OVERVIEW

SPI 2500

Feb. 2009

PARMI

INTRODUCTION

SPI 2500 System

Major roles of the system

SPI 2500 System

- **Offline 3D SPI machine**
- **Best Seller**
- **Economic model**
- **Rigid Structure**
- **3 dimensional measuring**
  - Height, Area, Volume

Major roles of the system

Detecting faulty solder paste locations

- Volume, Height, Area

Monitoring the current printing process

-Helps operator to know printing status at production lines
-Suitable for 0201 chip, CSP, fine pitch QFP etc.

SPC (Statistical process control)

- Classical printing process monitoring & control functions
- Cost effective solution for monitoring & analysis

HARDWARE

Outlook and Dimension

Hardware Schematics

Hardware Configuration

Working Table

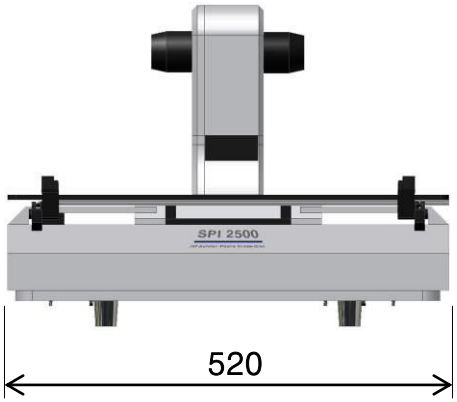
Sensor Translation

Control System

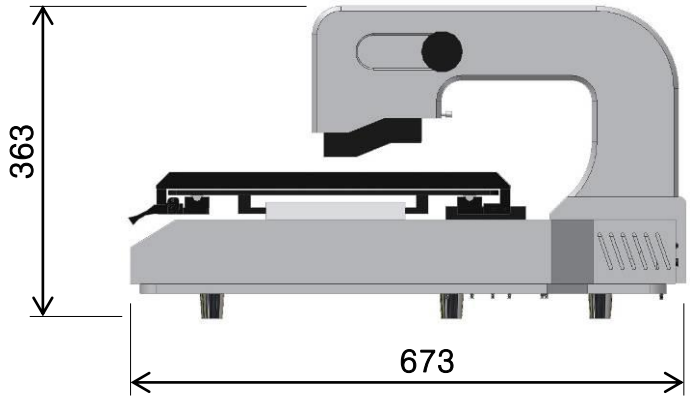
Outlook and Dimension

- Outlooks
  - Simple & Elegant
  - Power indicating Led
- Base plate & Frame
  - Rigid Structure
  - Preserve stable measuring
- Focusing Units
  - Smooth Z-Axis movement
  - No backlash

TOP VIEW



SIDE VIEW



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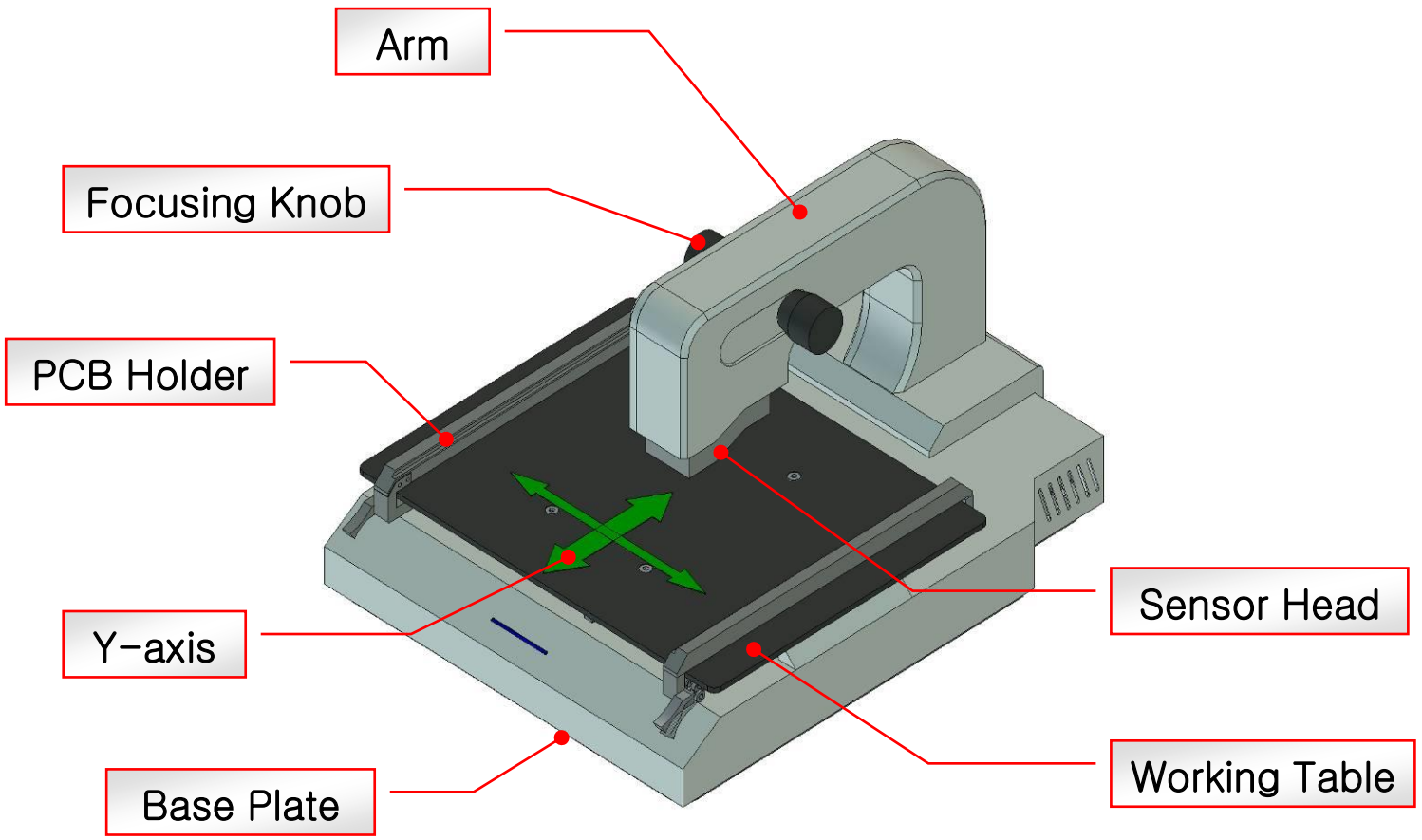
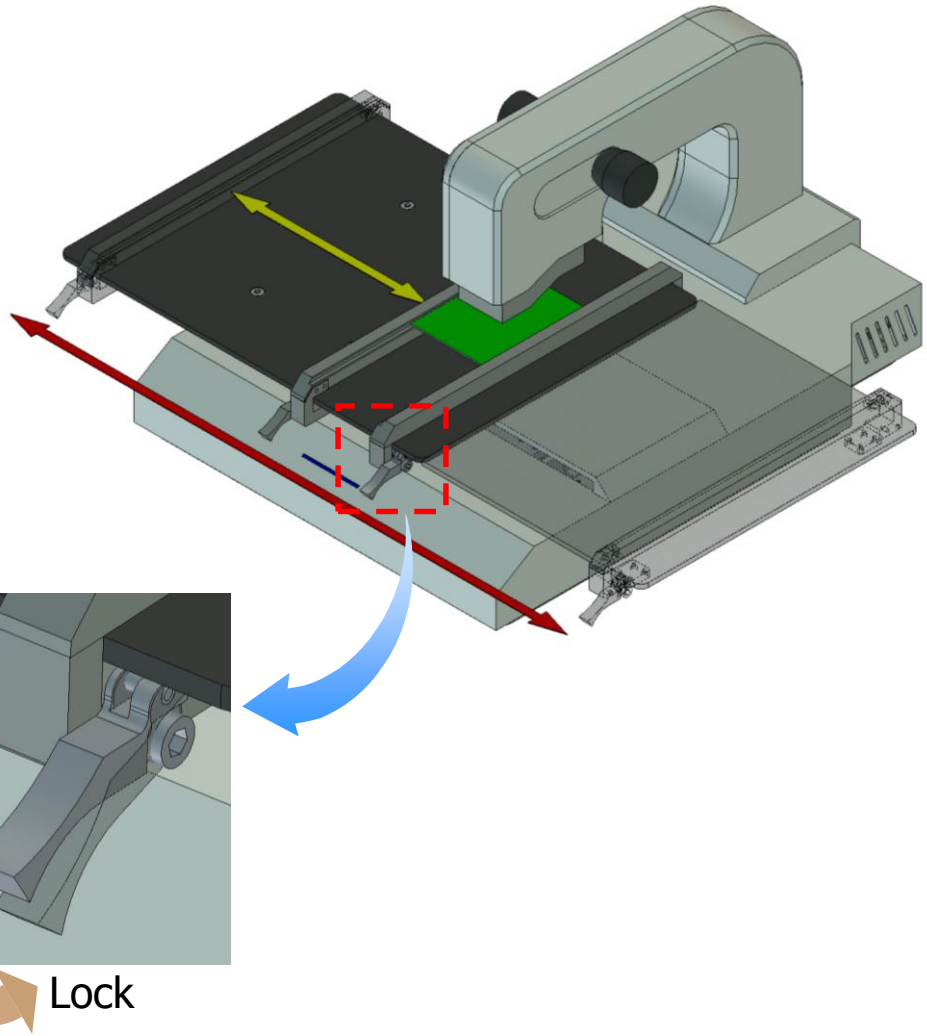
Hardware Schematics



Working Table

- Wide Table
  - Small footprint, but mount big PCBs
  - Max. 420 x 390 mm
  - Move X-direction Max.315mm

- PCB Holder
  - Mount PCBs with back side component
  - Convenience Locking knob



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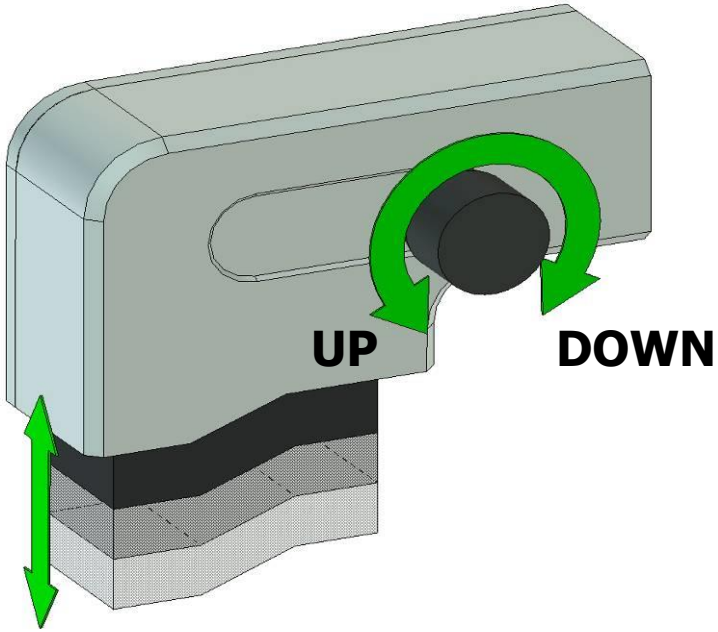
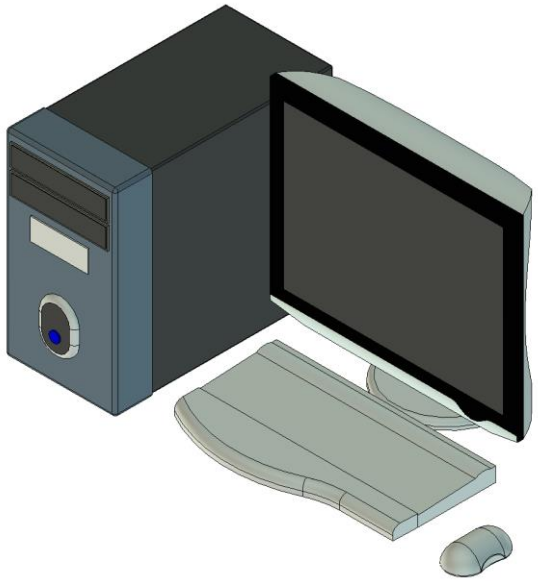
Sensor Translation

- Rotating the focusing knob
  - Move the sensor up and down
  - To get focused laser beam on PCBs with different thickness



Control System

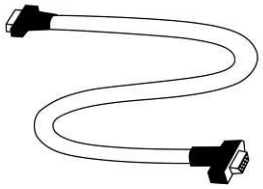
- Main Controller : PC
  - Scanning area to get 3D profiles
  - Image Acquisition & Processing
  - Measuring volume, height, area
  - SPC analysis

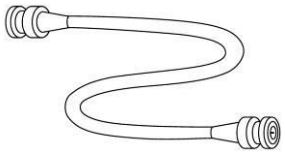


- PC Specification

CPU	Pentium Core II Duo Processor
RAM	4 GB
HDD	160 GB
VGA	64MB or 128MB
O/S	Windows XP Professional
DISPLAY	17” LCD

- Interface Cables
  - Communication Cable
  - Image Signal Cable





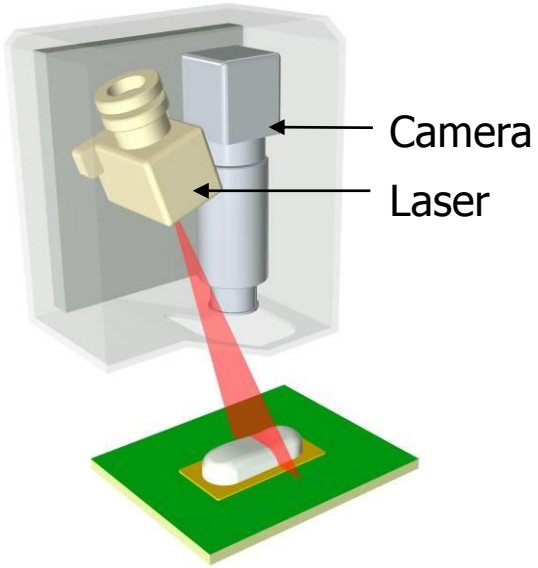
3D SENSOR

3D Measuring Principle

Sensor Specification

True 3D Shape

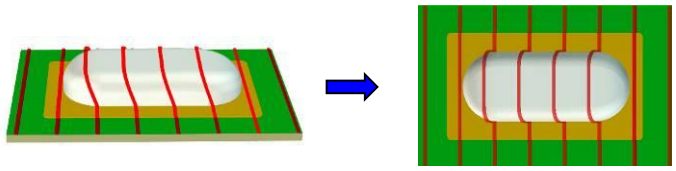
3D Measuring Principle

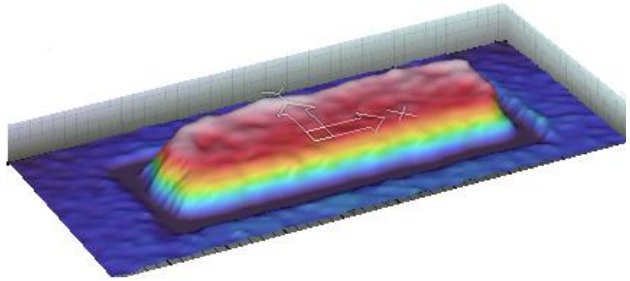


- Laser Optical Triangulation
- Industrial proven robust method
- Project laser sheet beam on PCB
- Get sectional profiles
- Extract height values from profiles

Perspective View

Top View





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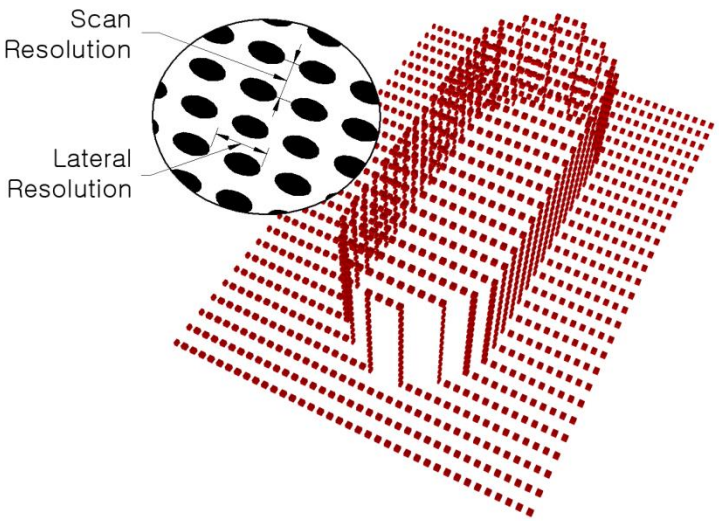
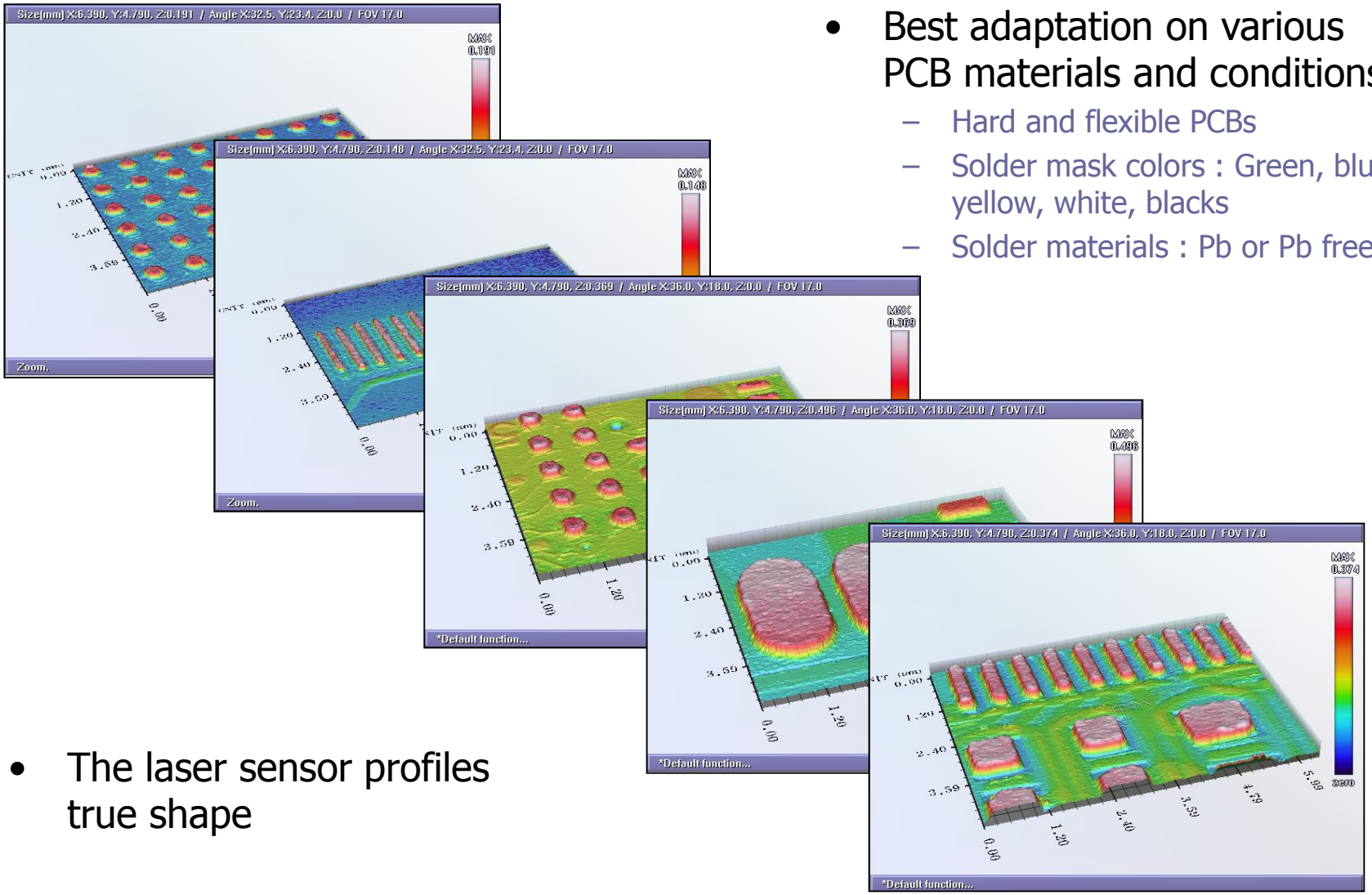
Sensor Specification

Field of View (FOV)	6.4 x 4.8 mm
Measuring Speed	30 Profiles/sec
Spatial Resolution	10 ㎛
Measuring Depth	500 ㎛
Height Accuracy	3 ㎛
Height Repeatability	±1 ㎛, 3sigma limit
Camera Pixels	640 x 480



True 3D Shape



- Best adaptation on various PCB materials and conditions
  - Hard and flexible PCBs
  - Solder mask colors : Green, blue, yellow, white, blacks
  - Solder materials : Pb or Pb free

- The laser sensor profiles true shape

SPIworks2500

Structure of SPIworks2500

Measuring Sequence

Supported Modes

Model Management

Scanning

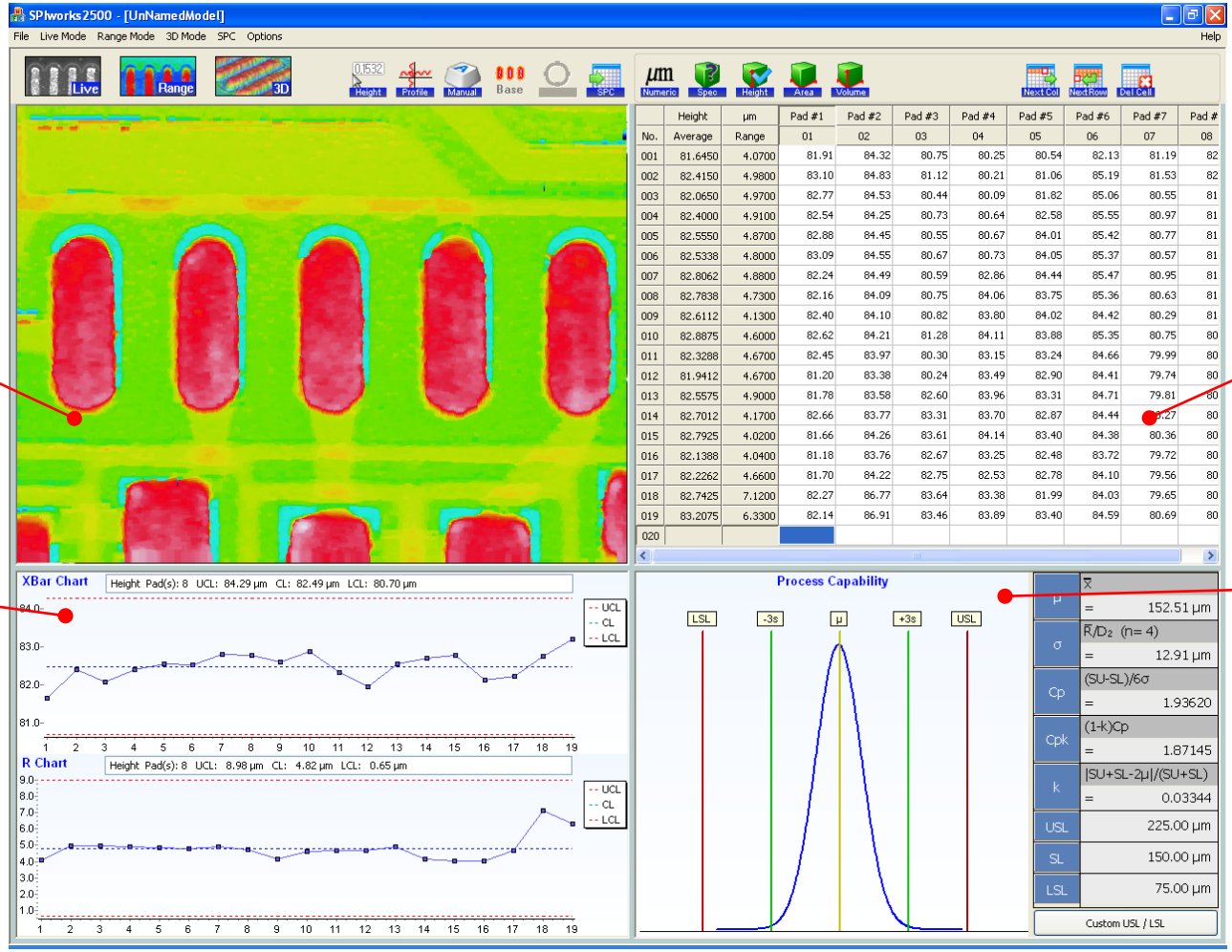
Auto Measuring

Manual Measuring

SPC

Export

Structure of SPIworks2500



Viewer

Control Charts

Data Sheet

Process Capability Analysis

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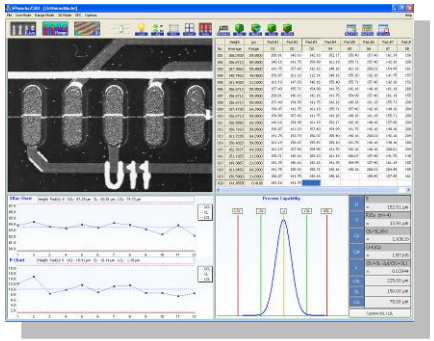
Measuring Sequence

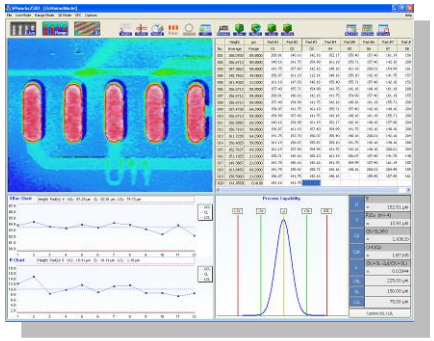
① Make or open a model (file)
② Place a PCB on the working table
③ Adjust the focus by rotating the focusing knob
④ 3D Data acquisition by scanning
⑤ Measuring height, area & volume of solder paste locations
⑥ Add measured data to the data sheet
⑦ Analysis printing process by various SPC charts

Supported Modes

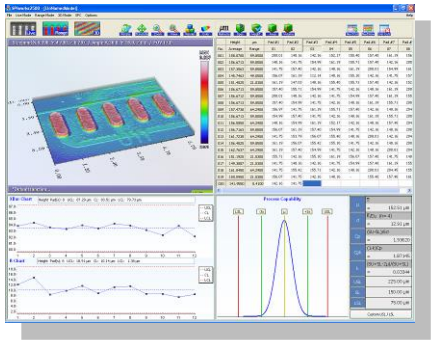
- **Live mode**
  - Display Live Image from Camera : 30 FPS
  - Help operator to adjust sensor head
  - LED light & laser Control



- **Range Mode**
  - Display Height map by pseudo Coloring
  - Helps operator to select solder paste locations
  - Various functions for measuring



- **3D mode**
  - Display 3D shape of scanned area
  - 5 Different Color Table
  - Rendering Mode : Vertex / Line / Polygon
  - Functions : zoom, rotation, translation



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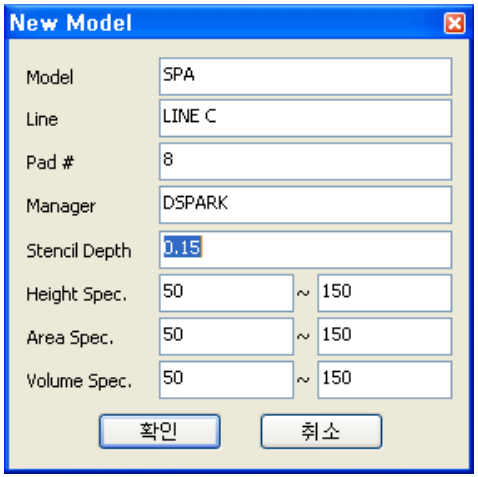
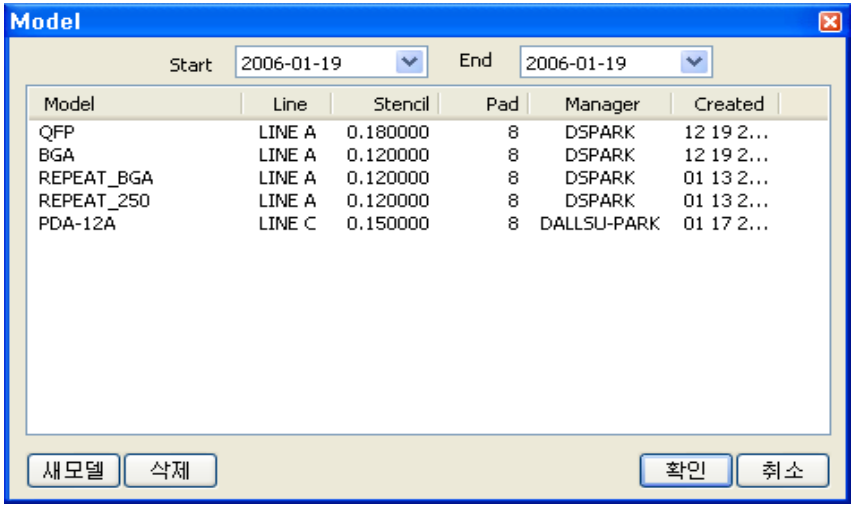
Model Management

- **Make a new model**
  - Designate model name, line Name, number of pads, stencil thickness, upper and lower specification limits



- **Open a model**
  - Query a period to see existing models
  - Select a model to open measured data



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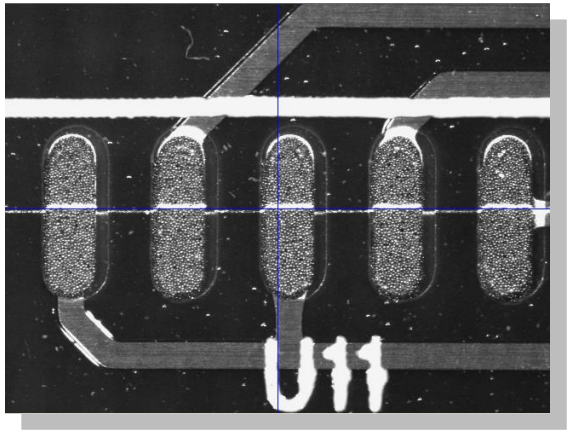
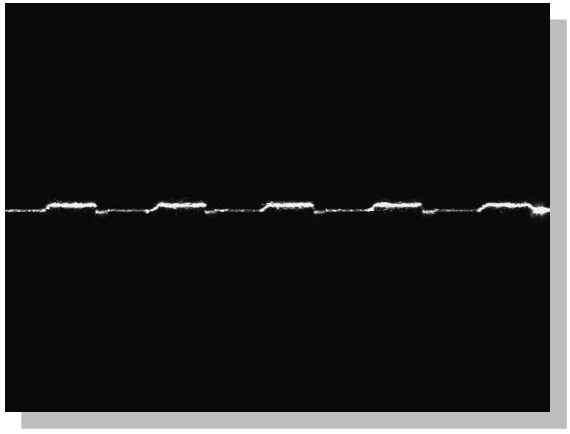
Scanning

- Focusing at live image mode
  - Adjust Focusing knob for laser beam to be middle of live image viewer

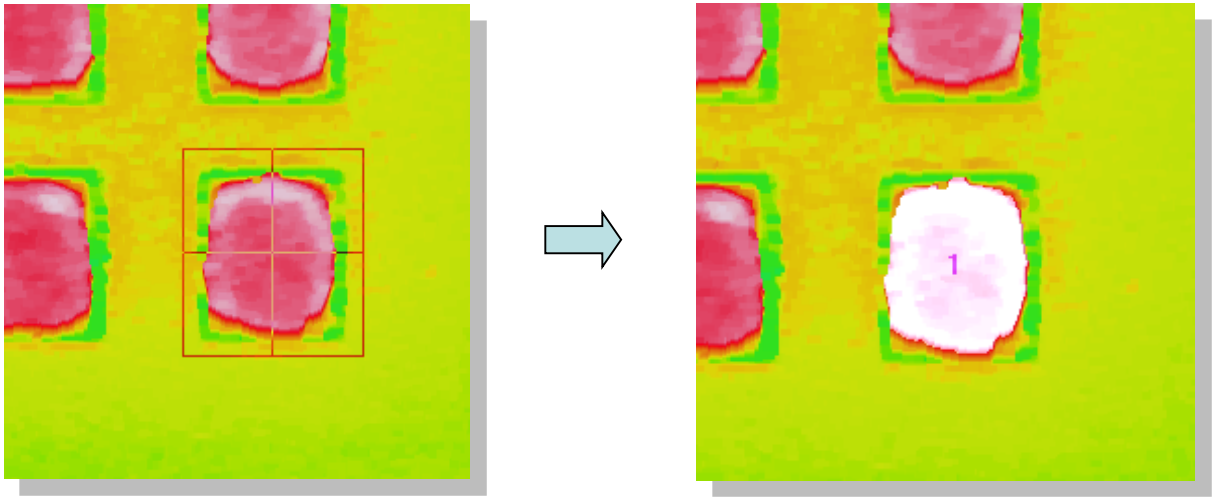


- Scanning at live image mode
  - Acquire Laser Profiles for area seen at live image viewer at 10um scan interval
  - Move the Y stage automatically



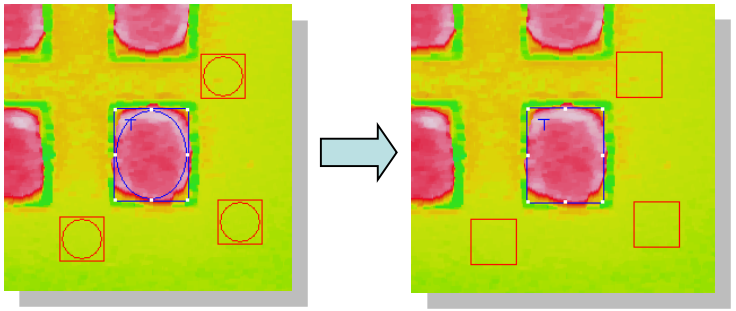
Auto Measuring

- Auto measuring at range image mode
  - Typical measuring mode
  - Select pads locations by making rectangles
  - Rectangle encloses a solder paste location
  - Vision algorithm automatically recognizes solder paste area and base plane
  - Height, Area, Volume data are calculated

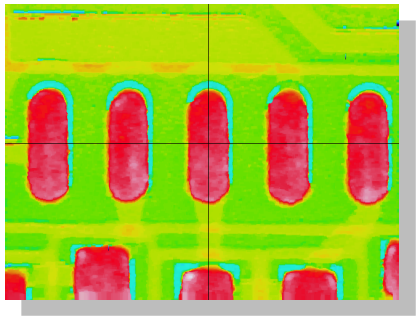


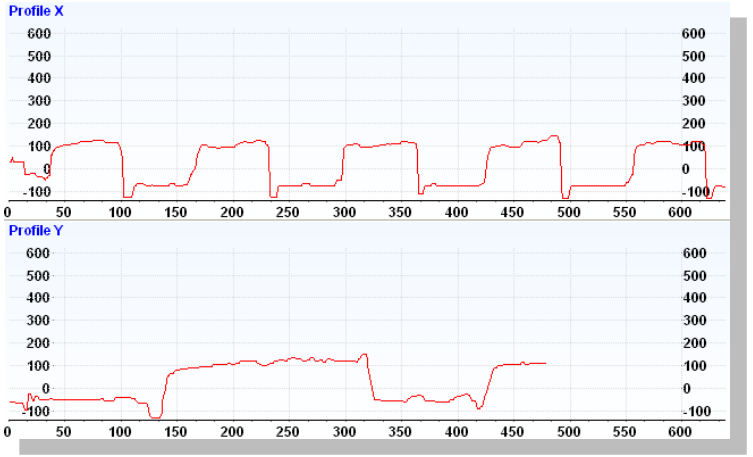
Manual Measuring

- Manual measuring at range image mode
  - Alternative measuring mode
  - Designate 3 rectangles or circles for base plane
  - Select solder paste locations
  - Base reference is calculated by 3 base points
  - Height, area, Volume data is calculated



- Cross sectional profile at range image mode
  - Show X and Y direction cross sectional profiles





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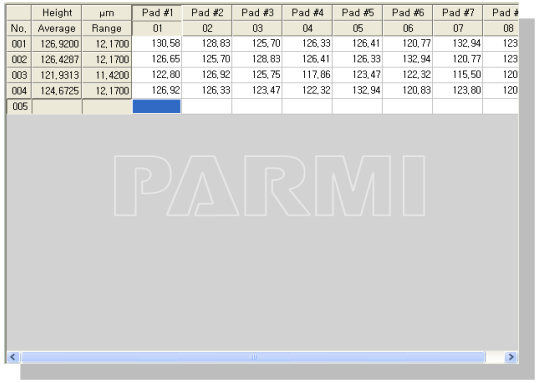
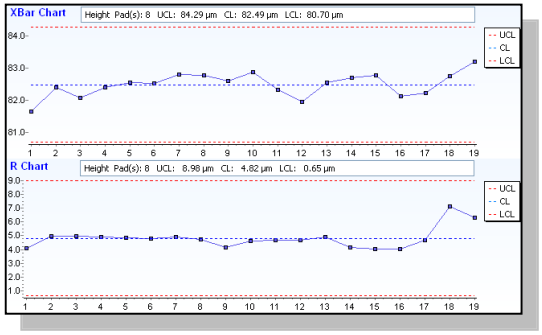
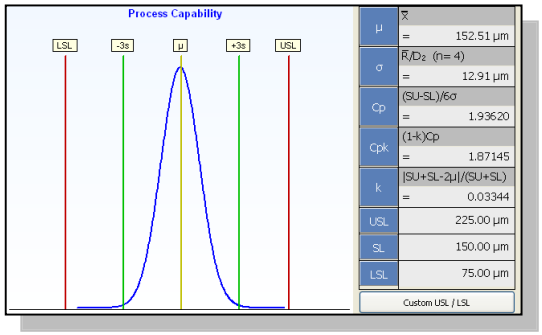
SPC



	Height	μm	Pad #1	Pad #2	Pad #3	Pad #4	Pad #5	Pad #6	Pad #7	Pad #
No.	Average	Range	01	02	03	04	05	06	07	08
001	126,9200	12,1700	130,58	128,83	125,70	126,33	126,41	120,77	132,94	123
002	126,4287	12,1700	126,65	125,70	128,83	126,41	126,33	132,94	120,77	123
003	121,9313	11,4200	122,80	126,92	125,75	117,86	123,47	122,32	115,50	120
004	124,6725	12,1700	126,92	126,33	123,47	122,32	132,94	120,83	123,80	120
005										

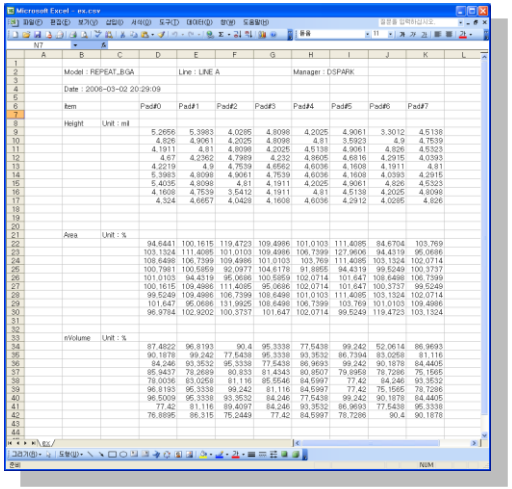




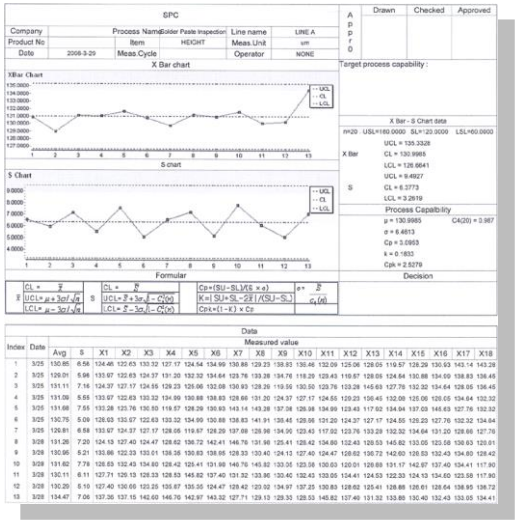
- Data Sheet
  - Shows measured height, area, volume data
  - The data in the sheet are used for SPC analysis
  - Data can be saved on database
- Control Charts
  - X-Bar & Range Chart
  - Shewhart control chart : UCL, CL, LCL
  - Monitor printing process
- Process Capability
  - Histogram Graph
  - Process Capability analysis : u, Sigma, Cp, Cpk
  - Set upper and lower limits

Export

- Measured data can be exported as *.csv file which can be opened with Microsoft Excel.



- Data can also be printed as Report format.



- Note! Specification setting must be done to export the data.

SPECIFICATIONS

Functional & Dimensional

Measurement Specification

Functional & Dimensional

- **Functional Specification**

Motorized Stage Stroke : Y	20 mm
Working Table Manual Stroke : X	315 mm
Scanning Interval	10, 20um
Measurable Range	6.4(X) x 4.8(Y) x 0.5(Z) mm
Sensor Translation (Z-Axis)	35 mm

- **Dimensional Specification**

Body Dimension	520(W) x 673(D) x 363(H) mm
Working Table Dimension	520(W) x 400(D) mm
Body Weight	36Kg
Electrical Requirement	AC 100~240V, 50/60Hz

Measurement Specification

- **Measurement Specification**

Measuring Principle	Optical Triangulation (Laser Sheet Beam)
3D Viewer	3D Open GL
Measuring Mode	Manual, Automatic
Field of View(Scan Area)	6.4 × 4.8 mm
Measuring Speed	30profiles/sec
Special Resolution	10㎛
Height Accuracy(*1)	3㎛
Height Repeatability(*1)	2㎛
Measurable Data	Area, Height, Volume
Measurable Depth	500㎛
Measurable Panel Size	Max. 400(W) x 390(D) mm