configured with a variety of substrate chucks and material handling options. Applications of the model 400 stepper span the entire spectrum of HDI technologies, from MCMs to BGAs and PC boards. Exposure of many types of photoresist coated substrates is possible, among them glass, ceramic, silicon, FR-4, metal, and polyimide.

## KEY FEATURES

- Large field lens allows exposure of an extended range of sites without stitching of multiple smaller fields.
- Variable magnification compensates for mask/substrate mismatch.
- Large depth of focus permits use of thick resists.
- Global and individual site alignment provides accurate registration.
- The option of manual or fully automatic loading of masks and substrates offers added flexibility.



## Why projection lithography?

As features continue to decrease in size, small defects may no longer be acceptable or economically repairable. In contact printing, the risk of contaminating or damaging the mask is substantial. In projection lithography the mask and substrate are separated by a significant distance, which protects the mask against damage from contamination during the typical exposure cycle. This results in higher yields and longer lasting masks.

## The benefits of a large field stepper

The step and repeat architecture provides the ability to align and expose each site individually. Critical applications such as manufacturing small multi-layer dies using relatively unstable substrates are no longer difficult because the individual site alignment compensates for material dimensional changes that may have rendered global alignment ineffective. A large field projection lens adds flexibility, allowing imaging of sites sized up to 6" x 6" in one exposure, with no need for stitching of adjacent fields. This means that one exposure tool can be used for many applications, ranging from very small micro BGA or flip chip substrates to much larger interconnect boards.

## Variable Magnification Lens

In some manufacturing processes, substrates may experience dimensional changes between the first and subsequent exposure cycles, resulting in a mismatch between the first layer pattern and the second or higher layer mask. While compensation via artwork dimensional adjustments is a possibility, a more cost effective and flexible method is to change the magnification ratio of the lens for the specific layer. This technique is available on the model 400 stepper. Lens magnification is nominally set at 1:1 and can be varied by  $\pm 400$  PPM. Two programmable methods can be used:

1. Global compensation, for cases where the variation is uniform over the entire substrate (isotropic).
2. Individual site compensation, applicable to cases where the variation is non uniform (anisotropic).

# MODEL 400 SPECIFICATIONS

## SUBSTRATE

Substrate Size: Up to 610 x 610 mm (24" x 24")  
Expose Area: Up to 610 x 610 mm (24" x 24")

Minimum Substrate Thickness: 0.7mm  
Maximum Substrate Thickness: 15 mm

Substrate Loading:  
Manual by equipment operator  
or  
Automatic from cassette

## MASK

Maximum Outside Dimensions: 203 mm (8") square  
Maximum Pattern Area: 152 mm (6") square

Mask Loading:  
Standard: Manual loading by operator

Optional: Automatic loading from  
single random access  
cassette (15 masks  
maximum capacity)

## ILLUMINATION SOURCE

Lamp type: Mercury short arc  
Lamp power: 2.5 kW  
Intensity at substrate: 38 mW/cm<sup>2</sup>  
Beam uniformity: ±5%  
Exposure energy range: 10 - 2000 mJ/cm<sup>2</sup>

## PROJECTION LENS

Expose field: 152 mm (6") diameter  
Wavelength: 365 nm ±5 nm ( i-line)  
Magnification: 1 : 1 with ±400 ppm correction  
N.A.: 0.06  
Resolution & Depth Of Focus (DOF in μm):  
6 μm ≥ 70 DOF | 10 μm ≥ 180 DOF | 15 μm ≥ 300DOF

## SUBSTRATE ALIGNMENT

Off axis camera with bright and dark field illumination for both global and individual site alignment

Standard: ± 6 microns  
Optional: ± 2 microns with laser interferometer

\* All specifications are subject to change without notice.

