



# Optilia Instruments

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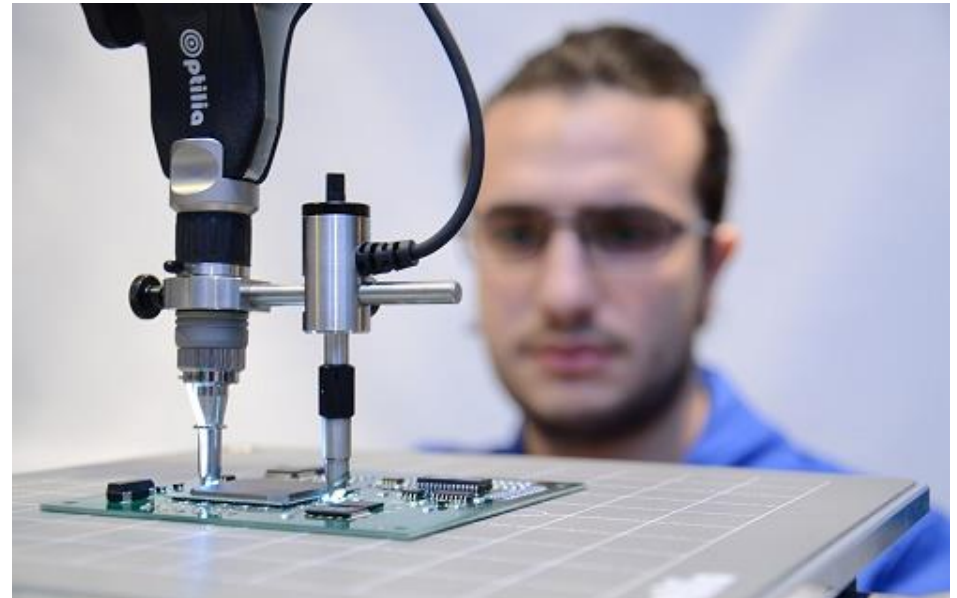
Empowering Your Vision!

Product Review:

# Optilia BGA Inspection Systems

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Cutting edge technology in optical inspection of BGA,  $\mu$ BGA, CSP and FlipChip soldering!



# Optical BGA Inspection vs. X-ray

## Capabilities

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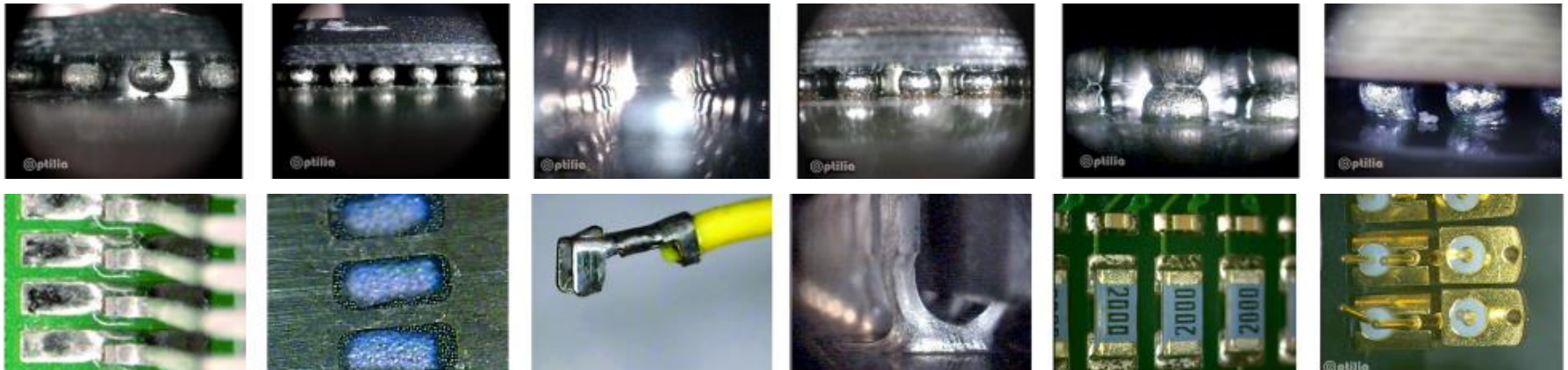
BGA	Optical Inspection	X-ray Inspection
Placement	✓	✓
Bridging	✓	✓
Cold Solder Joints	✓	✓
Reflow Problems	✓	✓
Excess Flux	✓	✗
Contamination	✓	✗
Ball Shape	✓	✓
Voids	✗	✓

PCB	Optical Inspection	X-ray Inspection
Top Inspection	✓	✗
Assembly and Rework	✓	✗

# What are the Applications?

Optical Inspection, recording, analysis and documentation of

- BGA
- $\mu$ BGA as low as 40 microns stand-off
- CSP
- Flip-Chip
- SMT Solder Joints
- Printed Solder Paste
- Assembled PCBs
- Stencil Apertures
- Components, pad, scores, connectors, cables



# Optilia BGA inspection technology

New generation, 90° side view BGA inspection system



- Specially designed patented optical system for bright image at low stand-off
- Flexible and configurable
- Reliable, easy to use and easy to maintain

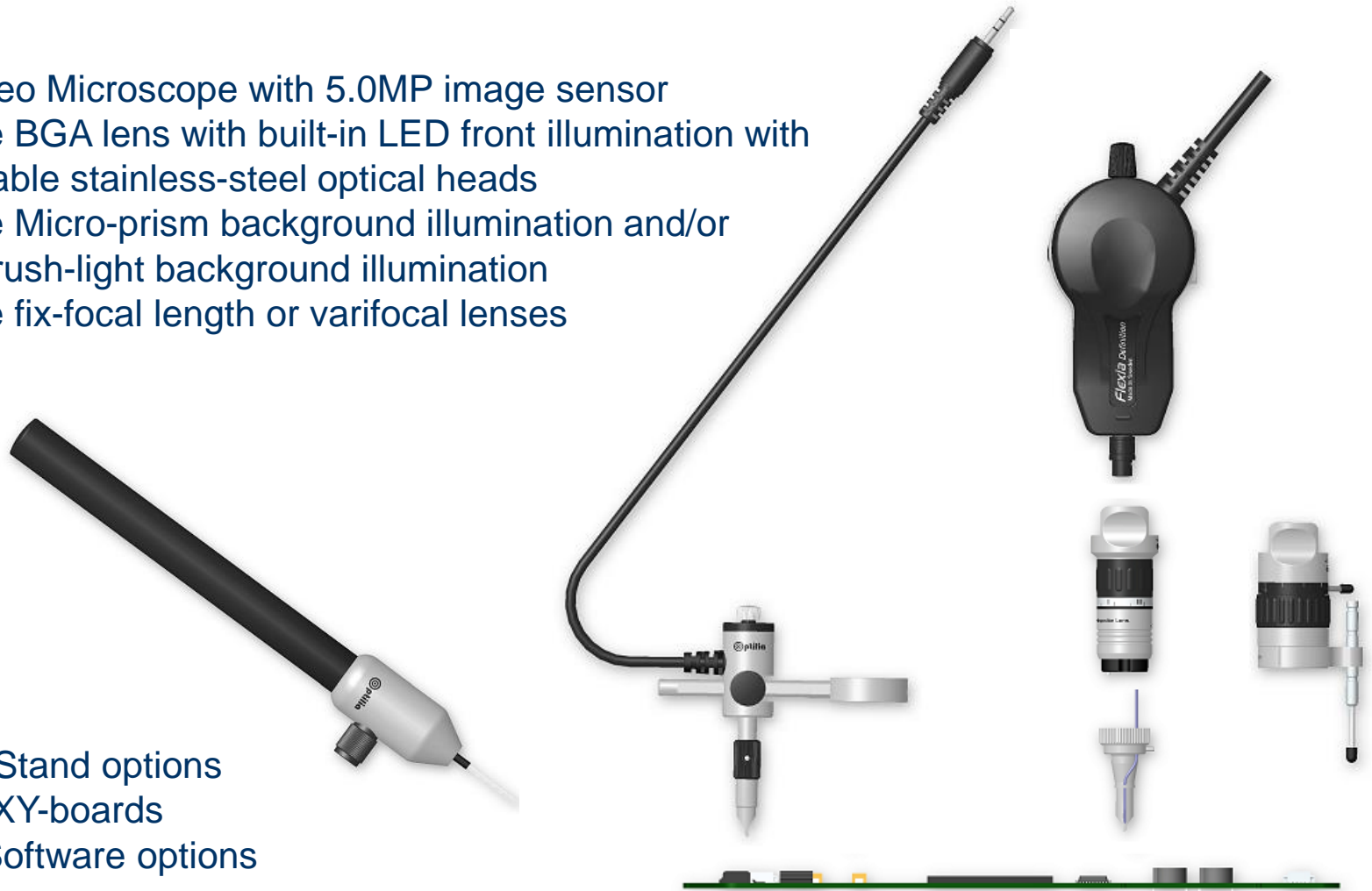
Swedish patent: SE 528,286  
US patent: US 7,643,136

# Optilia BGA inspection technology

## Optical system build-up

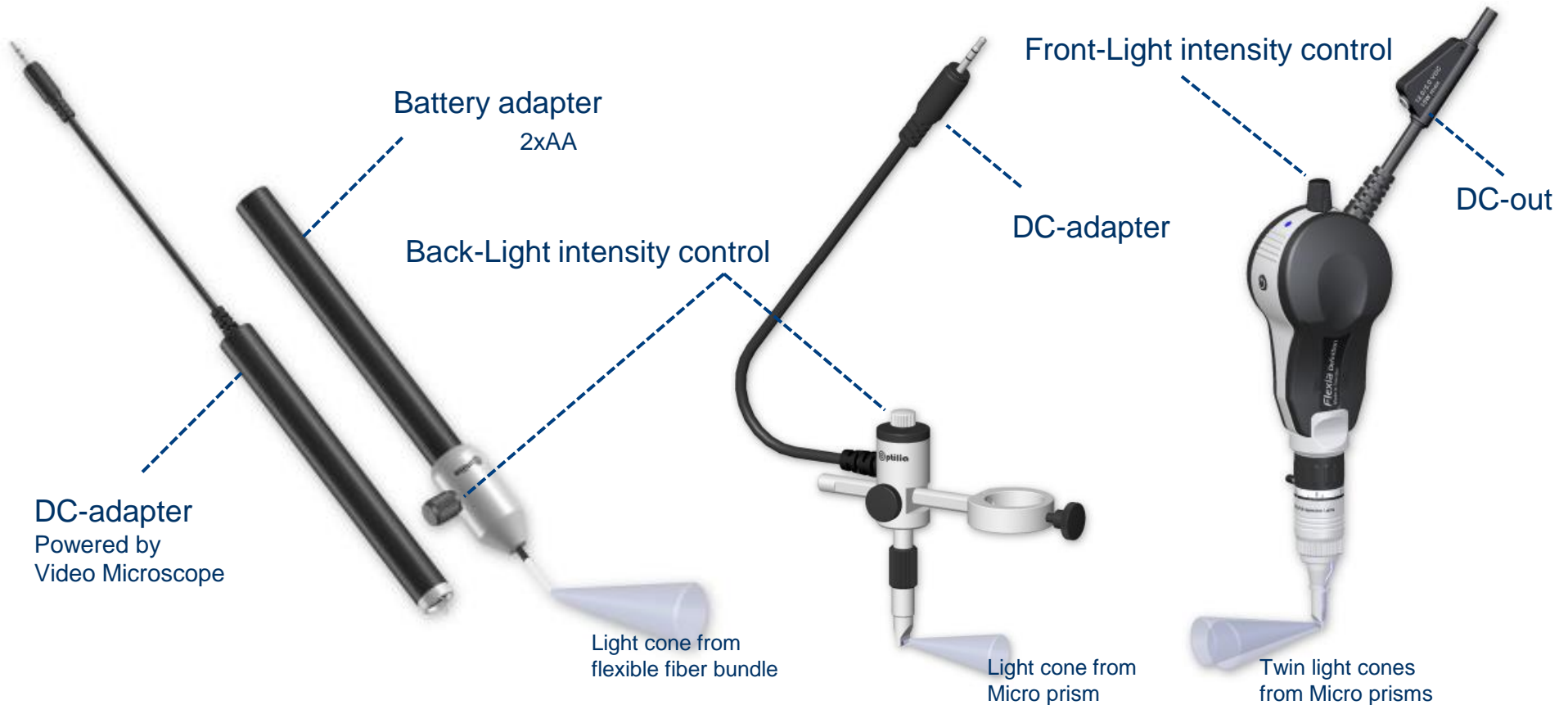
- Digital Video Microscope with 5.0MP image sensor
- Attachable BGA lens with built-in LED front illumination with exchangeable stainless-steel optical heads
- Attachable Micro-prism background illumination and/or
- Flexible Brush-light background illumination
- Attachable fix-focal length or varifocal lenses

- Variety of Stand options
- Precision XY-boards
- Different Software options



# Optilia BGA inspection technology

## New technology long-life multi-LED illumination system

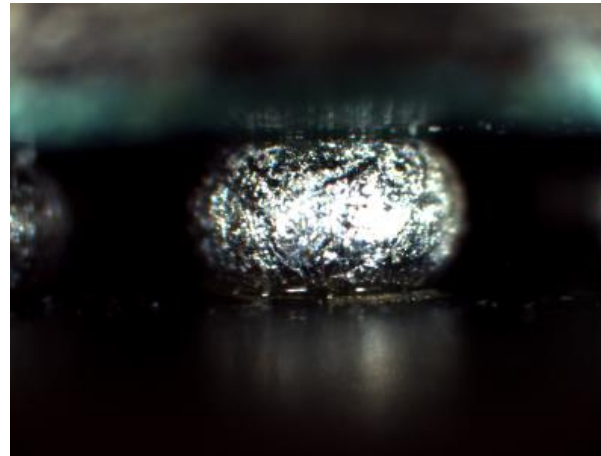


- Built-in High intensity front LED light with electronic Dimmer. Easy to adjust for best image
- Micro-prism background illumination with electronic Dimmer. Attached to the BGA lens
- Flexible Brush-light background illumination with electronic Dimmer. Highest flexibility
- Mobile battery powered or attached to DC-output of digital video microscope

# Optilia BGA inspection technology

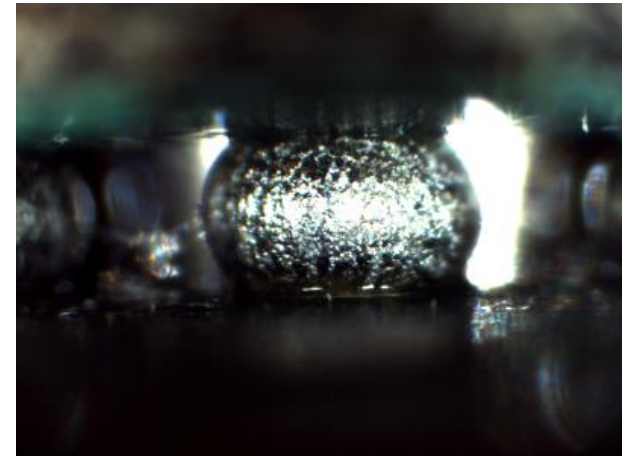
## Illumination impact on image

BGA solder ball illuminated by front incident light only. Surface structure and shape are visible.



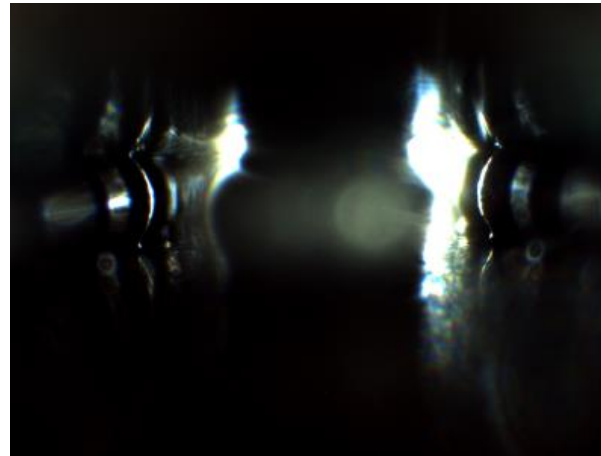
Normal intensity front-light (incident) only.

Same ball with both front- and back-illumination, normal intensity. Surface structure, shape and solder wetting are visible.



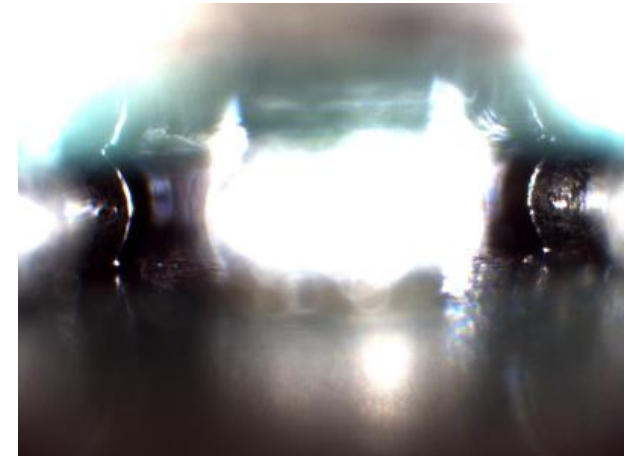
Normal intensity front and back-light.

BGA lens is Refocused. Bridges, contamination, fibers, excess flux are visible now.



Normal intensity front- and back-light. Refocused on thirds rows of bumps.

Front light intensity is increased! Surface structure of second row bumps become visible!



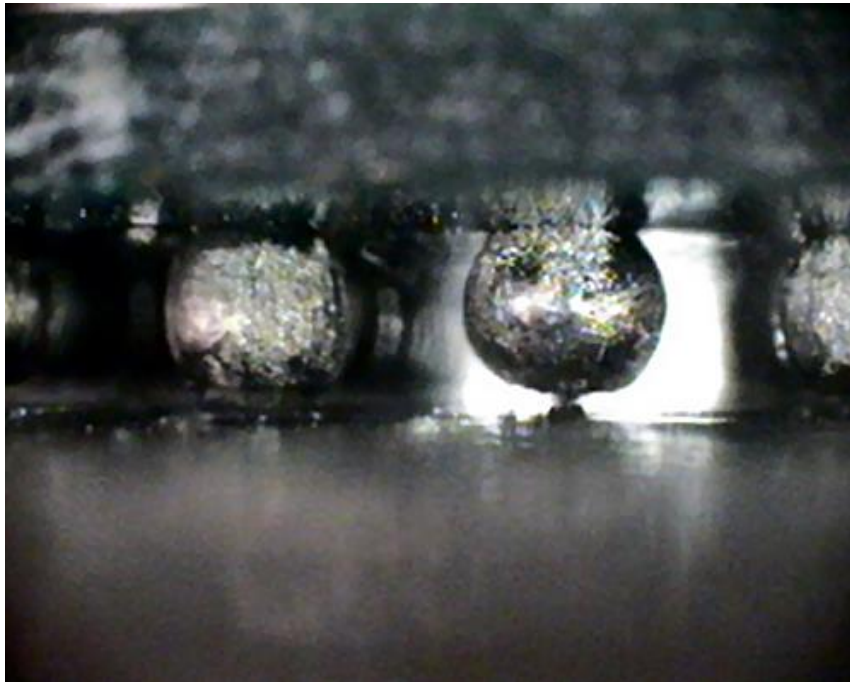
Extra intensity front- and normal back-light. Refocused on second rows of bumps.



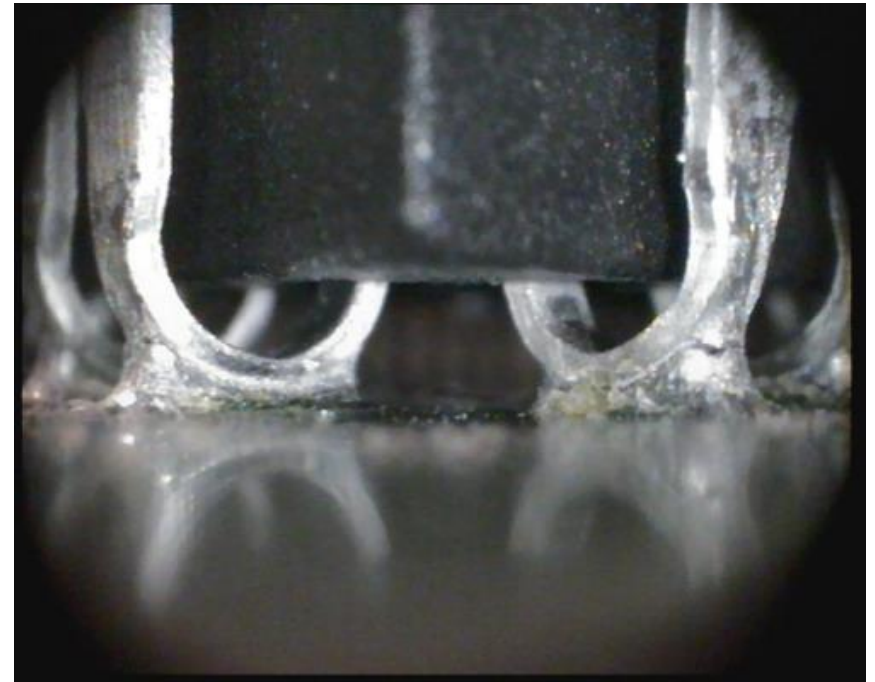
# Optilia BGA inspection technology

## Sample pictures

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Connection failure, BGA component.



Crack on lead solders, JLCC component.

# BGA lens with Low Aperture 90° Optical Head

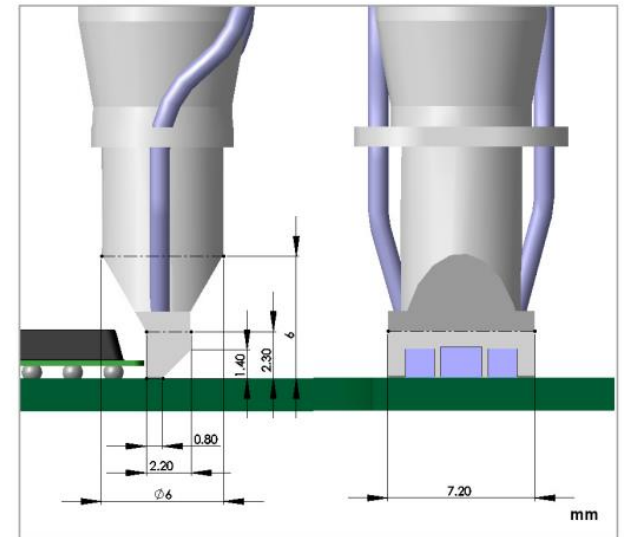
## Robust and Long-life Operation



OP-006 550



OP-006 551



- BGA stand-off min 40 microns
- Exchangeable Optical Head (spare part)
- Magnification Up to 250x on a 22" Monitor

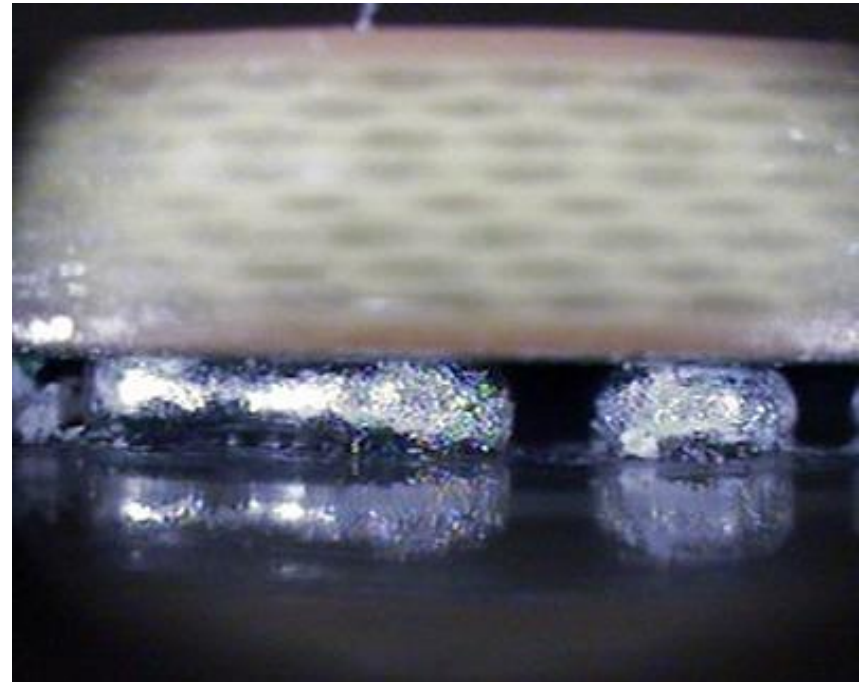
# Optilia BGA inspection technology

Sample pictures with Low-aperture BGA lens

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Fibres between BGA balls



Bridge

# BGA lens with Small Size 90° Optical Head

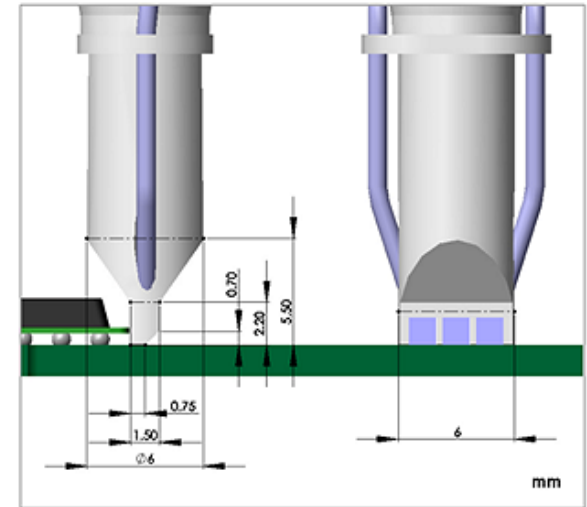
## Slim Optical Head for Narrow Inspections



OP-006 560



OP-006 561

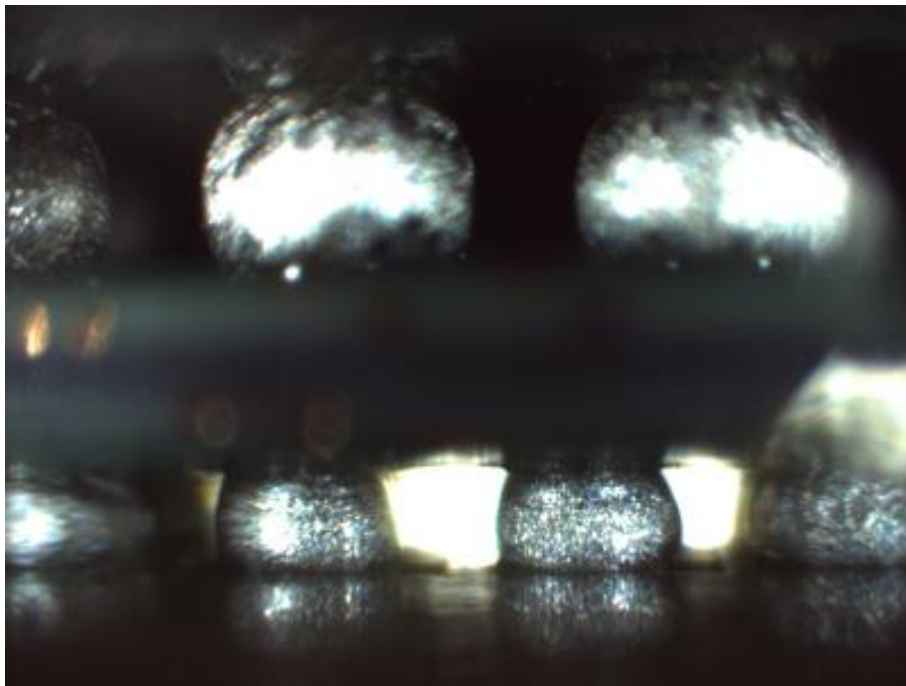


- BGA stand-off min 40 micron
- < 1.5 mm thin optical head (0.8 mm foot print)
- Exchangeable Optical Head (spare part)
- Magnification Up to 220x on a 22" Monitor

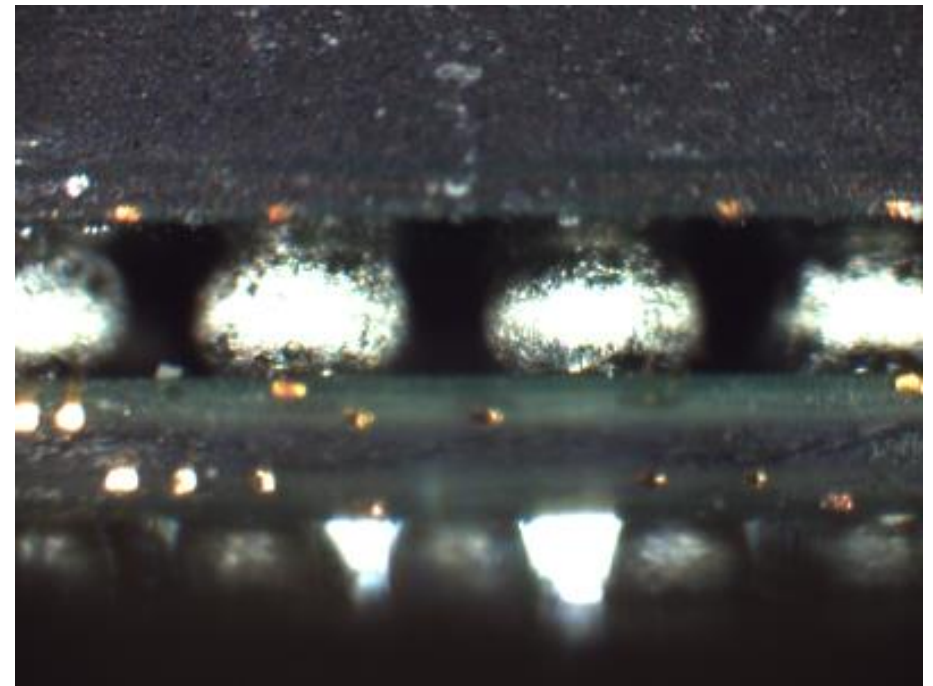
# Optilia BGA inspection technology

Sample pictures with Low aperture BGA lens

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Flip-chip component.



Same component. Lens is re-focused!

# Comparison of BGA side viewing Lenses

## Specification

Specification	Low Aperture	Small Size
<b>24" Screen Magnification</b> (if Flexia HM)	~ 280x – 5x	~ 350x – 25x
<b>Working Distance Range</b> (if Flexia HM)	~ 0.5 – 100 mm	~ 0.3 – 40 mm
<b>Field of View</b> (if Flexia HM)	~ 1.2 – 50 mm	~ 1.0 – 20 mm
<b>24" Screen Magnification</b> (if Flexia)	~ 130x – 9x	~ 180x – 24x
<b>Working Distance Range</b> (if Flexia)	~ 0.5 – 40 mm	~ 0.3 – 20 mm
<b>Field of View</b> (if Flexia)	~ 2.0 – 30 mm	~ 1.5 – 11 mm
<b>Depth of Field</b>	~ 5 mm at 20x ~ 0.2 mm at 250x	~ 5 mm at 20x ~ 0.2 mm at 250x
<b>Front Illumination</b>	Integrated twin LED	Integrated twin LED
<b>Back Illumination</b>	Flex. LED Brush-light & attachable Micro-Prism	Flex. LED Brush-light & attachable Micro-Prism
<b>Minimum Stand-off</b>	0.04 mm (40 microns)	0.04 mm (40 microns)
<b>Size of the Optical Head Tip</b>	7.2 x 2.2 mm (WxD)	6.0 x 1.5 mm (WxD)
<b>Foot Print of the Optical Head tip</b>	7.2 x 0.8 mm (WxD)	6.0 x 0.8 mm (WxD)

# Top-View Varifocal Lenses

## Attachable lenses with Built-in LED light for Top Inspection



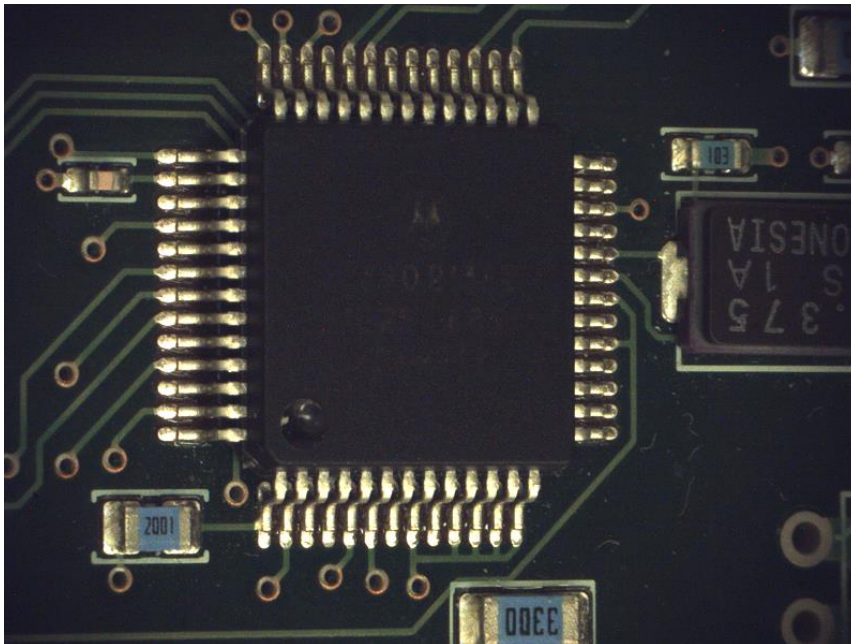
1-100x varifocal lens with built-in LED RingLight, **OP-019 407**

Built-in LED Light

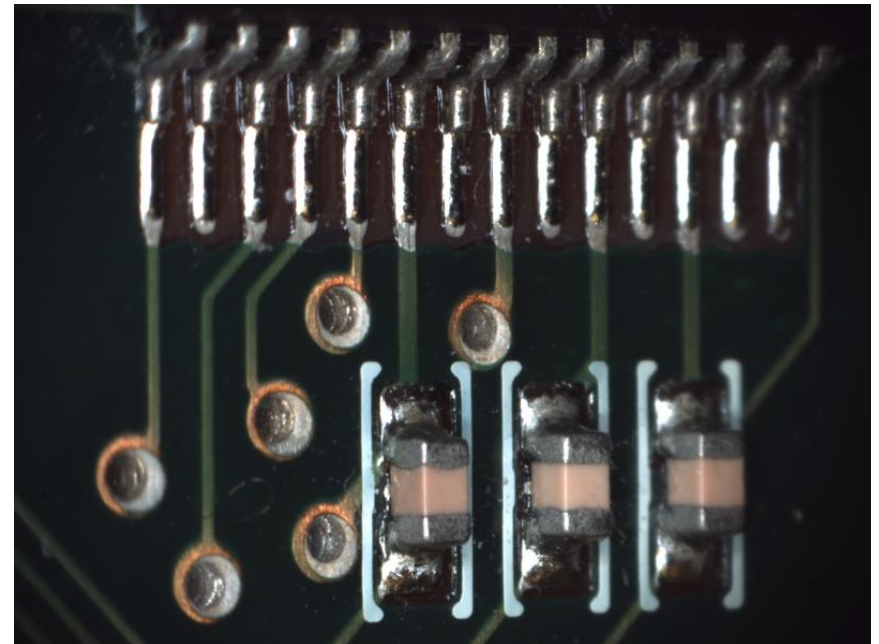


10-50x varifocal lens with Polarized LED RingLight, **OP-019 408**

Polarized LED Light



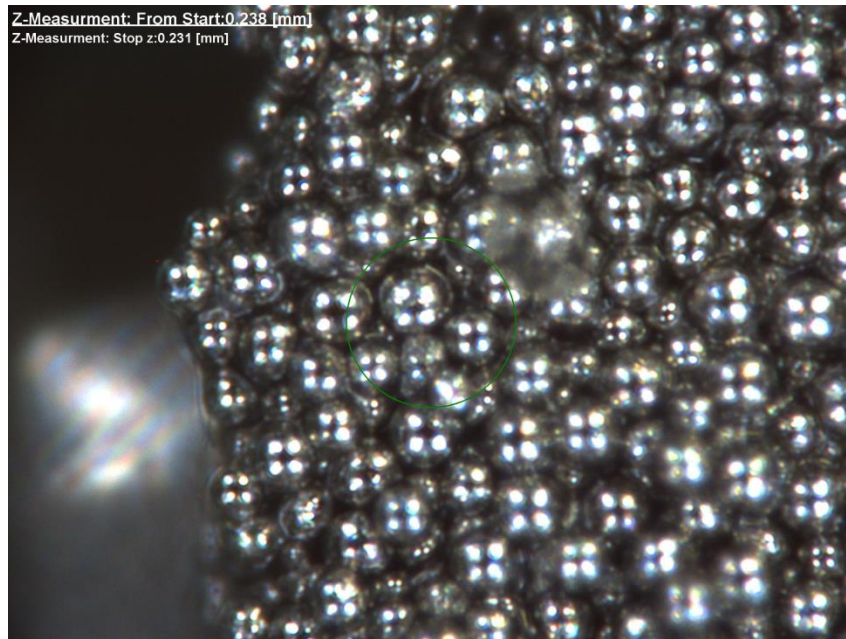
10x magnification, built-in RingLight



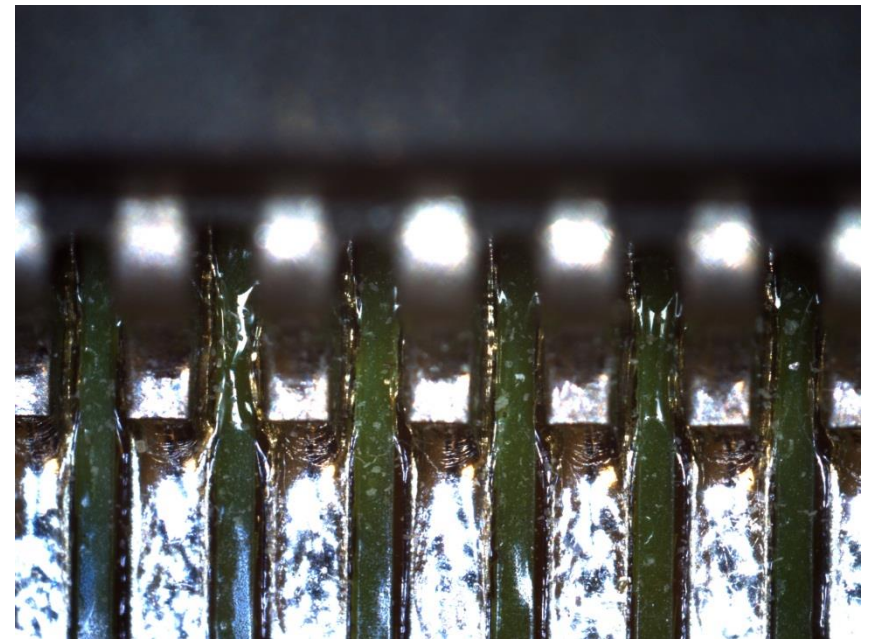
50x magnification, built-in RingLight

# Top-View Fixed focal length lenses

## High Magnification Fixed lenses, calibrated in the software



500x magnified solder past



250X, SOIC leads



# Why use Optilia BGA inspection systems?

Robust design, Micro prisms encapsulated in Steel Housing



# Why use Optilia BGA inspection systems?

## High Resolution 5.0 MP image sensor

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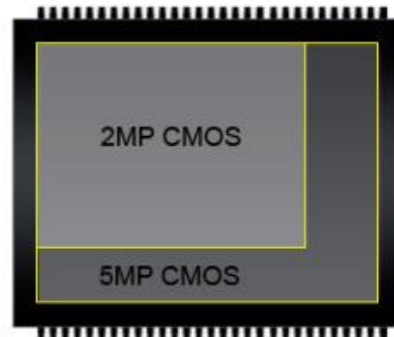
2MP CMOS  
1600H x 1200V

4.48x3.36 mm sensor size  
2.6x2.6  $\mu\text{m}$  pixels size



5MP CMOS  
2592H x 1944V

5.7x4.28 mm sensor size  
2.2x2.2  $\mu\text{m}$  pixels size

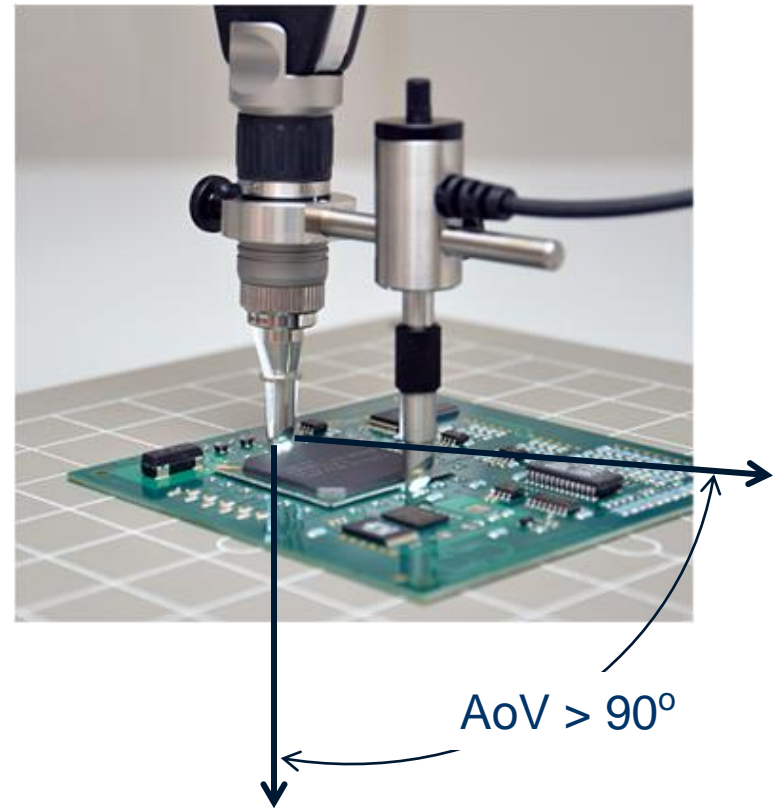
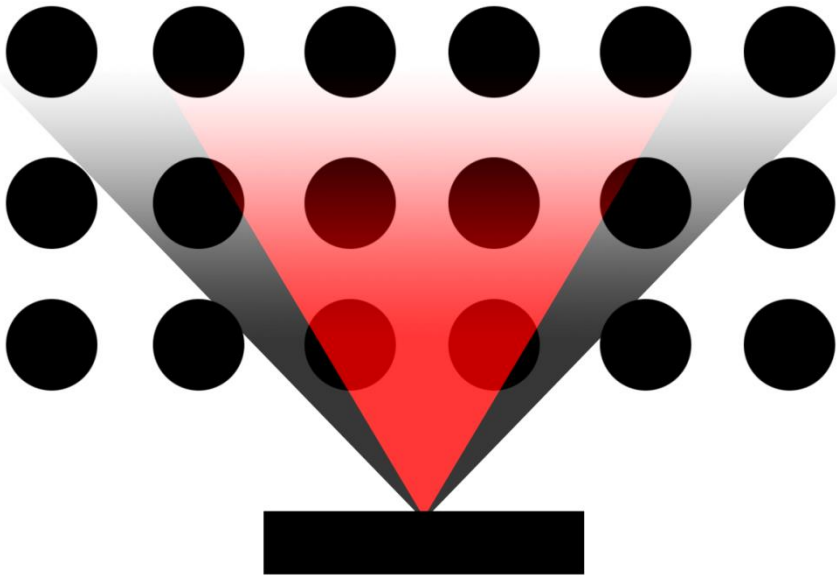


60% Larger Sensor  
27 % Larger Field of View  
160% More Pixels

- Highest resolution BGA system in the market. Crisp picture with more details!
- Larger Field of View makes hidden balls more visible

# Why use Optilia BGA inspection systems?

Larger Angle of View of the system makes hidden rows more visible!

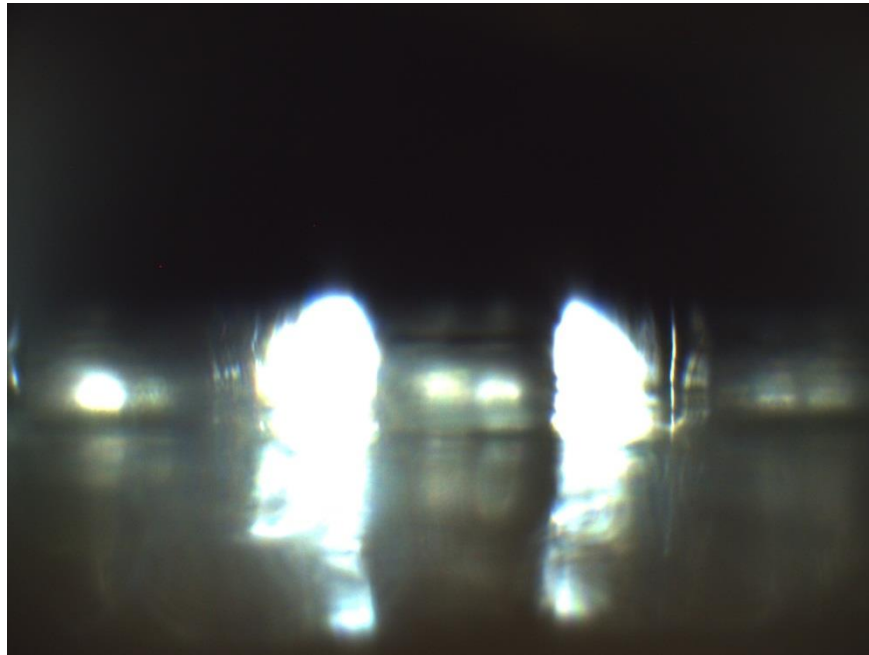


Red cone: Angle of View of the BGA lens with 2.0Mp camera  
Black cone: Angle of View of the BGA lens with 5.0Mp camera

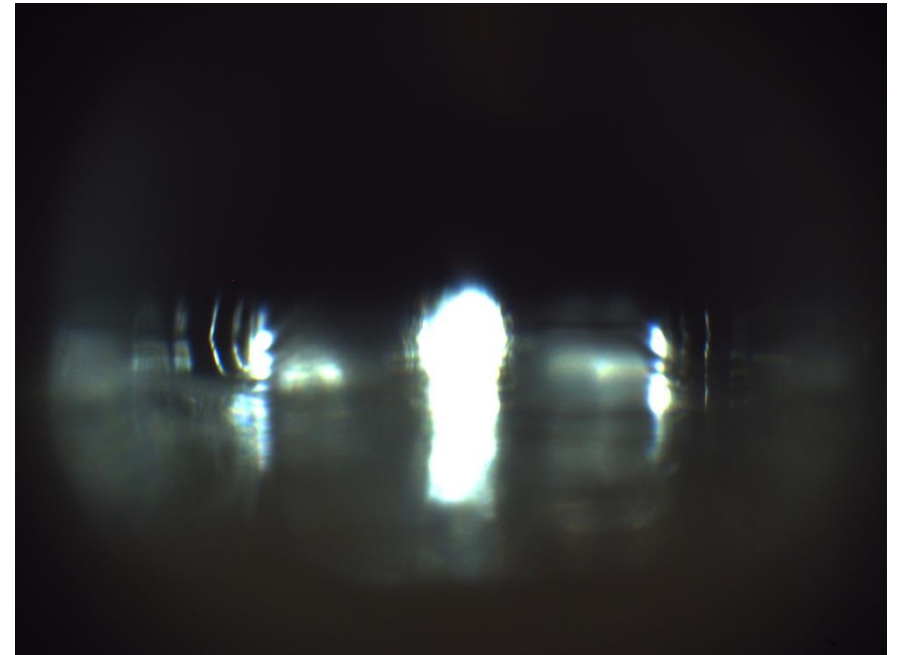
# Why use Optilia BGA inspection systems?

Designed for imaging BGA components with low stand-off

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μBGA with 120 mm stand-off  
Small size lens with **2.0 MP** camera

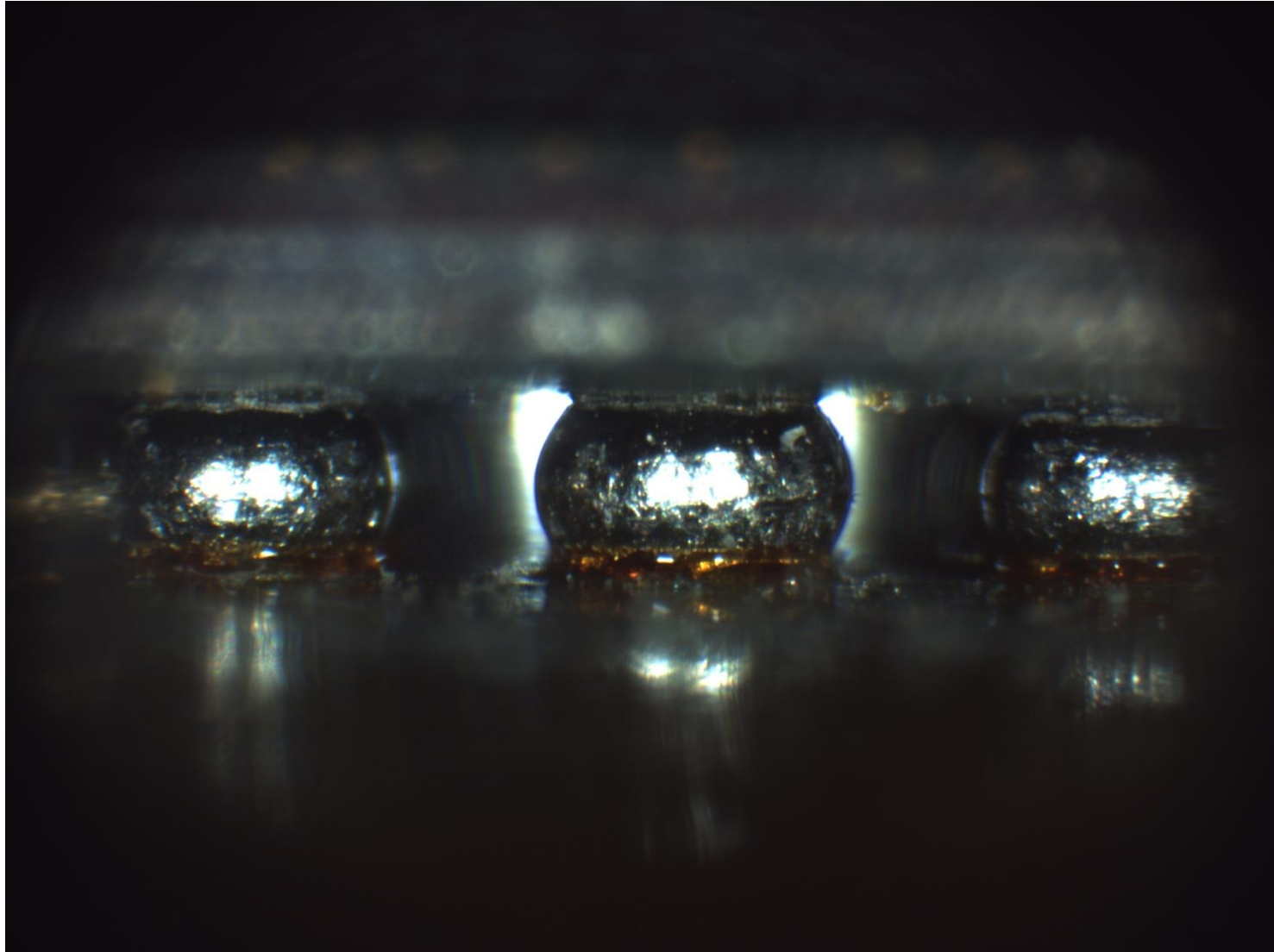


μBGA with 120 mm stand-off  
Small size lens with **5.0 MP** camera

# Why use Optilia BGA inspection systems?

Adjustable Focus for imaging up to 20 Rows for BGA

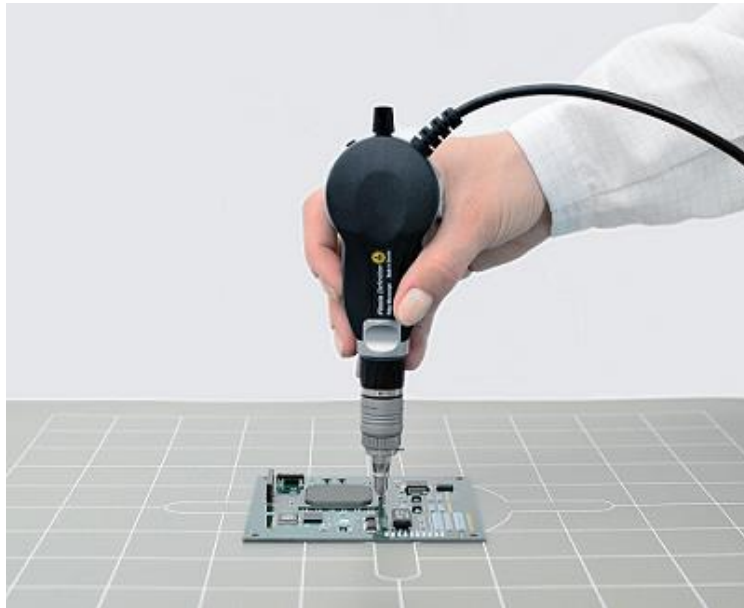
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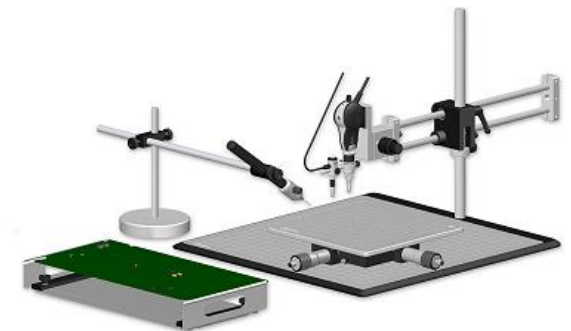
# Why use Optilia BGA inspection systems?

## Flexible and Configurable

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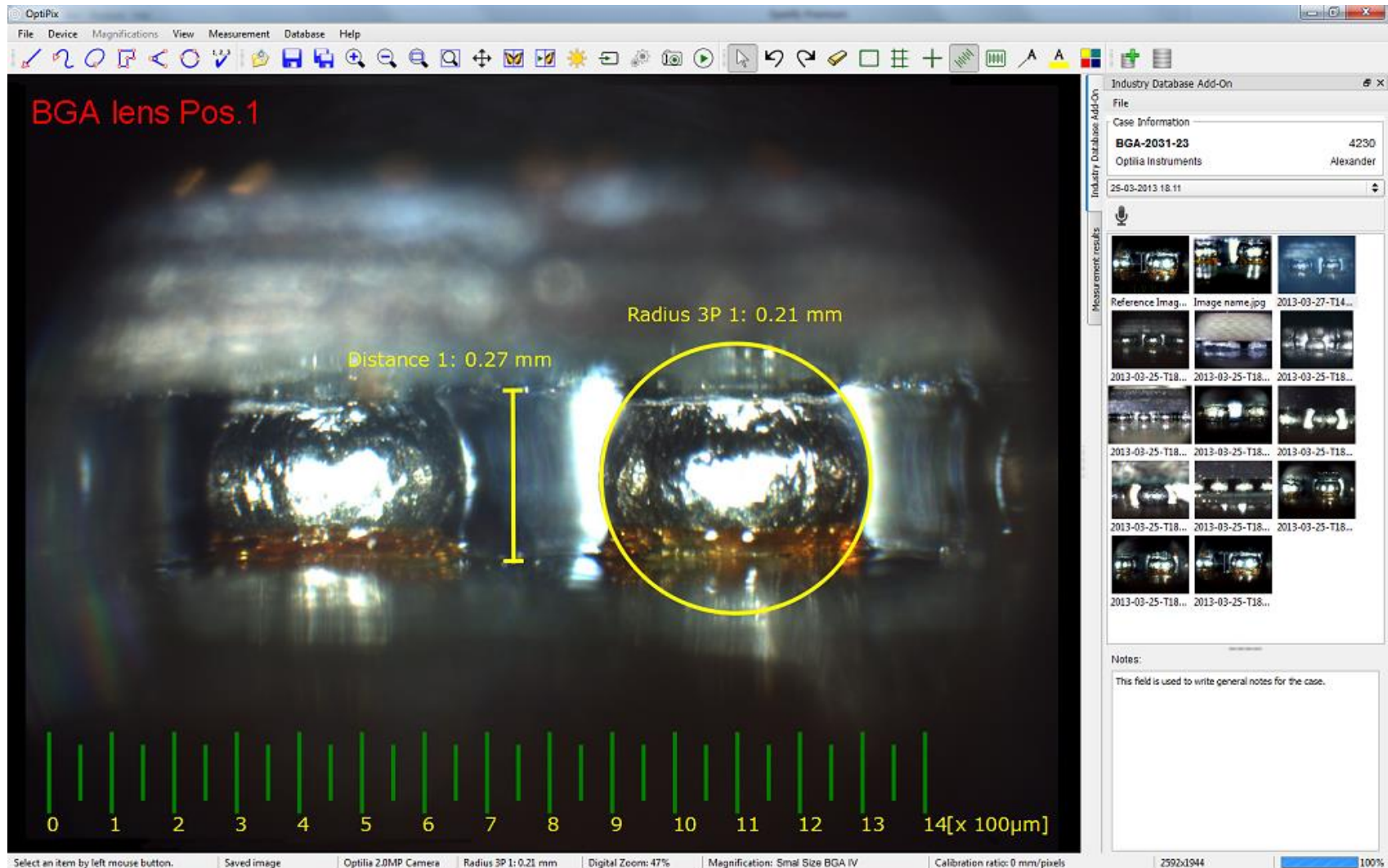


- Free hand operation
- Stand mount with background light and XY-translation
- XL-configuration with PCB holder for large size PCBs



# Software

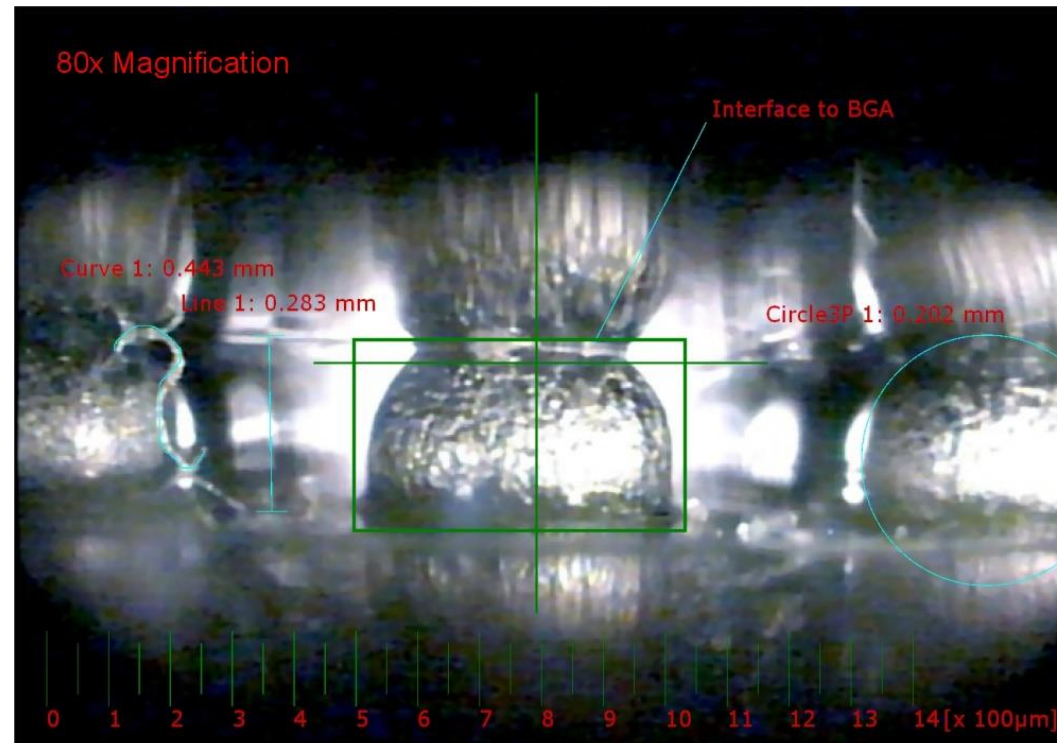
## OptiPix, Image Capture, Analysis, Measurements and Archiving.



# Software

## Overlays and Annotation

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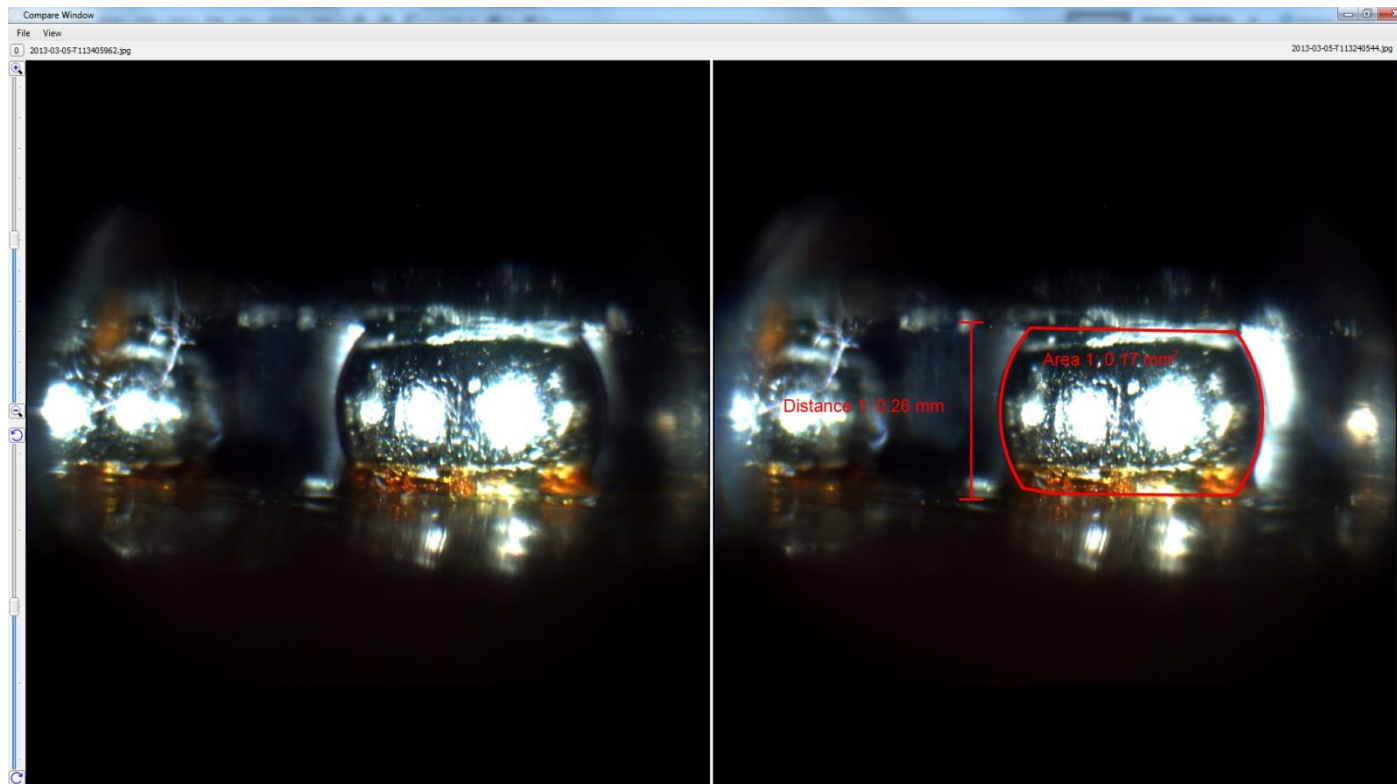


- Define and overlay grids, Cross-hair, rectangle and Ruler on live image to make quick analysis without capturing the image
- OptiPix enables the user to annotate and comment on each image



# Software

## Compare Image

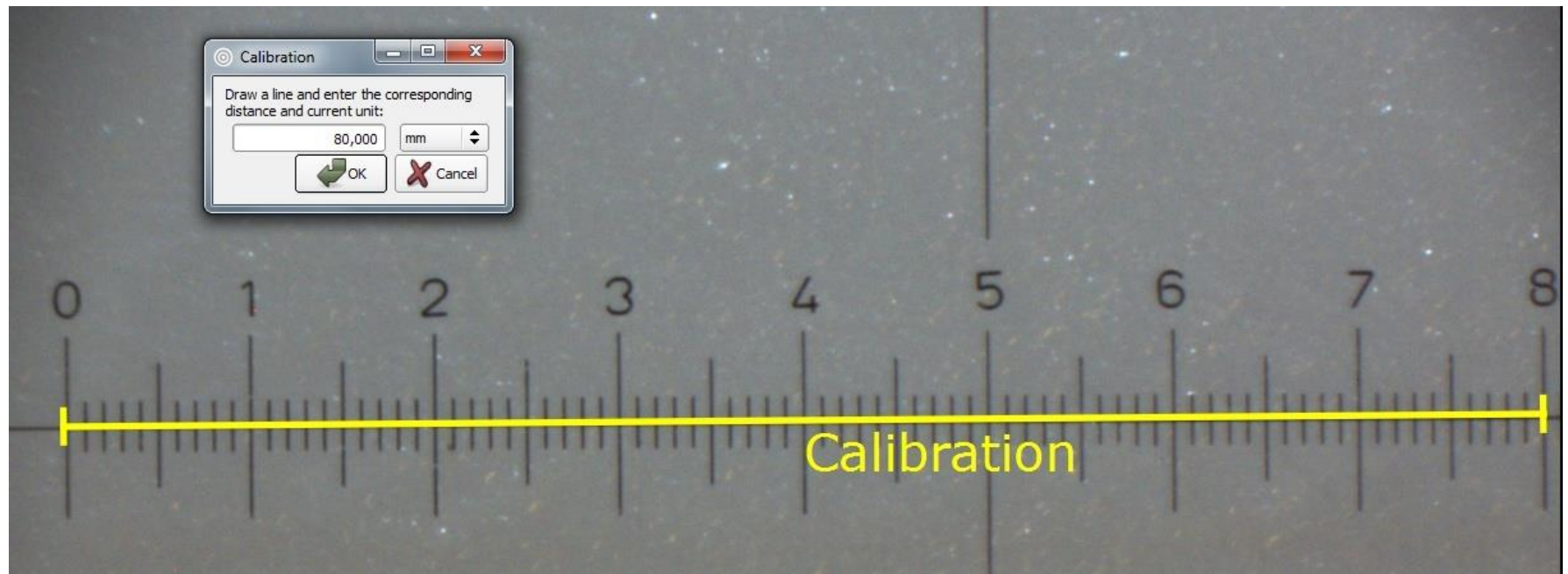


- OptiPix enables you to view and compare the live image side by side with a reference image.

# Software

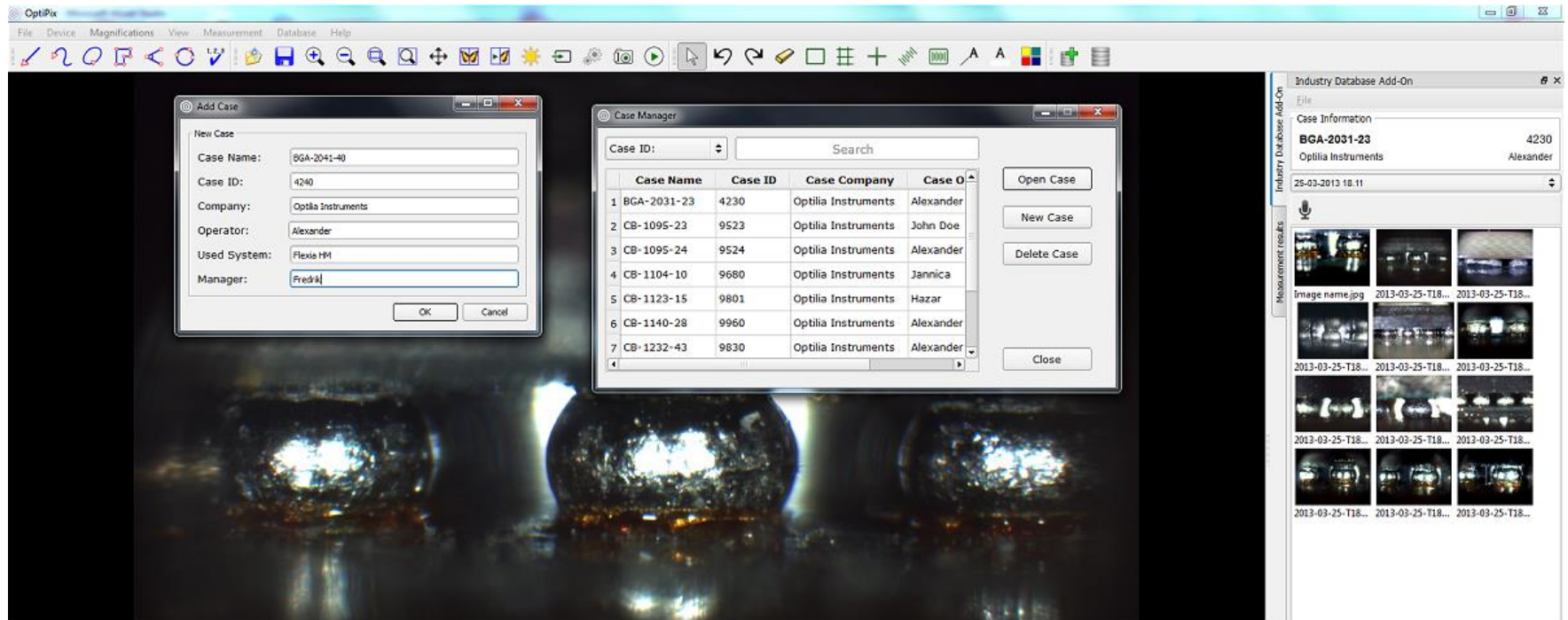
## Calibrated Measurements

- All fixed focal length lenses are pre-calibrated and ready to use in software
- BGA lenses have marks for focus positions which can easily be calibrated in the software
- Unlimited amount of user-defined calibrations



# Software

## Image file structure and Database



- OptiPix is built around a file tree. The file tree serves as an overall view for categorized images
- For further organization and security the images can be stored in an encrypted database
- Sort and find images based on -for example- the operator and date

# Software

## Reporting



**CB Certificate**  
Verified by Optilia

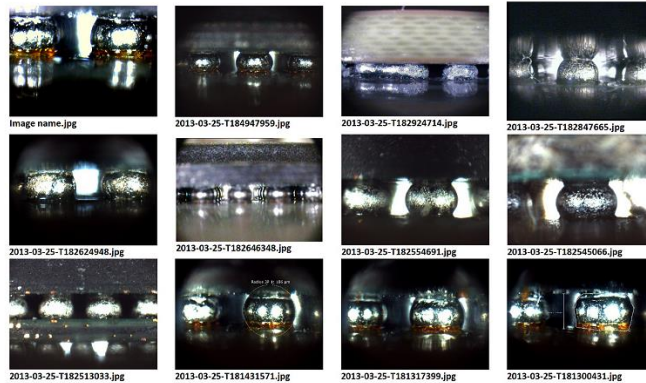
2013-03-25

Case Name: BGA-2031-23	Case ID: 4230	Company: Optilia Instruments	Inspection Date: 25-03-2013 18.11
Used System: Flexia HM		Manager: Hazar	

**Notes:**

This is the front page of the report. The selected images shown below has its own page. This Report has for example 17 page (front page + 16 images). Every data that is connected to the image such as measurements, comments, magnifications, calibration et.c. are visible on each image page.

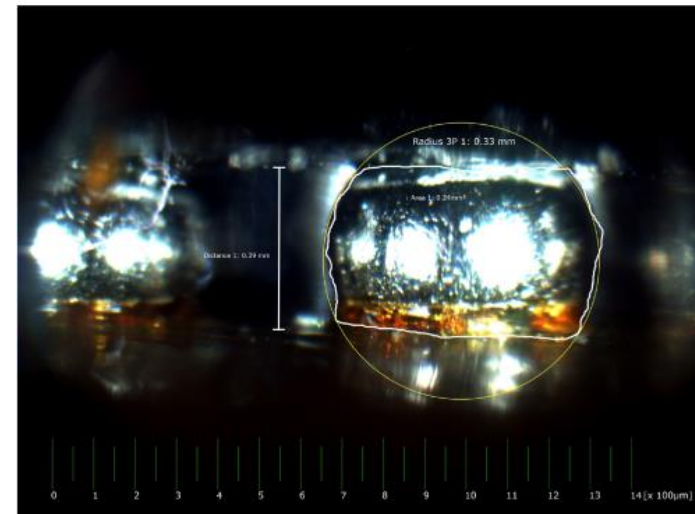
This field is used to write general notes for the case. The two titles above "Used System" and "Manager" are customisable and it is possible to add additional five customisable fields (maximum 7).



Alexander  
Printed name of Operator

*[Signature]*  
Signature of Operator

Reference Image.jpg, Optilia Flexia BGA Small Size Lens



**Measurement Results**

Tool	Physical quantity	Value	Unit
Distance 1	Length	0.39	mm
Area 1	Perimeter	2	mm
	Area	0.24	mm <sup>2</sup>
Radius 3P 1	Radius	0.33	mm

**Comments**

This image is used as reference image to verify BGA Package.

BGA-2031-23 - 2013-03-26 - 2

- Results can be printed, copied to excel sheets or created as an inspection report

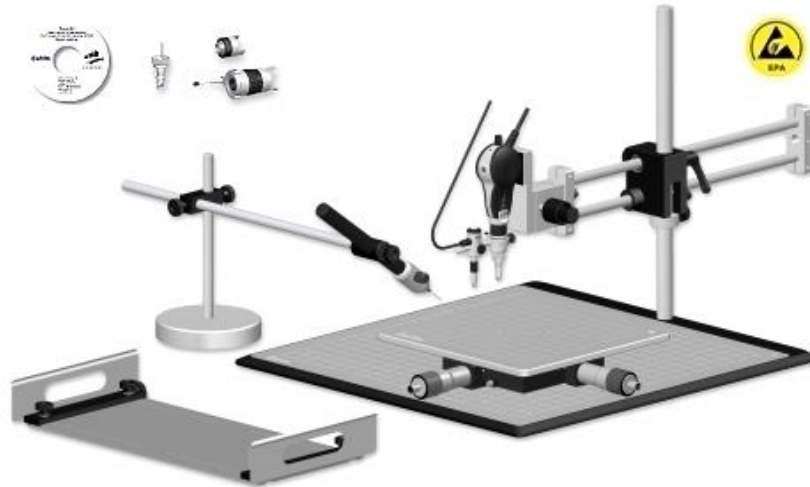


# Software features

OptiPix Feature	Lite	Full	Data base
<b>Database management</b>			
Encrypted Database			✓
Case Management			✓
Advanced Search and Sort			✓
Create Automatic Reports in pdf			✓
<b>Archiving</b>			
File Folder System Management	✓	✓	✓
Open/save Images with Calibration	✓	✓	✓
<b>Device</b>			
Image Capture	✓	✓	✓
Adjust Properties	✓	✓	✓
Adjust Resolution	✓	✓	✓
User-defined Magnification	✓	✓	✓
<b>View</b>			
Freeze Image	✓	✓	✓
Compare Image (live and freezed)		✓	✓
<b>Image manipulation</b>			
Contrast, Brightness, Color contrast		✓	✓
Flip images Vertically/Horizontaly	✓	✓	✓

OptiPix Feature	Lite	Full	Data base
<b>Calibrated Measurements</b>			
Calibrate user-defined Magnifications	✓	✓	✓
Distance Measurement	✓	✓	✓
Circle and Polygon Measurement		✓	✓
Angle and Curve Measurement		✓	✓
Free-form Area, Length and Perimeter		✓	✓
Count Objects		✓	✓
<b>Overlays on Live Image</b>			
Adjustable Grid, Crosshair	✓	✓	✓
Adjustable Rectangle		✓	✓
Calibrated Ruler		✓	✓
Digital Graticule		✓	✓
<b>Others</b>			
Annotations on Image	✓	✓	✓
Change item Size, Color, Font		✓	✓
Color Mapping, B/W Conversion		✓	✓

# Optilia BGA Inspection Configurations



XL system



Standard



Exclusive



Hand-operated

# BGA Inspection Configurations

View	XL	Exclusive	Standard	Hand-operated
Digital Microscope Unit (5.0Mp image sensor USB2.0)	Flexia HM ESD-protected	Flexia HM ESD-protected	Flexia ESD-protected	Flexia ESD-protected
Side Viewing BGA lens, Small Size	✓	✓		
Side Viewing BGA lens, Low Aperture	✓	✓	✓	✓
Background Illumination with Micro-prism	✓	✓		
Background illumination Brush Light	✓	✓	✓	✓
Stand for Brush Light	✓	✓	✓	
1-100x Varifocal Lens with LED RingLight	✓	✓	✓	
RingLight White LED for 100x Objective	✓	✓	✓	
Focusing Stand, Coarse/fine movement		✓	✓	
Extra large Boom Stand, Coarse/fine mov.	✓			
PCB Holder, ESD-Protected	✓			
Desktop Holder				✓
Precision XY-Translation Board	✓	✓		
OptiPix Software	Full, Database	Full, Database	Lite Version	Lite Version
Annual Service and Support for OptiPix	✓	✓	✓	✓
Aluminum Transport Case	✓	✓	✓	✓
<b>Price</b>	<b><u>E-mail</u></b>	<b><u>E-mail</u></b>	<b><u>E-mail</u></b>	<b><u>E-mail</u></b>