

MACHINE SPECIFICATIONS DOCUMENT (MSD-ADIX-SA)



(Photo for information only)

ADIX-SA



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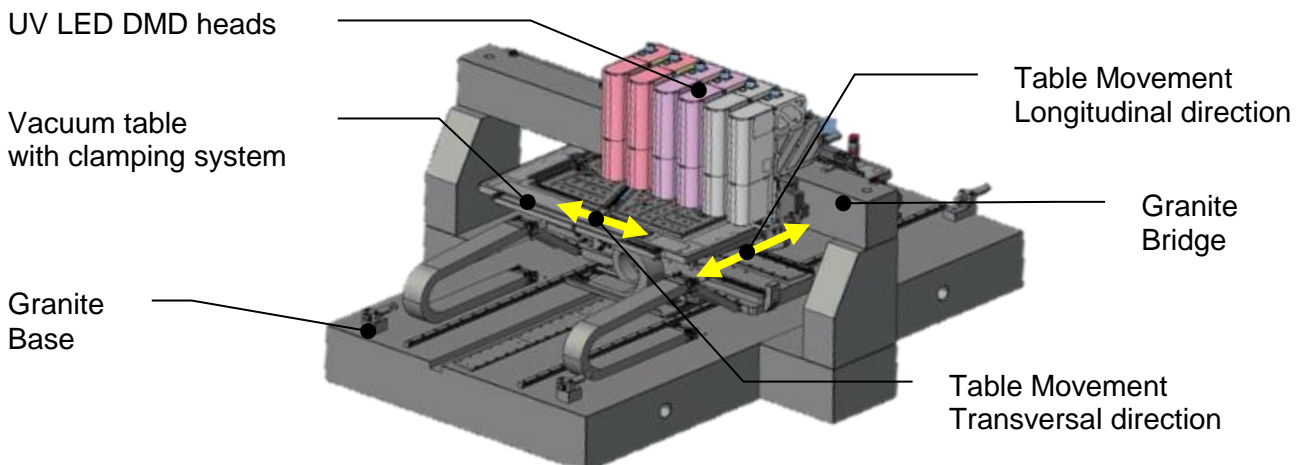


1. Equipment Overview

ADIX is an UV LED DMD Direct Imaging solution based on its new ALDS™ technology.

The solution is dedicated for PCB and FPC applications, for high mix low and medium volume production, in inner layer, outer layer, and solder mask processes.

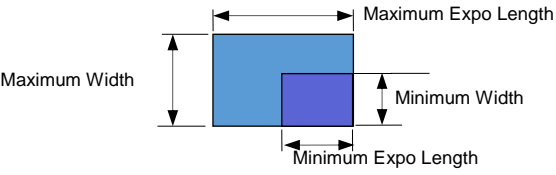
It was designed to reach the best-cost performance.





4. Products and Tooling

4.1. Product Definition

Basic Material	Single or Double Side PCB (Rigid or Rigid-Flex) Single or Double Side FCCL (Flexible Copper Clad Laminate)
Product Size	Minimum & Maximum : <i>Refer to Table of Specifications</i> 
Product Thicknesses	Minimum & Maximum : <i>Refer to Table of Specifications</i>
Max. Weight of the product	6kg max.
Warp and Twist	For panel thickness 0.04 to 0.8mm : 1% of the diagonal For panel thickness 0.8 to 6.0mm : 0.5% of the diagonal

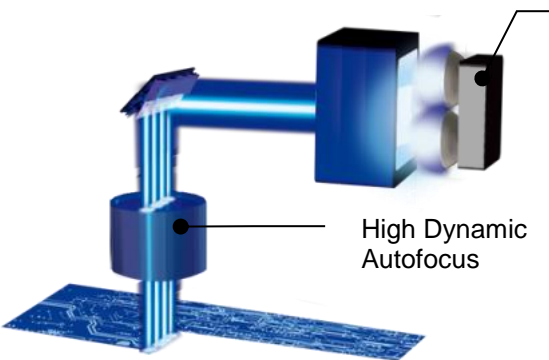
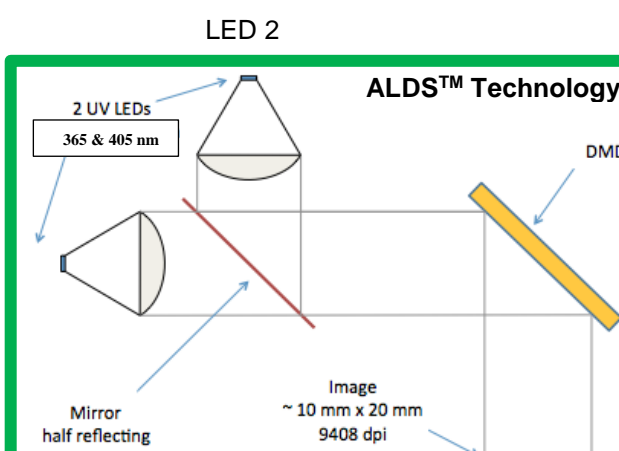
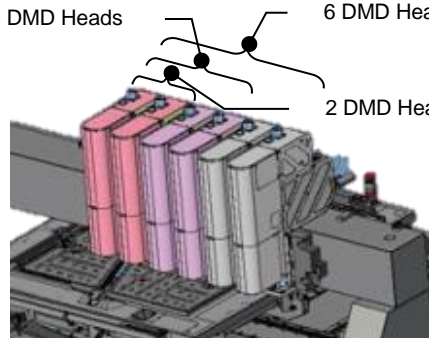
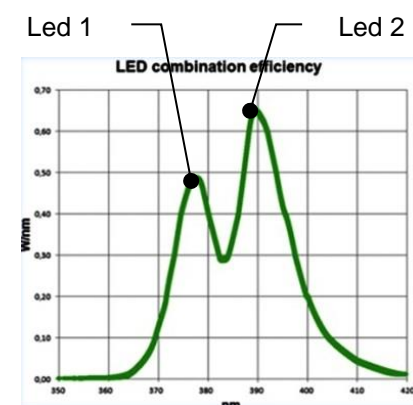
4.2. Photo Resist Definition

Photo Resist Type	Dry Film, Liquid Resist, Solder Mask
Photo Resist Brand / Ref.	Datasheet about the photo resist will be required to confirm the feasibility
Photo Resist Thickness	Datasheet about the photo resist will be required to confirm the feasibility
Photo Resist Energy	<i>Refer to Table of Specifications</i>

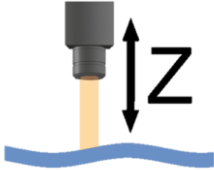
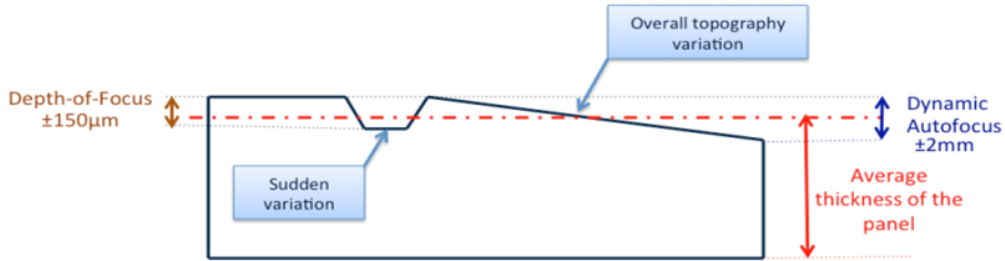


5. UV Light Source

5.1. ALDS™ (Altix Led DMD Solution)

<p>Principle:</p>  <p>Combination of two high density LED light sources through a unique optical device</p>  <p>High Dynamic Autofocus</p> <p>LED 1</p> <p>LED 2</p> <p>2 UV LEDs 365 & 405 nm</p> <p>ALDS™ Technology</p> <p>DMD</p> <p>Mirror half reflecting</p> <p>Image ~ 10 mm x 20 mm 9408 dpi</p>		
<p>Configuration</p>	 <p>4 DMD Heads</p> <p>6 DMD Heads</p> <p>2 DMD Heads</p>	<p>The number of Photo Heads can be chosen accordingly (2, 4 or 6)</p> <p>This number of Photo Heads can be enlarged anytime (+2 or +4)</p> <p>On-site upgradable to add Photo Heads</p>
<p>Source Type</p>	<p>UV LED DMD</p>	
<p>Exposure Spectrum</p>	<p>From 360 to 420nm</p>  <p>Led 1</p> <p>Led 2</p> <p>LED combination efficiency</p> <p>W/mm</p> <p>nm</p>	<p>Combination of 2 different UV LED light wavelengths 365 & 405 nm in each head</p> <p>Polymerize a large range of dry film (LDI/DI & conventional), ink and solder resist</p> <p>Adjustment of the output ratio to suit perfectly the photo resists</p>
<p>Max. Effective Area</p>	<p><i>Refer to Table of Specification</i></p>	



Autofocus	High dynamics autofocus: $\pm 2,000\mu\text{m}$ (for each head) 	The system comprises one autofocus that enables to compensate the uneven surface of the panels. Located in each head, there is one sensor, which checks the topography of the panel in real time. The Photo Heads will be able to absorb the thickness variation of $\pm 2\text{mm}$ from the average
Depth of focus	Depth of Focus (DoF): $\pm 100\mu\text{m}$ A sudden variation of the thickness can't be absorbed by the autofocus, but only by the depth-of-focus which is $\pm 100\mu\text{m}$ Depth of focus is a lens optics concept that measures the tolerance of placement of the image plane (the film plane in a camera) in relation to the lens. In a camera, depth of focus indicates the tolerance of the film's displacement within the camera, and is therefore sometimes referred to as "lens-to-film tolerance." 	



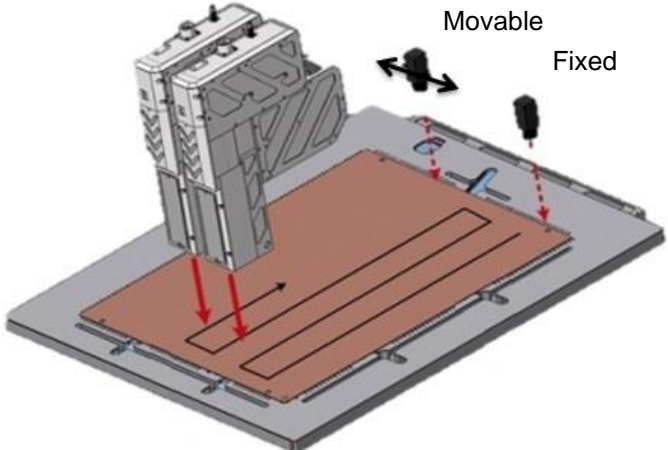

6. Registration

6.1. Side-to-Side registration (Inner Layers)

<p>Principle:</p> <p>3 CCD Cameras</p> <p>Vacuum table</p> <p>Granite</p> <p>3 targets will be printed at the side A. After finishing side A, the operator will turn the panel back, and the 3 CCDs dedicated for Inner Layer will detect the fiducial to print accurately the Side B.</p>	
<p>Registration Type</p>	<p>Side-to-Side registration</p>
<p>Configuration Cameras</p>	<p>3 CCD cameras located on LOWER SIDE Field of vision of the CCD cameras: 10,8 x 8,1 mm</p> <p>Fixed Fixed Fixed</p>
<p>Location of the cameras – 2 configurations</p>	<p>Fixed To optimize the registration, there are two possible configurations depending on the panel size. See COM1125 to have more details</p> <p>Small Size</p> <p>Large Size</p>
<p>CDD cameras Lighting</p>	<p>Annular LED Lighting</p>
<p>Types of targets</p>	<p>Dot Depending on resist, other types of targets may be preferred</p>
<p>Adding UV Patterns in the Gerber file in automatic mode</p>	<p>The Direct Imaging software verifies the presence of these patterns in the creation of the batch. a specific aperture macro must be used for the recognition system to be used. If these patterns are not found in the Gerber file, they are automatically added.</p>



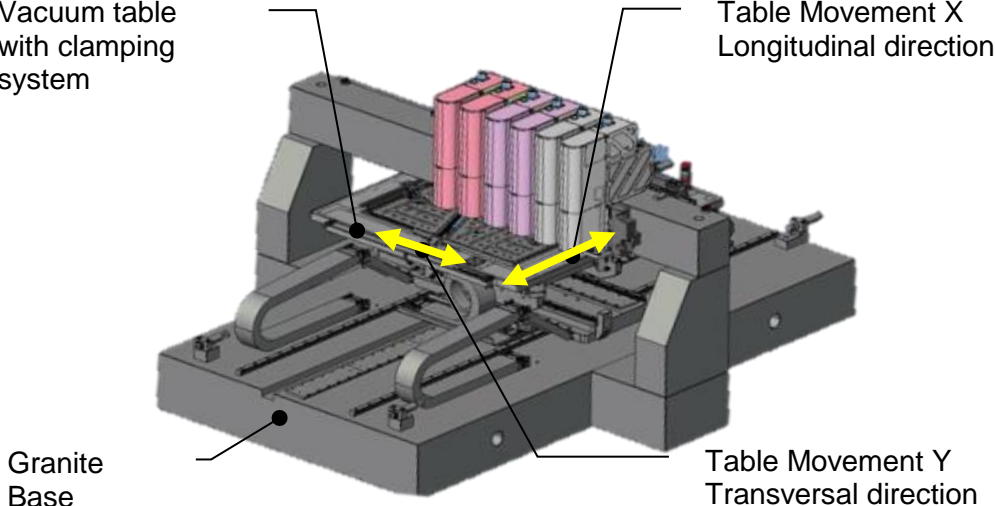
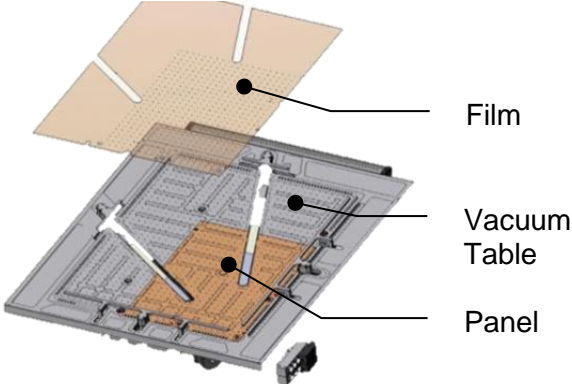
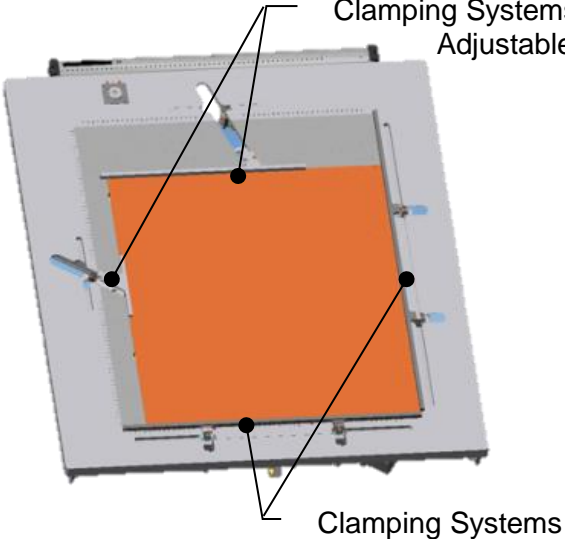
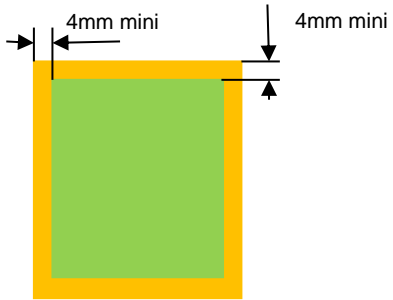
6.2. Image to Panel registration (Through holes or Copper pad)

Registration Type	Image to Panel registration
Configuration Cameras	<p>2 CCD cameras (One fixed / One movable) CCD cameras located on UPPER SIDE Field of vision of the CCD cameras: 10,8 x 8,1 mm</p>  <p>The table is movable and allows to place the targets under the corresponding camera.</p>
Location of the cameras	Minimum distance between cameras : 80 mm
CDD cameras Lighting	Direct Lighting with dual LED wavelength (red & infrared)
Types of targets on panel	<p>Different target type available :</p> <ul style="list-style-type: none"> - Holes - Matrix of holes - Microvia holes - Copper pads - <p><u>Nota:</u> Possibility to use other types of targets. The request has to be done to ALTIX R&D for validation, during the qualification process of the specifications</p>
Targets location	<p>To optimize the cycle time , it is preferred-to have 4 holes aligned in X and Y ; keying is possible (request to be done in accordance to ALTIX R&D for validation). For better positioning of the image, the best is also to have registration holes, as close as possible to the panel edges, while respecting the minimum edge space on the edge</p> 




7. Others functions

7.1. Panel handling

<p>Main Principle</p>	<p>The panel is placed on a Table with accurate movements in X, Y and Theta Table high positioning accuracy: $\pm 1\mu\text{m}$</p> <p>Vacuum table with clamping system</p>  <p>Granite Base</p> <p>Table Movement X Longitudinal direction</p> <p>Table Movement Y Transversal direction</p>	
<p>Holding by Vacuum</p>	 <p>Film</p> <p>Vacuum Table</p> <p>Panel</p>	<ul style="list-style-type: none"> - Panel fixed onto a vacuum table. - To fit the size of the panel, special films are provided and enable to cover the suction holes around the panel and thus, improve the vacuum efficiency
<p>Holding by Clamping System</p>	 <p>Clamping Systems Adjustable</p> <p>Clamping Systems</p>	<p>There is a clamping system that enables to push down the edge on the panel. The clamping will cover the panel on 4mm from the edge.</p> <p>Patented Solution:</p>  <p>4mm mini</p> <p>4mm mini</p> <p>A space of 4mm around the panel cannot be exposed</p>




7.2. Cleanliness

Basic Frame construction	Stainless Steel	
Hepa Filter or Clean Kit		
Dry Clean Air Supply (CDA)		

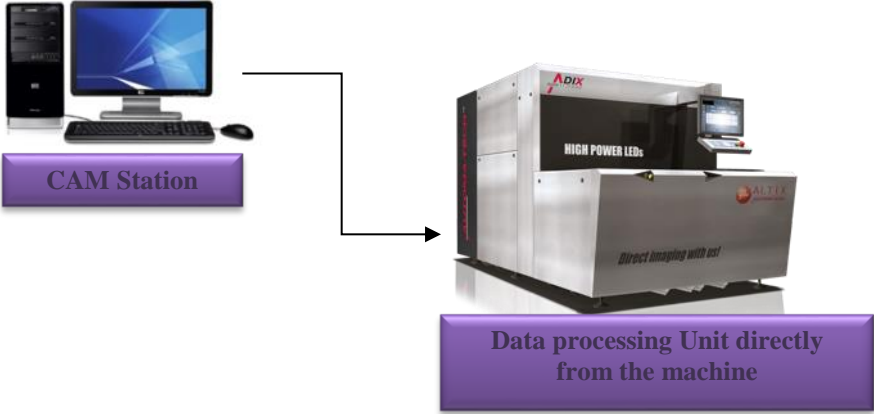
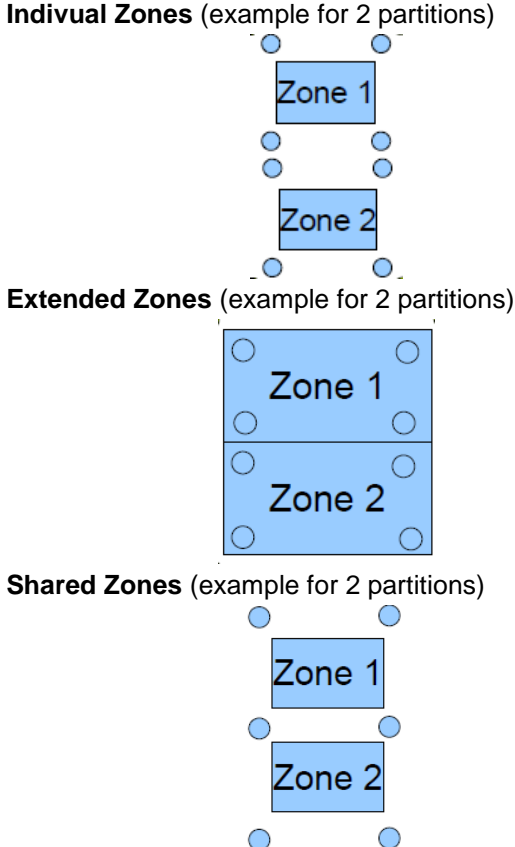
7.3. Machine Environment Control

Ambient Temperature	Built-in temperature control: $\pm 0.5^{\circ}\text{C}$

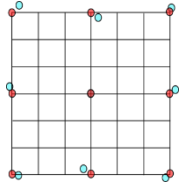
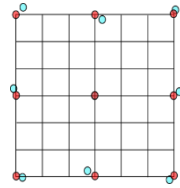
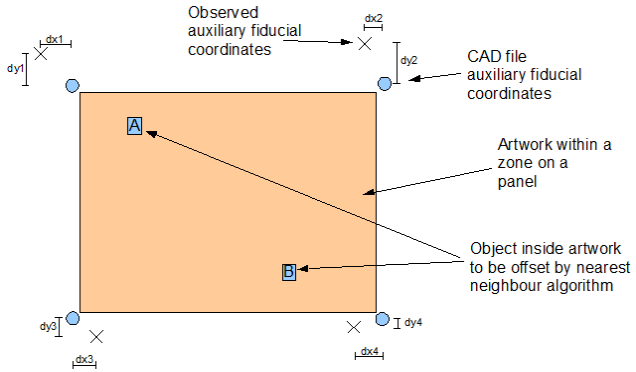
7.4. Machine Environment Control

ALTIX DIRECT IMAGING SUITE™ SOFTWARE		<p>Friendly and intuitive graphical user interface</p> <p>Smooth connectivity to CAM ensures fast and easy setup</p> <p>Recognize a wide array of different target types</p> <p>RIP different CAM files</p>
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	<p>The ADIX system consists of a data-processing unit that receives and rasterizes Gerber files from CAM station file inside the DI machine and queue them as soon as the operator validate a production batch.</p> <p>A RIP station can be installed for the convenience and comfort of the operator and production department. It will also be useful to use the ODB++ to Gerber conversion software ALTIX can provide upon request.</p> 
<p>Human Interface</p>	<p>Only one Large touch screen 19" to dialog between operator and machine All languages available (English, Simplified & Traditional Chinese, Korean, French, ...)</p>
<p>Type of Data Input</p>	<p>Extended Gerber ODB++</p>
<p>Partitioning</p>	<p>Partitions can be decomposed from 1 to 8</p> <p>Target located either as</p> <ul style="list-style-type: none"> - <i>Individual Zones</i> - <i>Extended Zones</i> - <i>Shared Zones</i> 



	<p>Fixed scaling set on batch data</p> <ul style="list-style-type: none"> - SFx and SFy are linear - SFx and SFy can be either equal or different <p><i>(dedicated mainly to Inner Layers)</i></p>	
	<p>Orthogonal XY as measured</p> <p>SFx and SFy are calculated by Vision software on each panel and scaling applied is equal to Mean (SFx, SFy)</p>	
	<p>Orthogonal X&Y as measured</p> <p>SFx and SFy are calculated by Vision software on each panel SFx & SFy can be different</p>	
	<p>Dynamic or Nearest Neighbour</p> <p>Distorsions are calculated so that :</p> <p><i>Item «A» on the figure will be offset according to the distance to the nearest neighbouring fiducials and the corresponding error vectors. In this case, the error vector (dx1,dy1) will be weighted most compared to the other surrounding error vectors. Correspondingly, item «B» will be offset according to the distance from the error vector (dx4,dy4) more than the other surrounding error vectors.</i></p>	
<p>Serialisation</p>	<p>Scaling Parameters</p> <p>SFx : 1.000012 SFy : 1.000082</p> <p>Image Serial Number</p> <p>ID: _009</p> <p>Batch Serial Number</p> <p>Date</p> <p>16/02/2014 16:05</p>	
<p>SPC² Module</p>	<p>A SPC module is delivered as part of the ALTIX DIRECT IMAGING SUITE™ SOFTWARE. It allows to monitor the production parameters and performances of the unit. Data are available in SQL Server Databasis</p>	
<p>Telemaintenance</p>	<p>Optional item</p> <p>With this option and an IP address, ALTIX's Engineers can troubleshoot, diagnose and adjust the machine to help ALTIX-Automatech and Customer maintenance staff</p>	

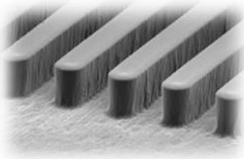
8. Performances

8.1. Alignment Precision

<p>Alignment Accuracy</p>	<p><i>Refer to Table of Specification</i></p>
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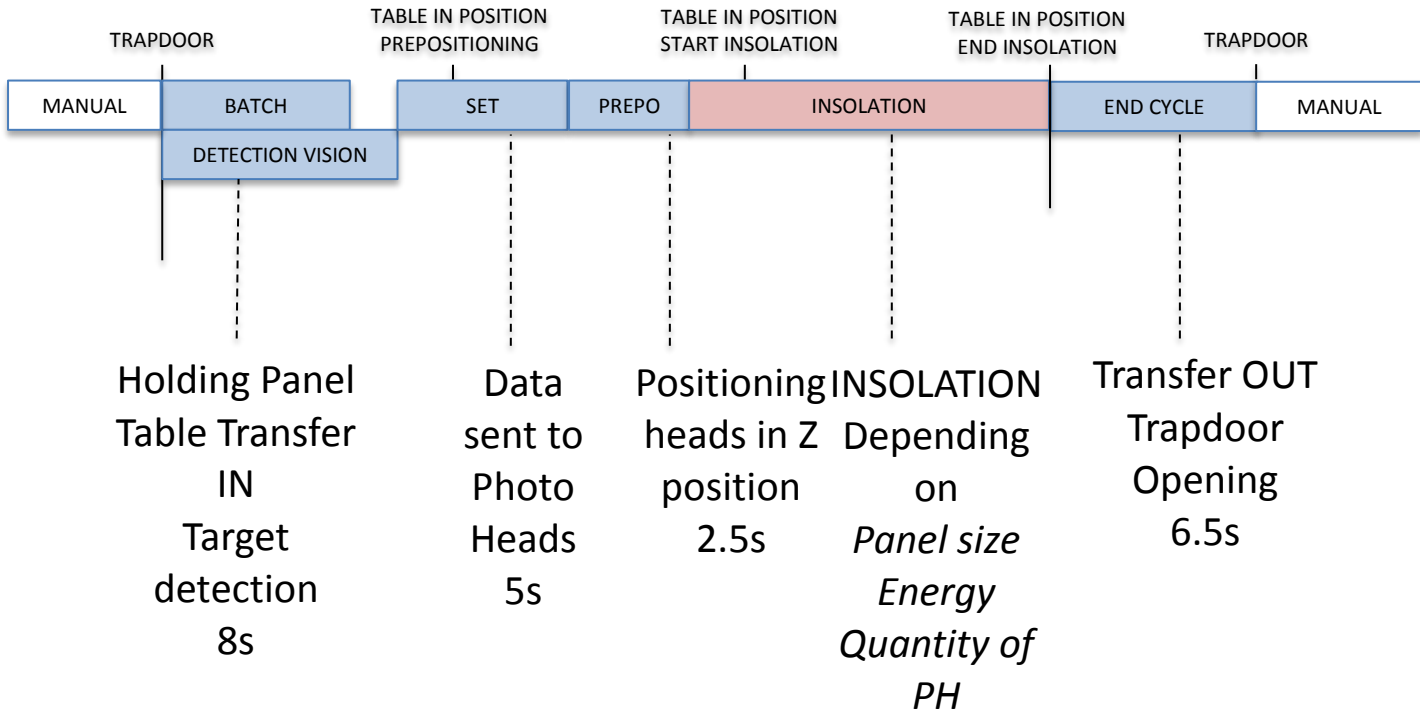


8.2. Resolution

Line / Space	<i>Refer to Table of Specification</i> (depending on Photo Resist and process capability of the customer) 	Main other conditions advised to achieve fine line resolution: <ul style="list-style-type: none">- Dry film adapted to resolution down to the resolution required (Type, Quality, Thickness)- Surface preparation adapted to resolution required- Lamination process adapted to resolution required- Development process adapted to resolution required (Use current developing equipment and parameter, if adapted to resolution required)
Edge Roughness	<i>Refer to Table of Specification</i>	



8.3. Productivity



Panel size : 18" x 24" (457mm x 610mm)

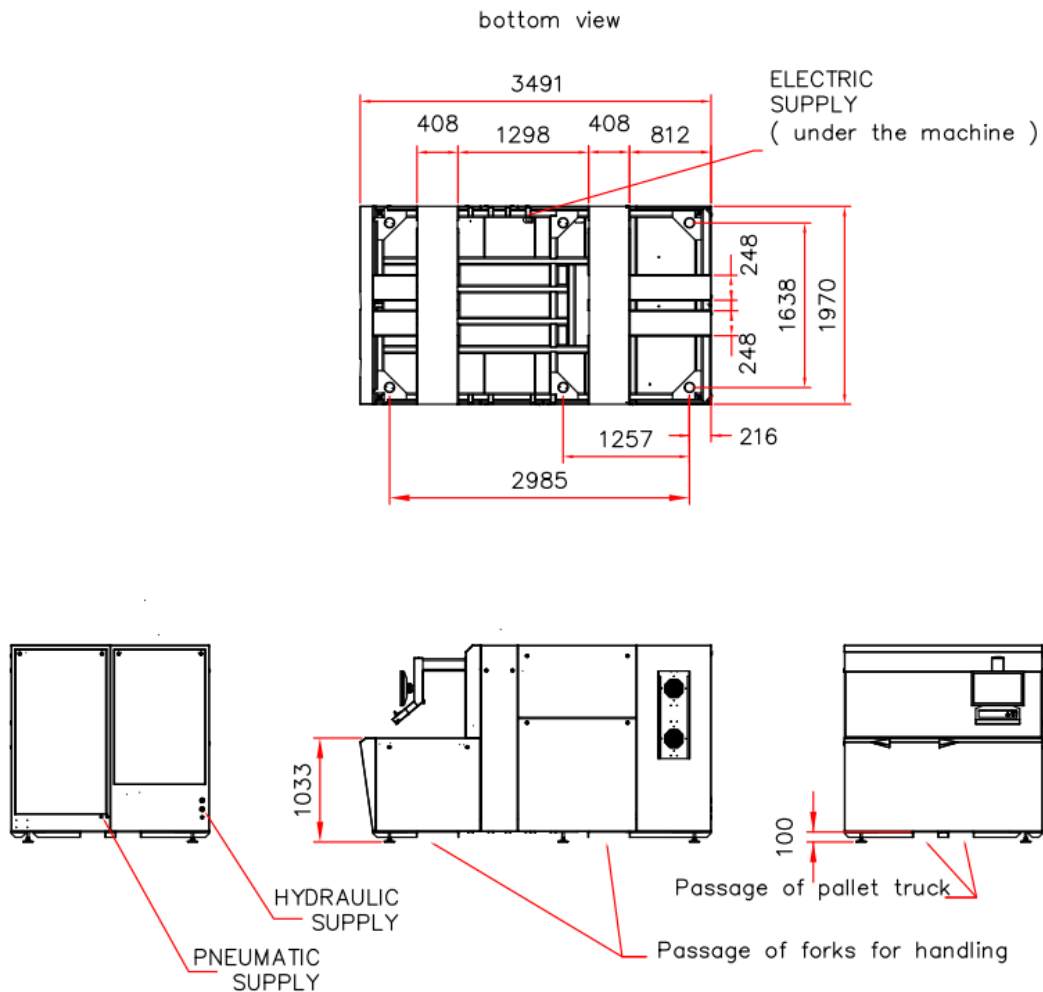
Energy	10mJ/cm ²	20mJ/cm ²	30mJ/cm ²	40mJ/cm ²	50mJ/cm ²	70mJ/cm ²	100mJ/cm ²
2 Photo Heads	61.8s	68.0s	83.1s	85.8s	92.3s	114.3s	146.8s
	58 side/h	53 side/h	43 side/h	42 side/h	39 side/h	32 side/h	25 side/h
4 Photo Heads	48.4s	52.2s	61.6s	63.2s	67.2s	80.7s	100.8s
	74 side/h	69 side/h	58 side/h	57 side/h	54 side/h	45 side/h	36 side/h
6 Photo Heads	40.0s	42.4s	48.2s	49.3s	51.8s	60.2s	72.7s
	90 side/h	85 side/h	75 side/h	73 side/h	70 side/h	60 side/h	50 side/h

9. Options

Pneumatic Air filtration	Optional Submicronic filter
Water filter on Water Network	Optional 1 or 2 filters



10. Layout (Altix ref. COM 1101-6)



11. Utilities

External Dimensions Length x Width x Height	<i>Refer to Table of Specification</i>
Machine weight	<i>Refer to Table of Specification</i>
Electrical supply	220/400/480 V - 50Hz – 3 phases
	Tolerance on Voltage: $\pm 6\%$
	<i>Refer to Table of Specification</i>
Pneumatic supply	Pressure: <i>Refer to Table of Specification</i>
	Air flow: <i>Refer to Table of Specification</i>
Water supply	Pressure: <i>Refer to Table of Specification</i>
	Difference of pressure (input pressure – Output pressure) > 1 bars
	Temperature: 12 to 14°C
	Water flow: <i>Refer to Table of Specification</i>
	To avoid corrosion pH must be around 7



12. Installation Environment

Comply with conditions given below for achieving and maintaining the optimal performance of the exposure system.

Location	Clean Room
Installation Conditions	Ambient Temperature: 20±2°C Relative Humidity: 50% RH ±5%
Room illumination	Inactinic yellow light
Clean room	Recommended cleanliness Class 10,000 (10,000 or less particles of size 0.5µm per cube foot)

13. Customization