

Challenges & Solutions Handling Small WLCSP Devices

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TestConX 2025

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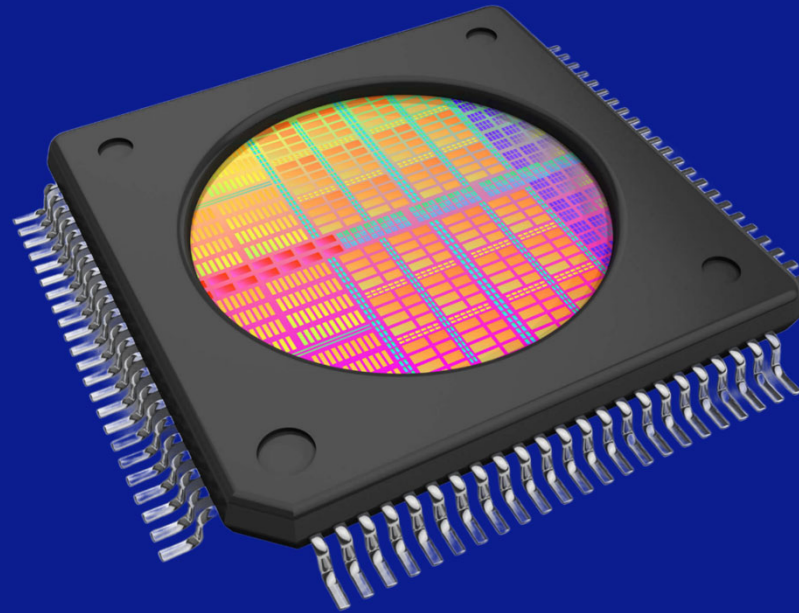
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Introduction



As IC devices become increasingly sophisticated, pick-and-place handlers must meet ever-growing demands



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Current Technology

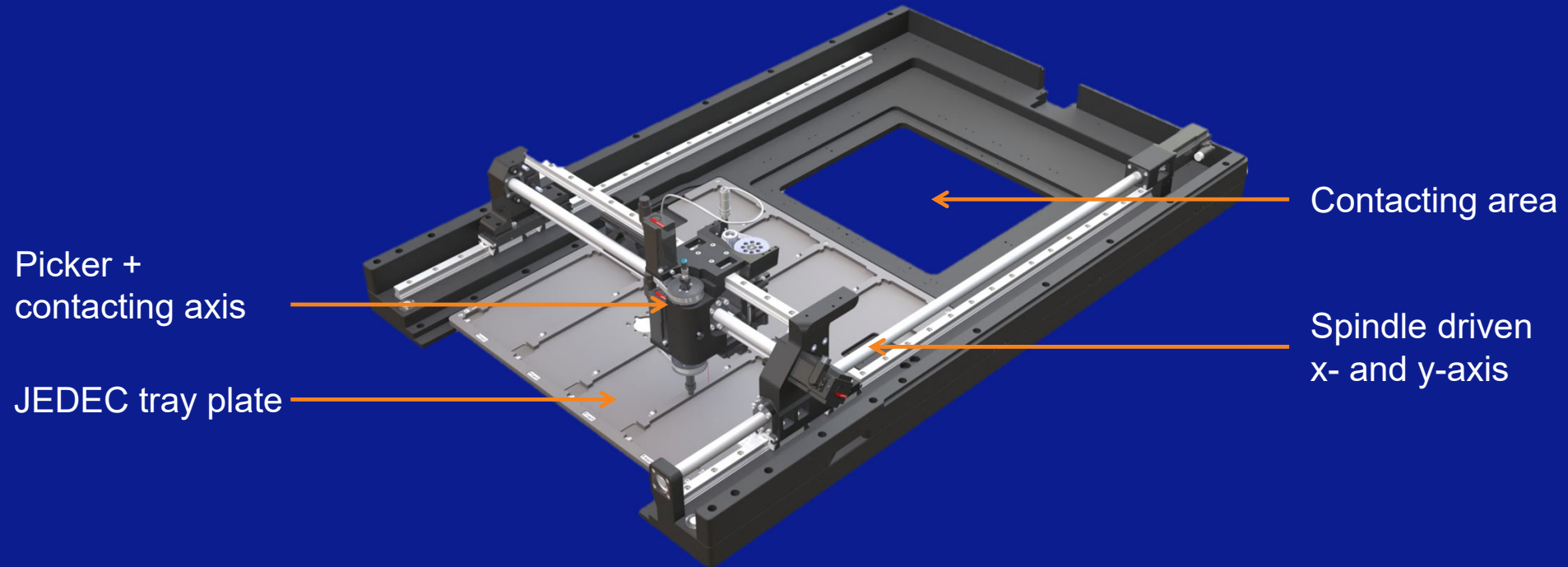
esmo talos – Engineering Handler

- Pick & place tri-temp handler
- Motorized X- and Y-Axis (gantry)
- Handling of all standard input types
 - Tape
 - JEDEC tray
 - Tube
 - Waffle pack



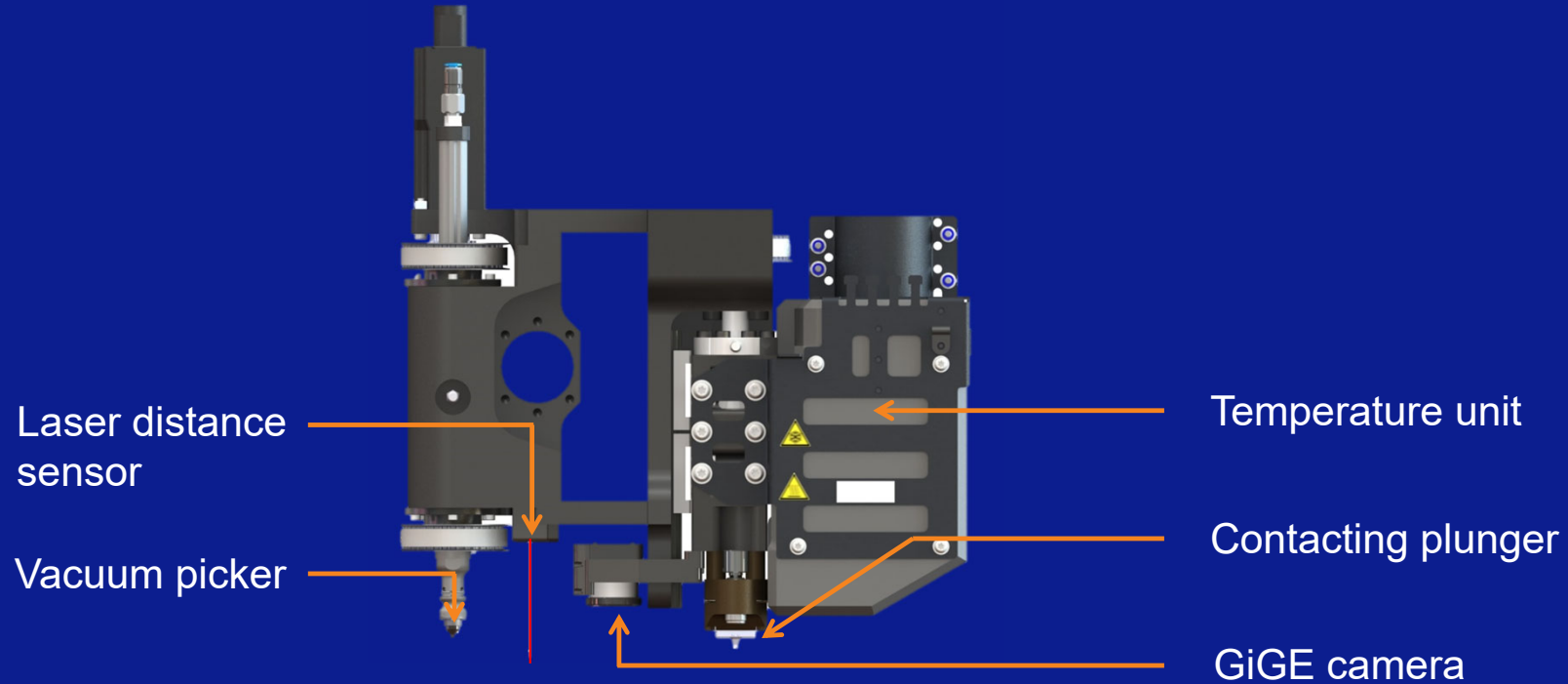
Current Technology

Handler Motorized Gantry



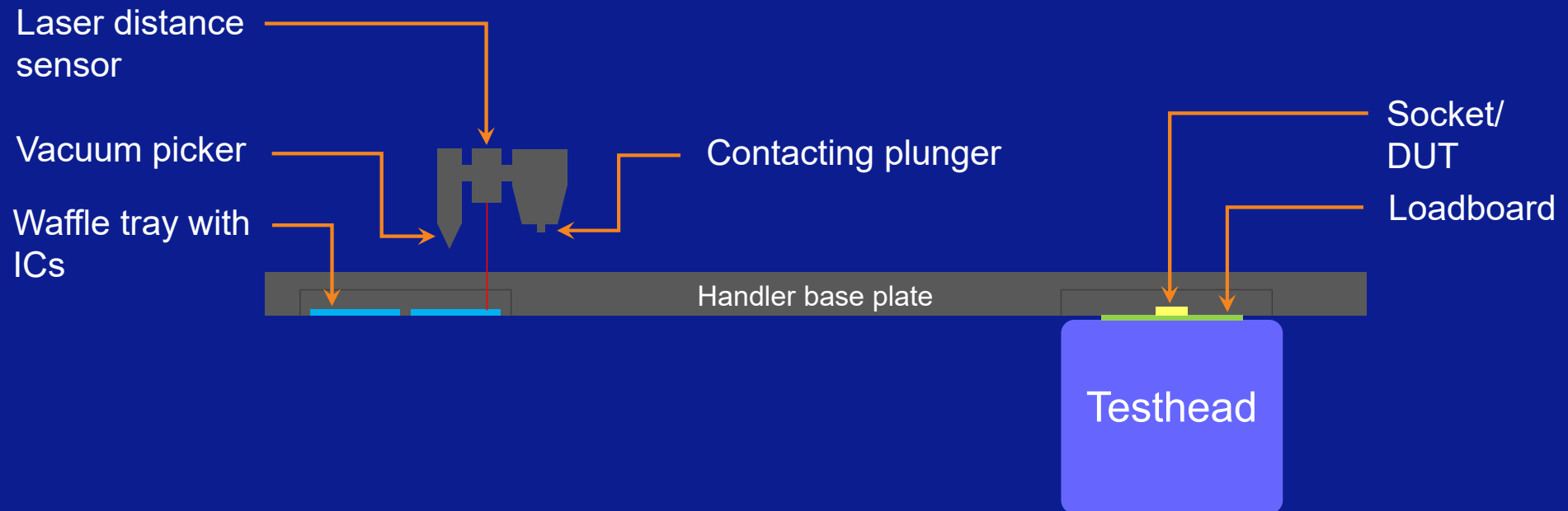
Current Technology

Picker & Contacting Axis



Current Technology

Schematic Handler Flow Chart



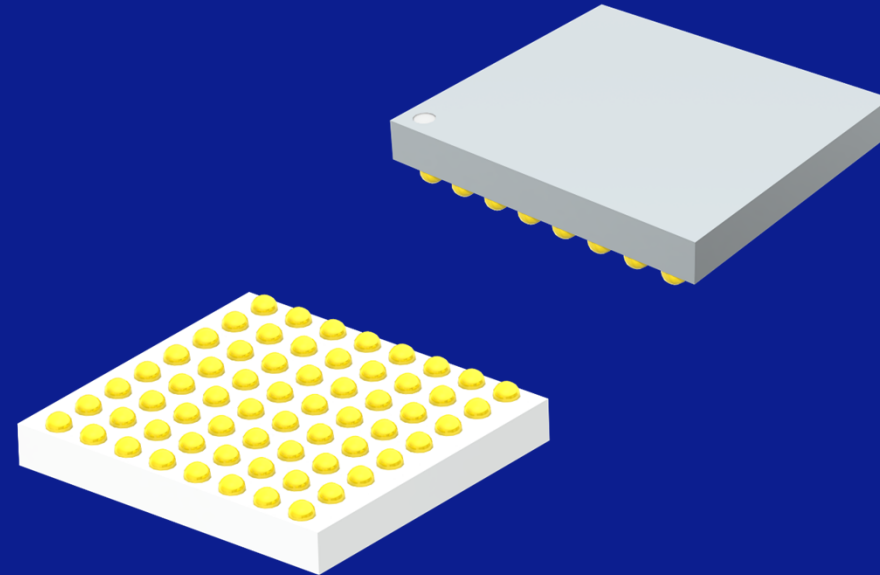
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Definition WLCSP

WLCSP = Wafer Level Chip Scale Package

Characteristics:

- Compact design:
die size = package size
- Solder balls are applied to wafer
- No molded housing required



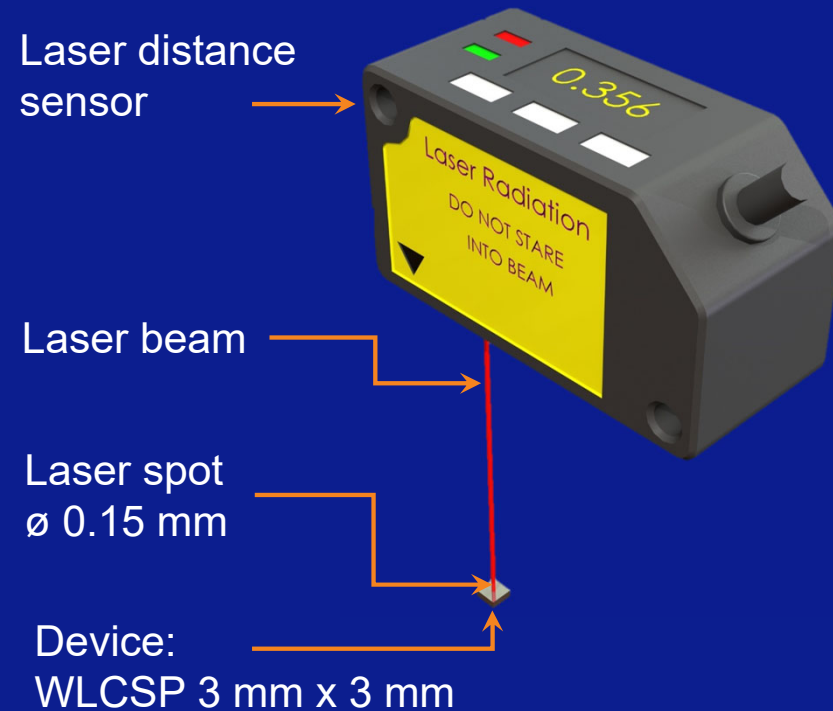
Problem Description

Customer Feedback

Customer reports problems when handling 3 mm x 3 mm WLCSP devices for the first time

Identified Problem

Problem seems to be the laser sensor → displays the error “out of range”

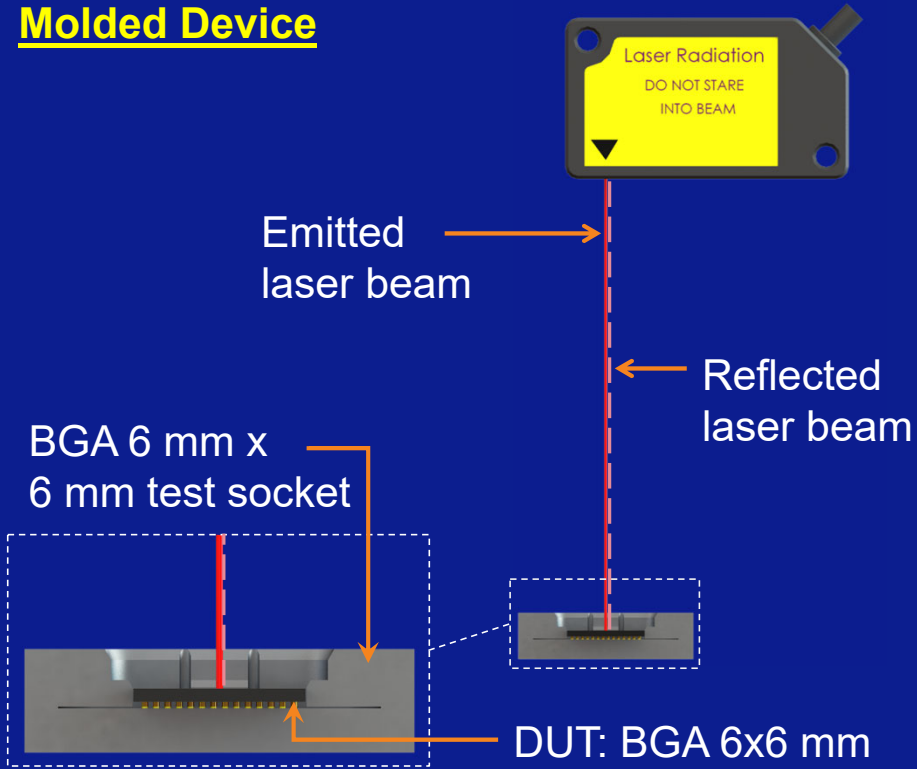


Problem description:

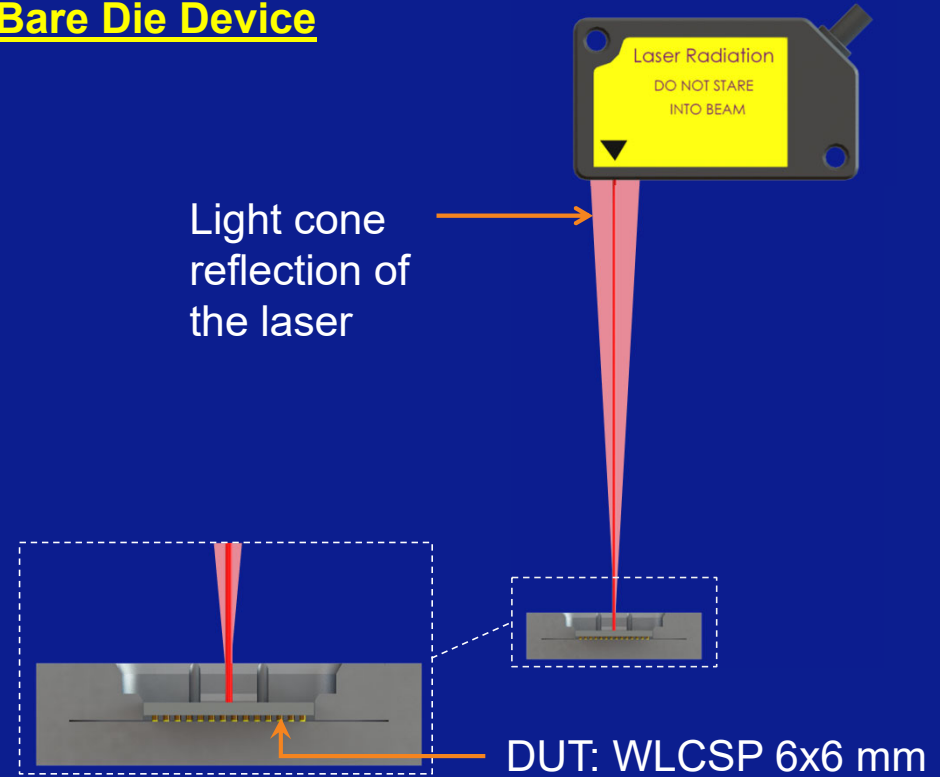
No measurement possible due to the reflective surface

Problem Description

Molded Device



Bare Die Device

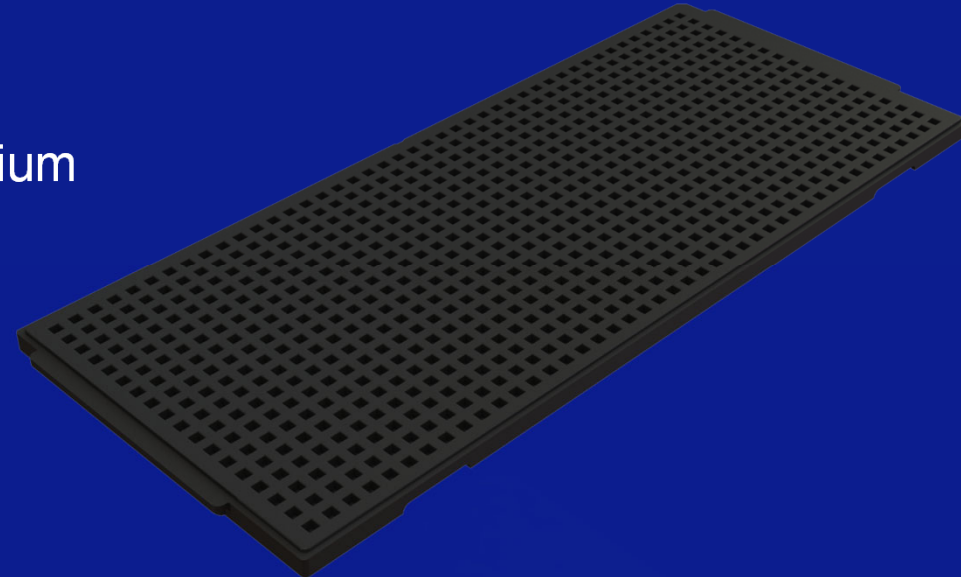


Problem Description

Why is the laser sensor so important?

Area of application:

- Device detection
- Presence check input/ output medium
- Z-Height calibration
- Device thickness measurement
- Double device detection
- Planarity check



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Challenge

All requirements must be fulfilled:

Compatibility:

Option needs to be retrofittable (field-upgradable)



Cycle Time:

Cycle time not to be increased



Measurement Accuracy:

Maximum deviation of ± 0.05 mm



Detection Rate:

Detection rate exceeding 98%



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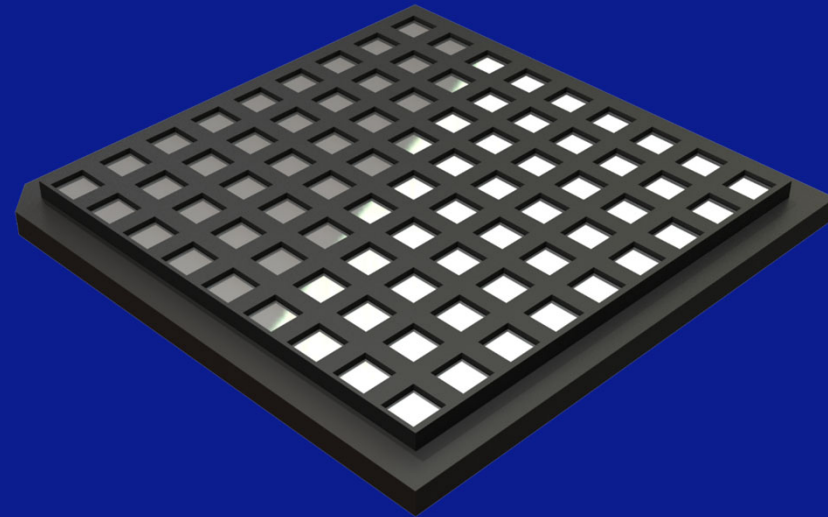
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Test Setup

Devices to be tested

Package Type:	WLCSP
Device Size:	3 x 3 mm
Quantity:	100
Input Medium:	2" waffle tray
Thickness nominal:	0.8 mm
Thickness tolerance:	$\pm 5 \mu\text{m}$



Test Setup

Sensors to be tested

Sensor I:

Description: WayCon laser sensor
Technology: High resolution laser sensor
Measurement range: 70 mm

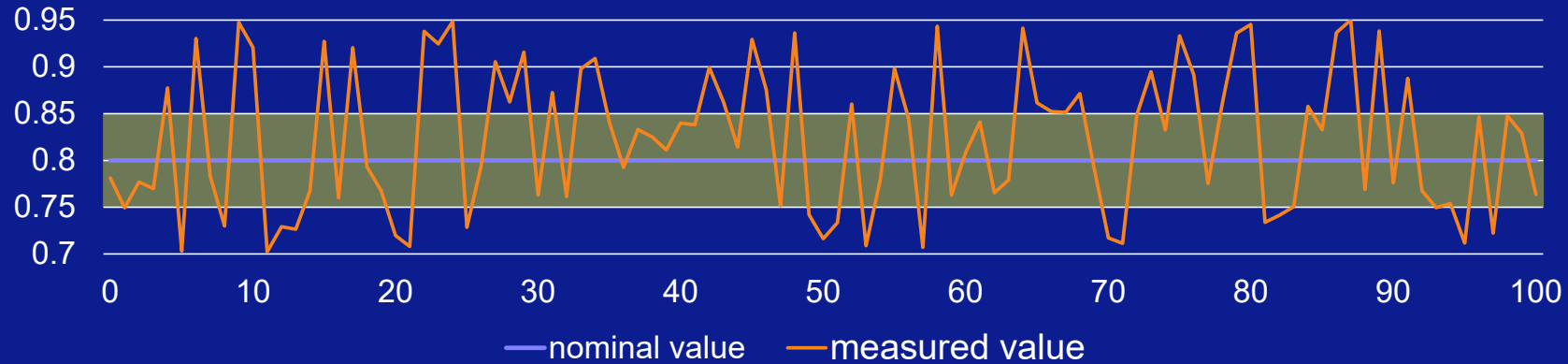
Sensor II:

Description: Micro-Epsilon confocal sensor
Technology: Optical sensor
Measurement range: 6 mm



Test Results

Device Thickness Measurement - Sensor I



Test result:

- max. deviation 0.15 mm
- 65% out of range



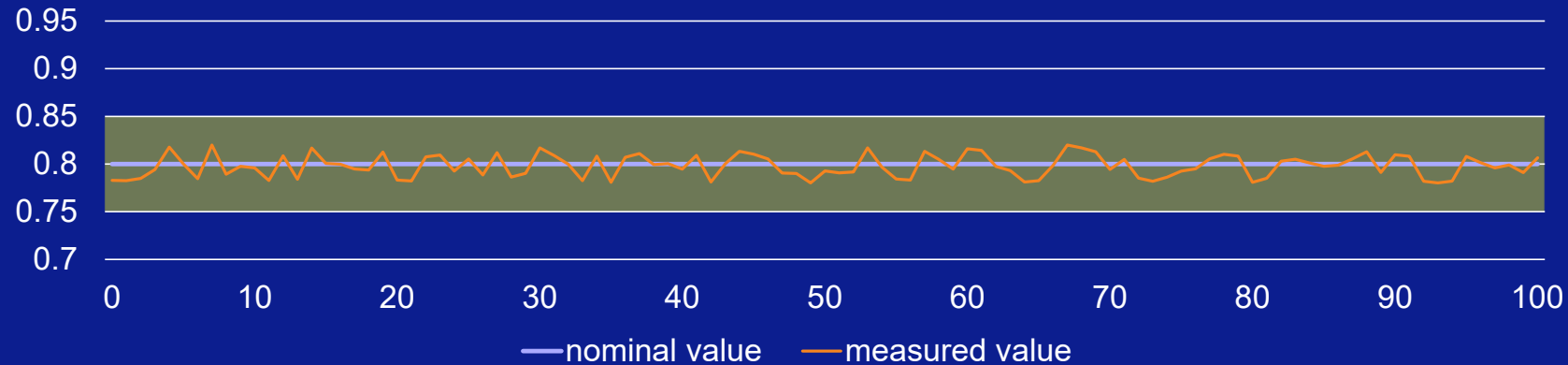
Conclusion:

Specifications not fulfilled
→ Sensor not suitable



Test Results

Device Thickness Measurement - Sensor II



Test result:

- max. deviation 0.02 mm
- 100% detection rate



Conclusion:

Specifications fulfilled
→ Sensor is suitable



Conclusion

Technical requirements:

- ✓ Detection rate > 98%
- ✓ Measurement deviation max. ± 0.05 mm
- ✓ Measuring rate 8 kHz



Integration Challenges:

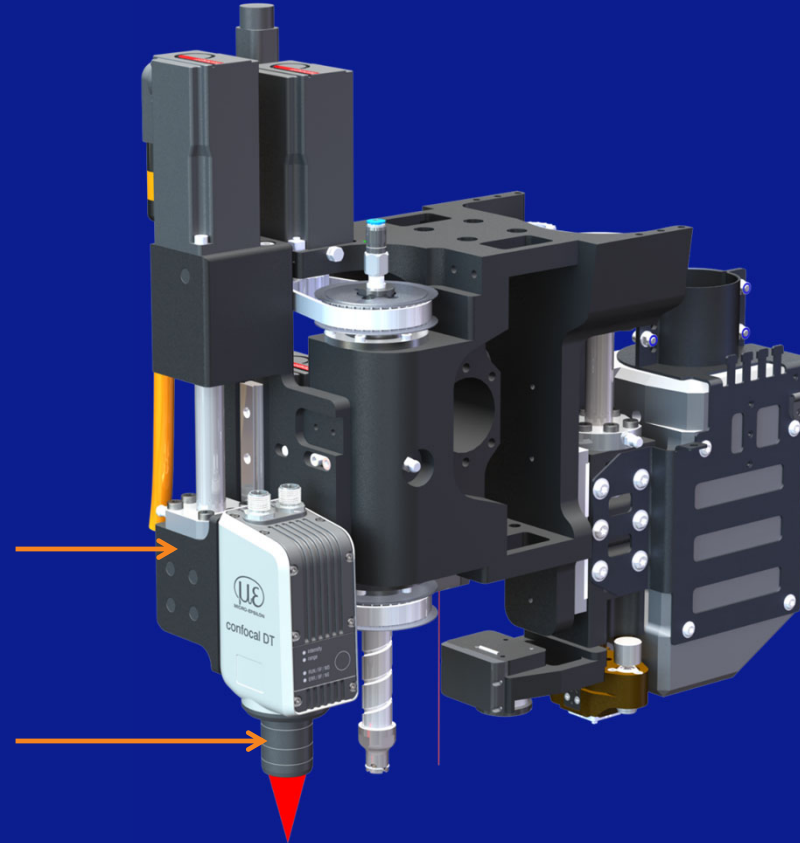
- ? Size of sensor
10x size of previous sensor
→ Repositioning required
- ? Measurement range = 6mm
previously 70mm
→ Sensor movement is required

Solution

Technical data:

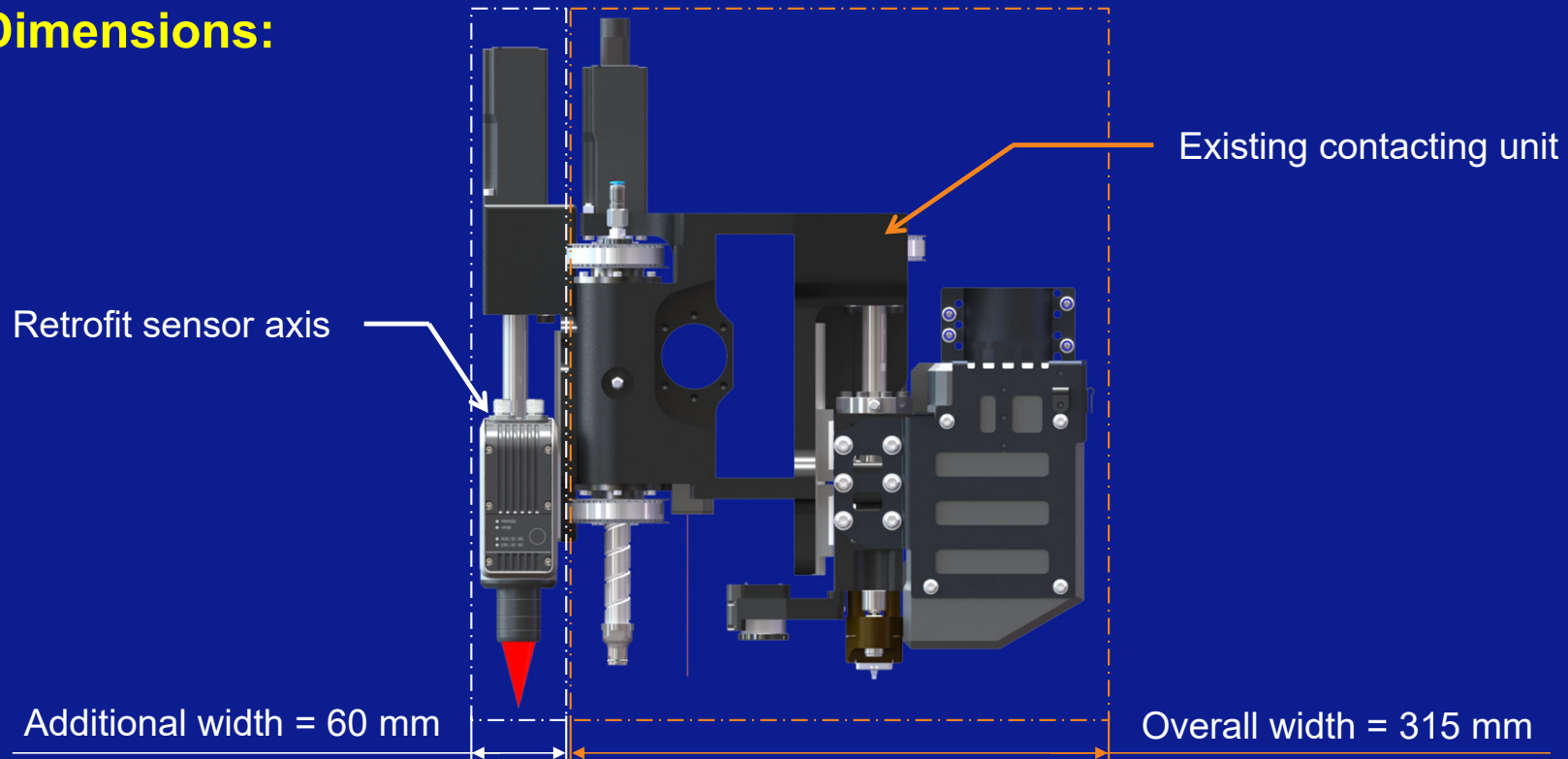
Movable sensor axis

Confocal sensor



Solution

Dimensions:



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Next Steps & Improvements

Sensor Integration:

Reduce footprint,
improve mechanical
integration



Software Integration:

Integration into
handler software



HMI Adaptation:

Add interface for
sensor control &
monitoring

Validation Testing:

Ensure stability in
production



Cycle Time Optimization:

Minimize repositioning
delays



Field Upgrade Concept:

Enable seamless
retrofitting



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