

**Optec LightBench** is a cost-effective laser beam delivery unit, a simple approach to quality UV micromachining. The LightBench delivers the laser beam from source to target, adding  $\mu\text{m}$ -level resolution along the way. With unsurpassed rigidity, the LightBench is the ideal vehicle to support key beam delivery devices such as energy controllers, beam shapers, illumination optics field lenses, mask units and vision systems, configured to suit the application.

## LightBench LB-BAS includes:-

- Rigid 1.5 meter long Aluminum section with I> 500cm<sup>4</sup>, equipped with smoothly adjustable leveling feet.
- Optical rail graduated in mm to help the user adjust optical modules to known, repeatable positions.
- Special Integrated Laser Micromachining Head comprising :
  - Interchangeable 193nm or 248nm process lens
  - Adjustable iris (for trade-off DOF vs resolution)
  - Smooth manual 40 mm Z-axis adjustment for the process lens
  - Digital Readout of focus position
  - Dichroic mirror (for TTL camera vision)
  - Beam splitter pellicule (for coaxial lighting)
  - Axial lighting source with adjustable condensor lens
  - Penta prism for TTL vision system
  - Dust cover with bellows
- Through-the-Lens (TTL) vision system including CCD camera on adjustable mount, light tubes, b/w CCTV monitor, up to 500x on-screen mag. A key feature of the LightBench is the WYSIWYG process lens technology, imported from the top-of-the-range MicroMaster. Eliminate the uncertainty: - when the image is sharp on the monitor the UV image is in focus. Just fire the laser for  $\mu\text{m}$  precise micromachining.
- Safety Cover or Beam Tubing, depending on wavelength and application

## Options:-

### OPERATING WAVELENGTH

STANDARD 248nm; 193 nm or other also available off-the shelf, with the same high optical performance.

### MASK SELECTION

- UNIVERSAL MASK HOLDER: Holds one mask up to 25mm x 40mm with manual adjustment of horizontal and vertical position.
- 40-P or 15-P SELECTOR: 40 motifs on a precut selector disk, or 15 individual motifs. Motorized motif selection with Full Control Option.
- DUAL MA15P: Manual 15mm x 15mm rectangular aperture.
- MRA: PC controlled, motorized rectangular aperture.

### ENERGY CONTROLLERS

- AT4030: Manual 5-95% energy controller, with open gate feature for 100% transmission.
- AT4040: PC controlled with compensation and open gate feature

### BEAM HANDLING

- FL150/FL150M Ajustable field lens unit for standard or small excimers.
- BC/BCM Beam Condensor, for standard & small excimers, gives 4X higher e.d. on mask.  
(N.B. Field Lens units may also be used as beam concentrator for micromachining applications requiring higher energy density at the target such as ceramics and metals.)
- HY120 Beam Shaper unit, for top hat profile, see data sheet.

### BEAM INPUT

- SEM Side entry module accepts beam from side or above/below,- adjustable mirror assembly to guide the laser beam onto lightBench
- RELAY Relay telescope to preserve beam profile

### POSITIONING EQUIPMENT

- STANDARD X,Y STAGES: X,Y stages fitted with both motors and manual control knobs. 1 $\mu\text{m}$  resolution. 100 or 200mm travel. Others available, consult use
- ROTATION STAGES Theta and/or PHI stages

### FULL CONTROL OPTION

This option allows the user to remotely control the OPTEC LightBench by motorizing the following modules:

- AT4040
- 40-P Mask selector or MRA(if installed)
- Motorized positioning stages
- Laser firing

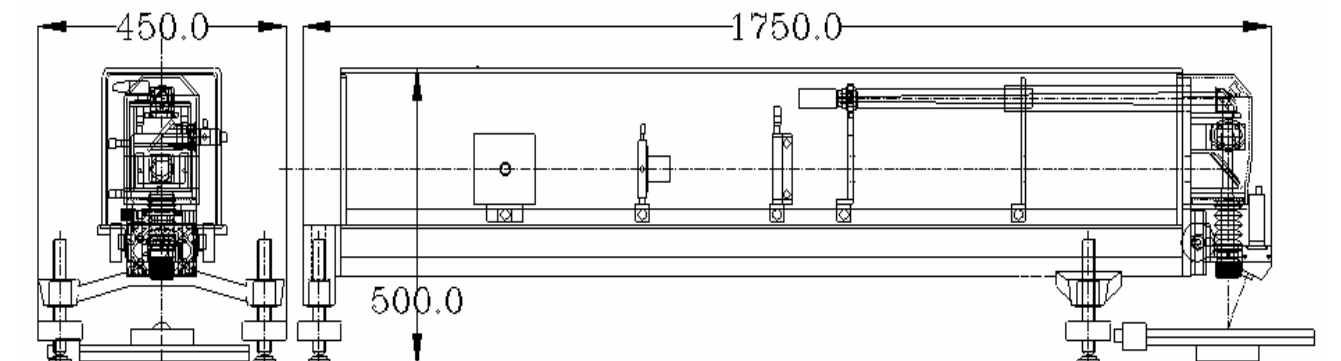
The option includes an industrial PC in rack with the necessary PS, drives, motion control & I/O cards. ProcessPower s/w allowing synchronization of laser firing with part motion, and a range of special routines including processing of files in standard industry formats.

### TURNKEY SYSTEMS

LB1500 & LB1000 systems are fully integrated solutions including part positioning, advanced control & laser source,- tailored to match your application.



## Layout:-



## Technical Specifications - OPTEC LightBench

### OPTICAL

- ◆ UV Wavelength 248nm or 193nm
- ◆ Energy Density 0.1J/cm<sup>2</sup> to 25J/cm<sup>2</sup>
- ◆ Materials soft plastics, inorganics, ceramics, thin metals
- ◆ Process Area up to 2mm x 2mm
- ◆ Machining Resolution <1.5 micron
- ◆ Energy Control 5% to 95%
- ◆ Mask Options from simple masks to adjustable apertures to multi-position selectors
- ◆ Demagnification 4x to 15x
- ◆ TTL Vision up to 500x
- ◆ Part Lighting integrated

### MECHANICAL

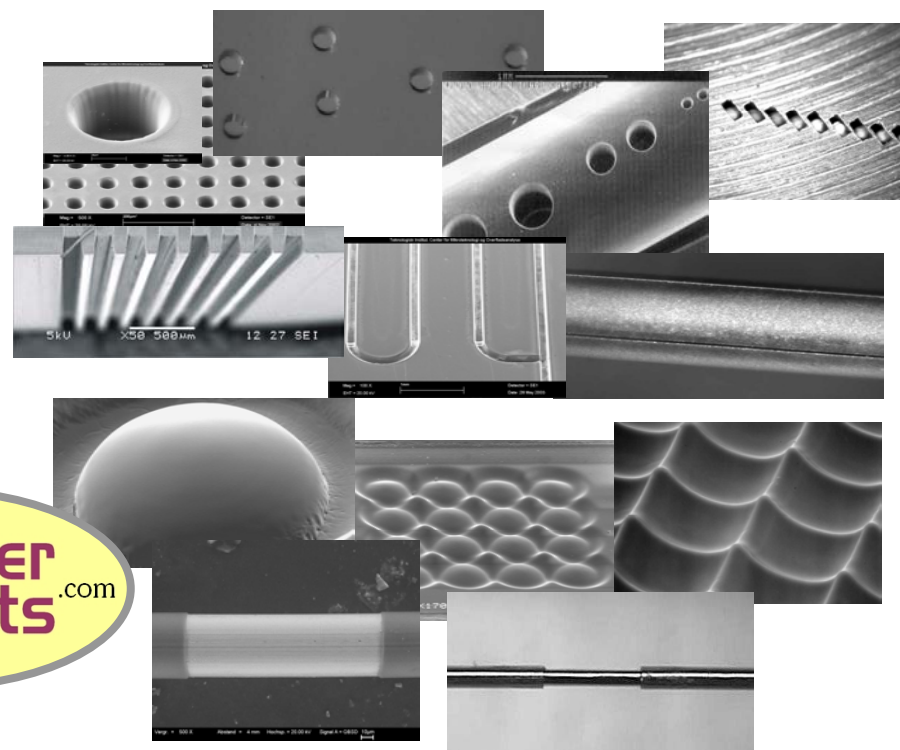
- ◆ Process Lens Focus Range 40mm – adjustable z axis
- ◆ Working Height adjustable
- ◆ x-y Positioning Stages 100-200mm(options)
- ◆ Part Positioning Resolution 1 micron
- ◆ Positioning Repeatability +/- 1micron

### PERFORMANCE

- ◆ The part is viewed through the projection lens, with unique WYSIWYG confocal performance ; when the part is in focus on the CCTV monitor the laser beam is automatically in focus, just fire the laser for accurate machining of the highlighted area with the selected process parameters.
- ◆ Materials for UV laser micromachining include a wide range of polymers, ceramics, glasses, metal, films, etc.
- ◆ Optimum energy density is material dependent in the range 0.25-25 J/cm.
- ◆ The area to be processed at one time depends on the mask, laser beam size selected demag and energy density requirements. Typical maximum feature size is 2 x 2 mm.
- ◆ Machining rate is material dependent, from 0.05 - 5 μm/laser shot. In some cases thermal effects also limit maximum shot repetition rate.
- ◆ Optical resolution is 1.5 μm; machining resolution also depends on material characteristics.
- ◆ Aspect ratio is material and energy density dependent, between 10° wall angle and practically zero taper.

### APPLICATIONS EXAMPLES

- ◆ Precision hole drilling;- filter, ink jet nozzle, catheter, probe card
- ◆ Groove milling;- fibre mount, μfluidics, segmenting
- ◆ 3D microstructures;- Fibre microlens, microlens arrays
- ◆ Cleaning;- fine wire stripping



### SERVICE

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# LightBench

Stay on the rails:- with the market's most flexible, high performance & cost-effective solution to UV Laser Micromachining



### KEY FEATURES

- ❖ High Rigidity Rail : - easy to reconfigure guaranteed reproducible results.
- ❖ Integrated Process Head : - with high resolution process lens, TTL vision system and axial lighting.
- ❖ Single smooth focus control with digital position display : - when the CCTV image focussed =UV focussed.
- ❖ Wide range of accessories : - configure the system to suit the application.

### APPLICATIONS

- ❖ Selective polymer film removal
- ❖ Micro hole drilling
- ❖ Thin film metal removal
- ❖ Micro milling
- ❖ Micro etching
- ❖ 3D structure generation

PLASTICS-POLYMERS-CERAMICS  
METAL-INORGANIC MATERIALS

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laser micromachining systems

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