SCREEN

SCREEN's Sustainable Cost-of-Ownership (CoO) Portfolio for Wafer Inspection and Thickness Measurement in Power Devices, Automotive, and IoT Applications

April 17, 2024

SCREEN Semiconductor Solutions Co., Ltd.

80th Anniversary

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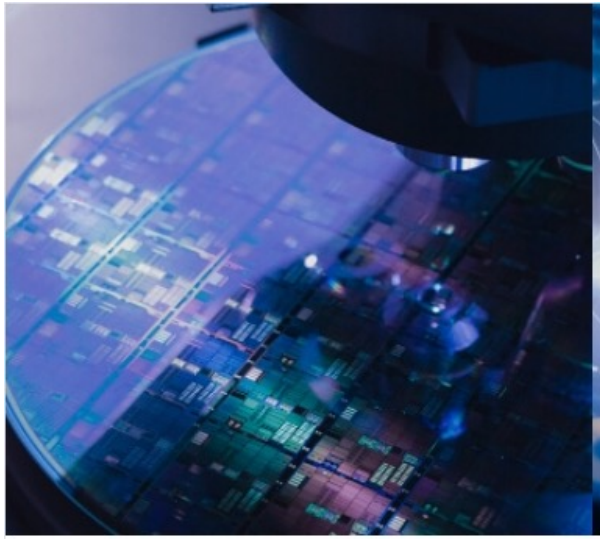
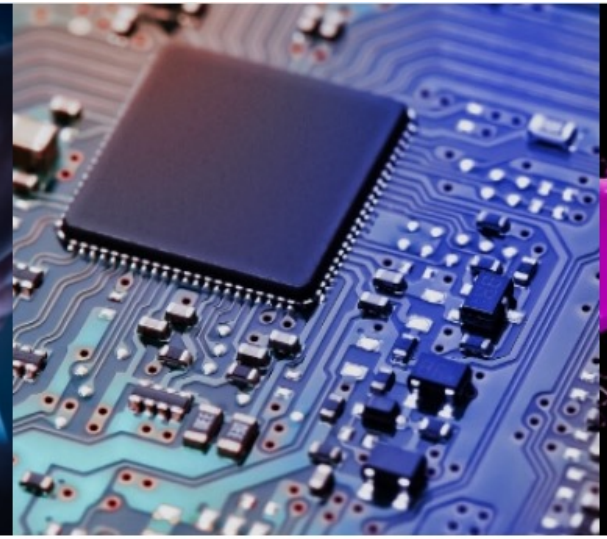
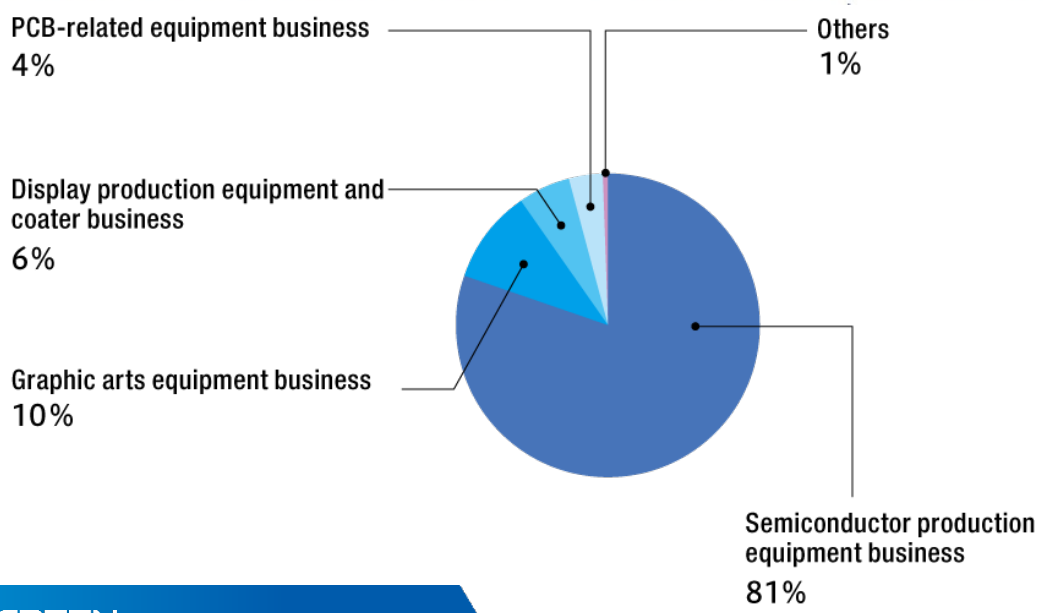
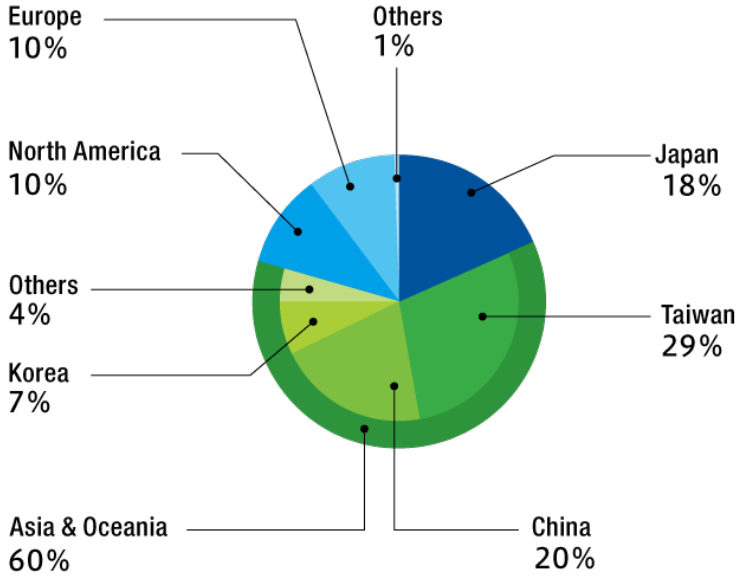
SCREEN's Business Field






Semiconductor production equipment　Display production equipment　PCB-related equipment　Graphic arts equipment





Cutting-edge Devices

Wafer size 300 mm

SU-3400
Single Wafer Cleaner

SU-3300
Single Wafer Cleaner

SU-3200
Single Wafer Cleaner

SS-3300S
Spin Scrubber

RE-3500
Measurement System

SS-80EX
Spin Scrubber

SB-3300
Wafer Backside Cleaning System

FC-3100
Wet Station

NEW

RF-300EX
Coat/Develop Track

RF-200EX
Coat/Develop Track

CW-2000
Compact Wet Station

VM-2500/3500
Measurement System

SC-80EX
Spray Coater

DT-3000
Coat/Develop Track

LA-3100
Flash Lamp Annealer

SP-2100
Spin Processor

SU-2000
Single Wafer Cleaner

ZI-3600
Inspection System

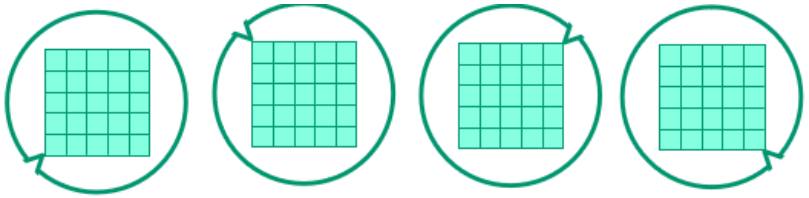
SK-60EX/SK-80EX
Coat/Develop Track

IoT Applications

Wafer size 200 mm

Visual Inspection and process control

Example of table-top tool from Screen



Since the early days of semiconductor, by using manually loaded table-top tools in the semiconductor industry was common to perform quality controls on random die and wafers (statistical visual inspection)
This method, as it's based on statistic, does not allow 100% of production control, and in most cases allow to detect only macro problems

What is the difference between visual inspection and automatic visual inspection?

1.Speed:

1. **Automatic Inspection Systems**: These systems perform inspections much faster than human workers and can operate 24/7.
2. **Human Visual Inspection**: Relies on human operators and may be slower due to factors like fatigue and working hours.

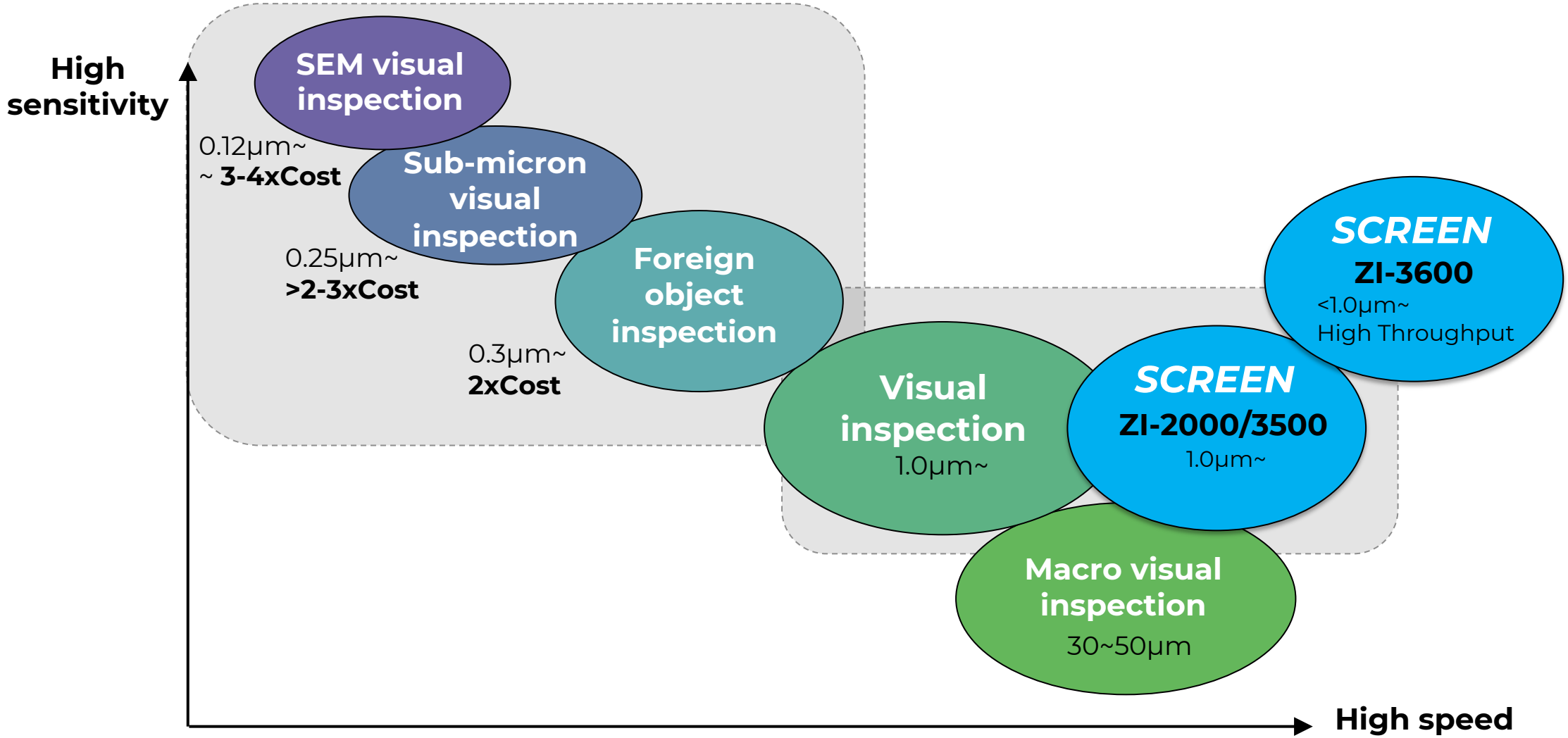
2.Accuracy:

1. **Automatic Inspection Systems**: Can be more accurate than human inspections. They can detect subtle defects that might be imperceptible to the human eye.
2. **Human Visual Inspection**: Although effective, it is reliable in only **80%** of cases. Factors like visual fatigue and different points of view contribute to this margin of error[23].

https://www.bing.com/search?form=NTPCHB&q=Bing+AI&showconv=1
https://www.ibm.com/topics/visual-inspection
https://eines.com/automatic-inspection-systems-human-visual-inspection
https://cortexrobotics.my/automated-inspection-systems-vs-human-visual-inspection/

Visual Inspection and process control

Power, automotive, and IoT device manufacturers are constantly confronted with the simultaneous need to fulfill stringent quality requirements, boost productivity on their production lines, and reduce the associated cost of ownership (CoO).



Visual Inspection and process control

For PCB

Since
CY1986

For FPD

Since
CY2007

For Wafer

Patterned wafer inspection system

Since
CY2010

Improved

Since
CY2017

Improved

From
CY2022

Wafer size
100-300mm

ZI-2000 (Under 200 mm)

ZI-3500 (Able to deal 300 mm)

ZI-3600
(High Speed & High Resolution)

Easy operation

Easy recipe creation

Cassette set

Pre scan

Map creation

Alignment mark

6 min.

Light source settings

Inspection parameter

3 min.

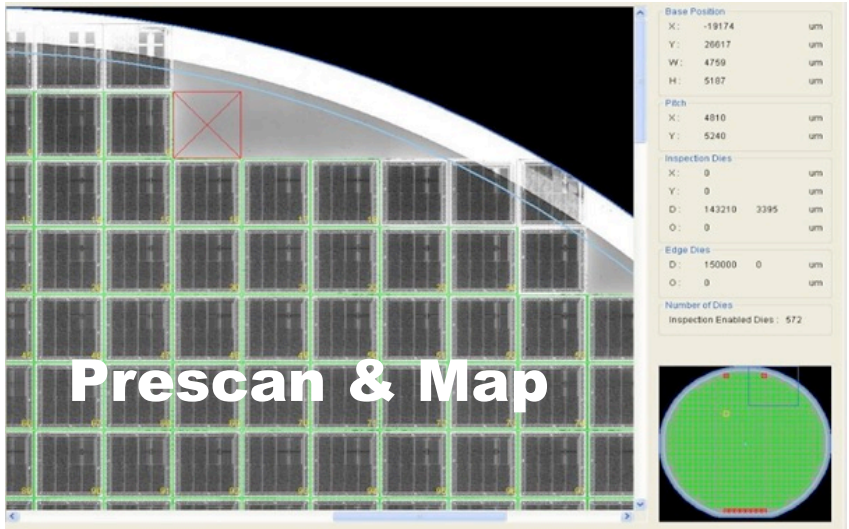
Test inspection

1 min.

Recipe creation is completed in 3 steps, minimum 10 min.

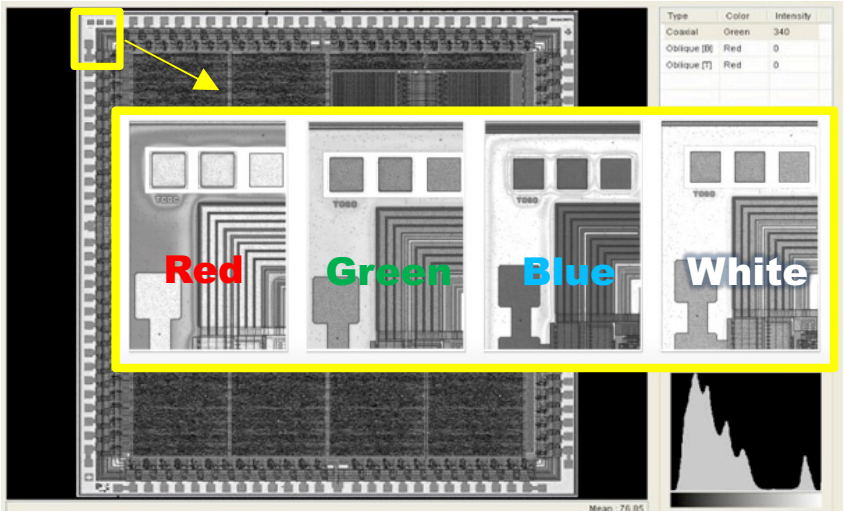
Map making

Easy creation while viewing the wafer image



Inspection condition setting

Newly set White in addition to R, G, B



Test inspection

Easy to check results

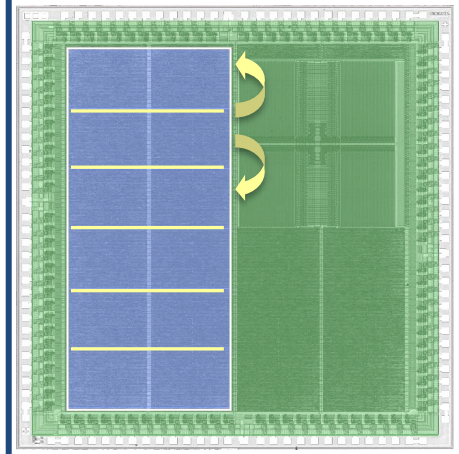
Easy operation Various inspection methods

Multiple inspection methods can be combined according to the defect type and inspection purpose.

Die to Die

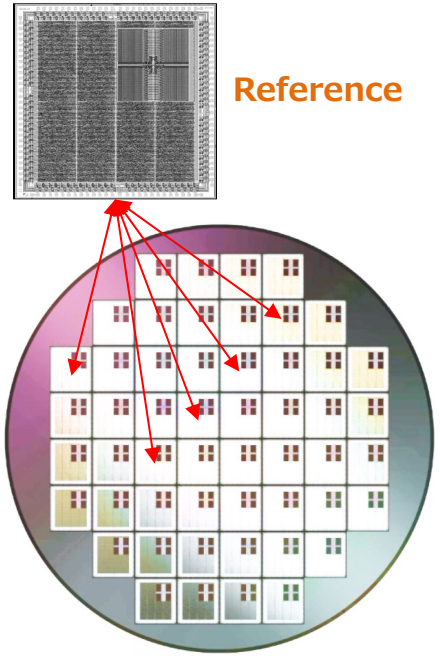
Cell to Cell

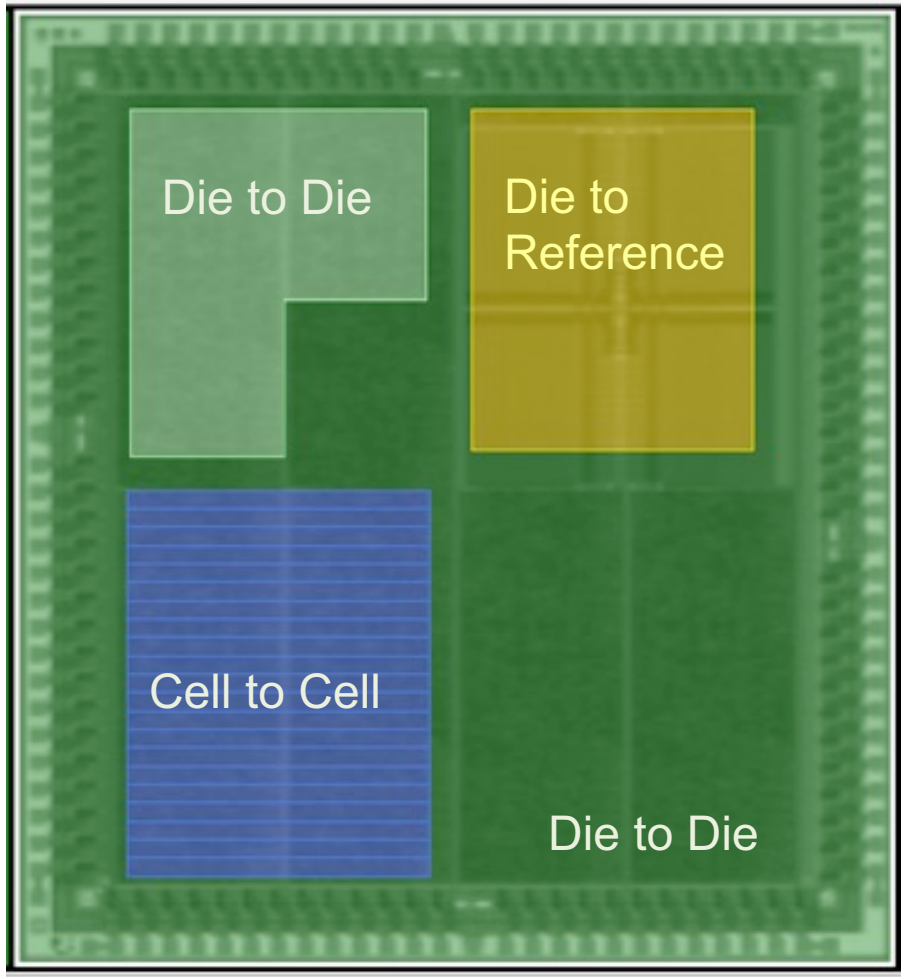
Select cell area and compare each cell
(like Die to Die)



Die to Reference

Compared with same reference image.



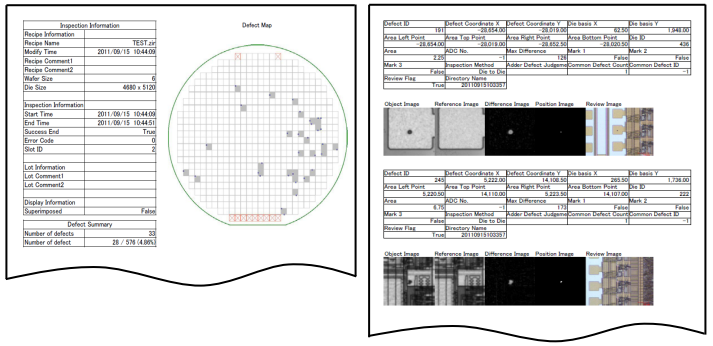


Easy operation Inspection result data conversion

Reports can be created in general formats such as PDF/Excel, so anyone can view inspection results.

Make report

xls doc pdf



Automatic data conversion / export

Other tool data

Wafer size 100-300mm

Bridge PC (data conversion)

Customer network

Switching HUB

ZI-3500 Backside inspection option

Front surface inspection and back surface inspection can be performed in one wafer load.

Product features

Backside deposits and edge cracks that cause wafer damage can be detected at the same time as surface inspection.

Throughput

Inspect the back and edges while preparing for a front surface inspection.

Specification

Front / back inspection results can be overlaid

Surface: Micro inspection

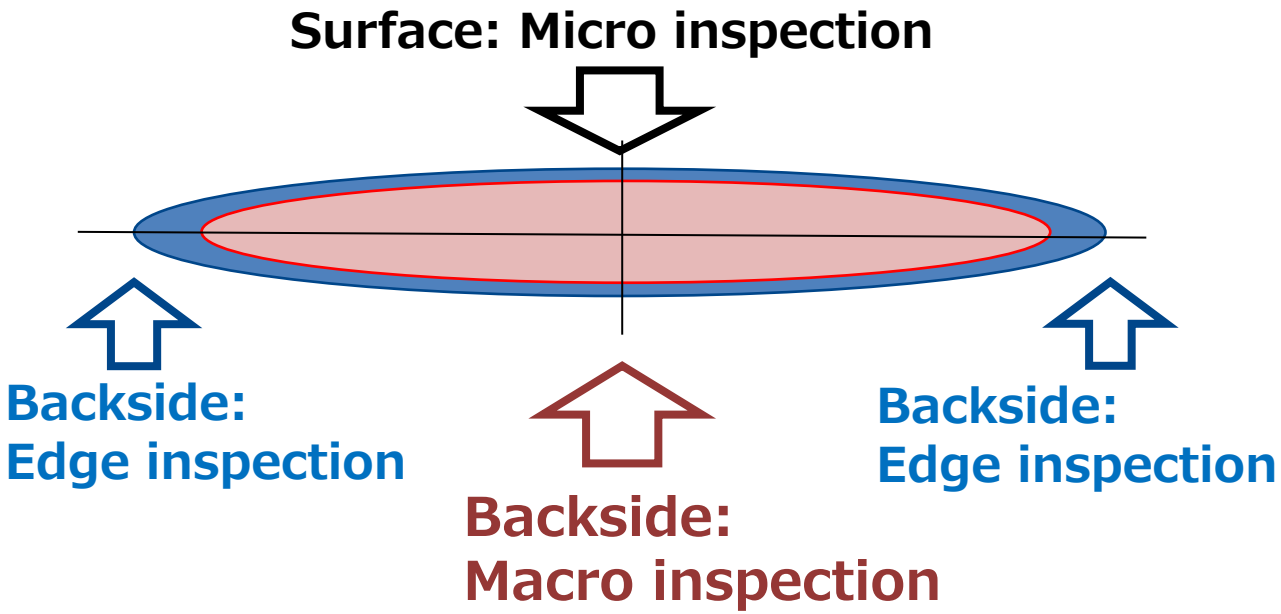
ZI-3500 Standard Inspection

Backside: Macro inspection

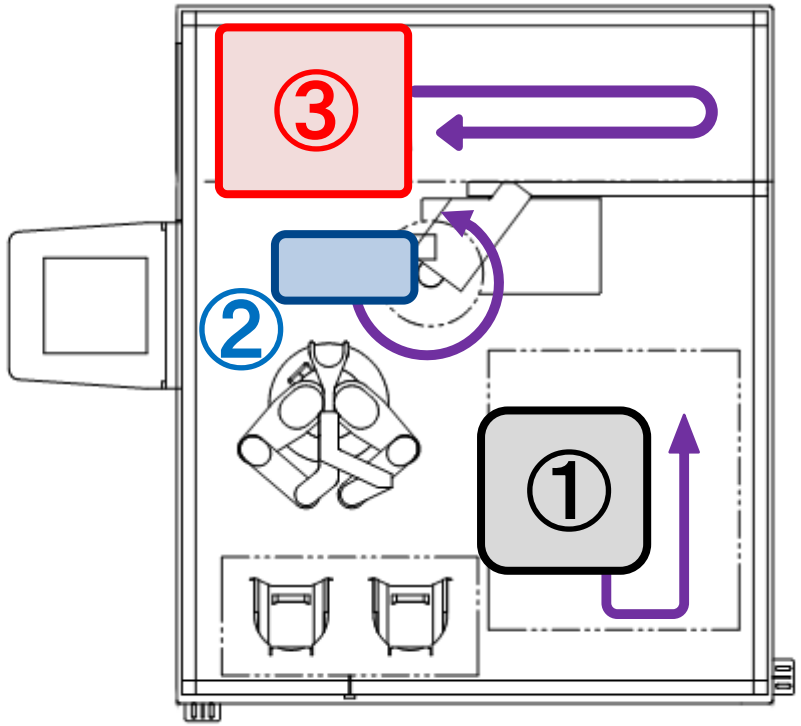
Non-contact inspection
Suitable for large foreign objects

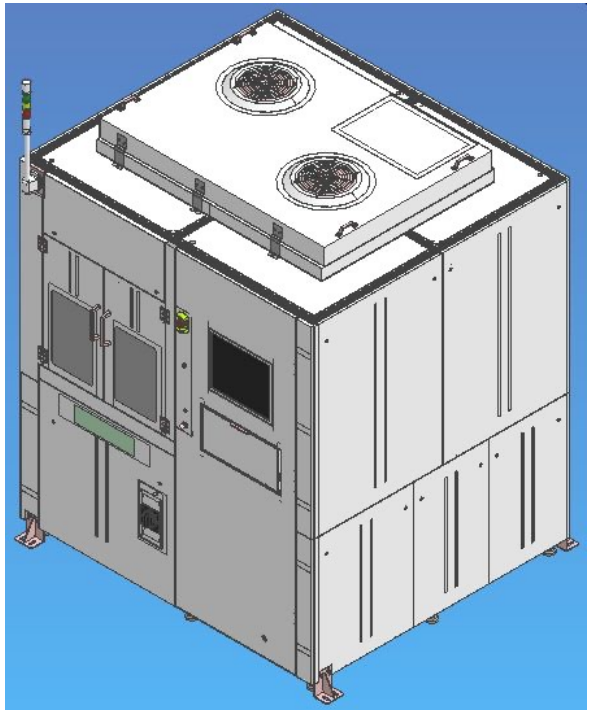
Backside: Edge inspection

Suitable for wafer cracks

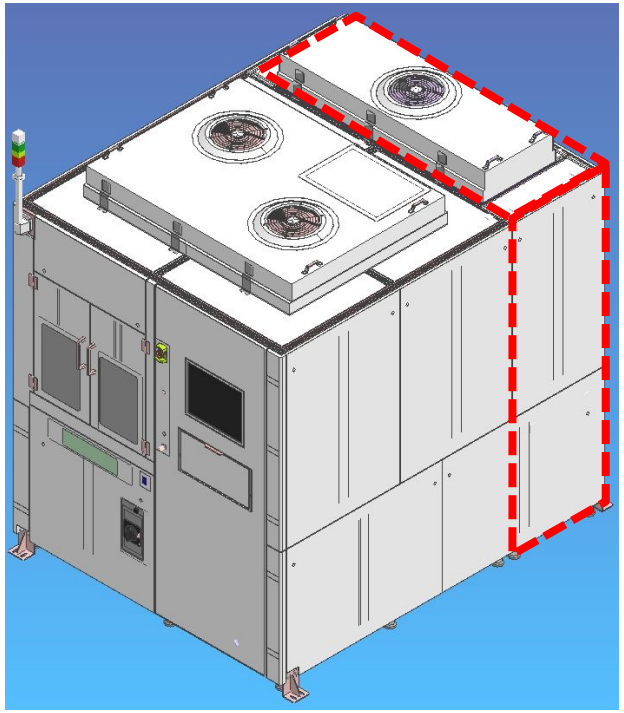


ZI-3500 Backside inspection flow





ZI-3500



ZI-3500 + Backside option

① Standard inspection at the surface inspection stage
② Backside edge inspection using rotation of pre-alignment stage
③ Backside inspection with non-contact edge clamp stage

Features of ZI-3600

Wafer size
100-300mm

Fast inspection

Twice the throughput compared to ZI-2000 / 3500

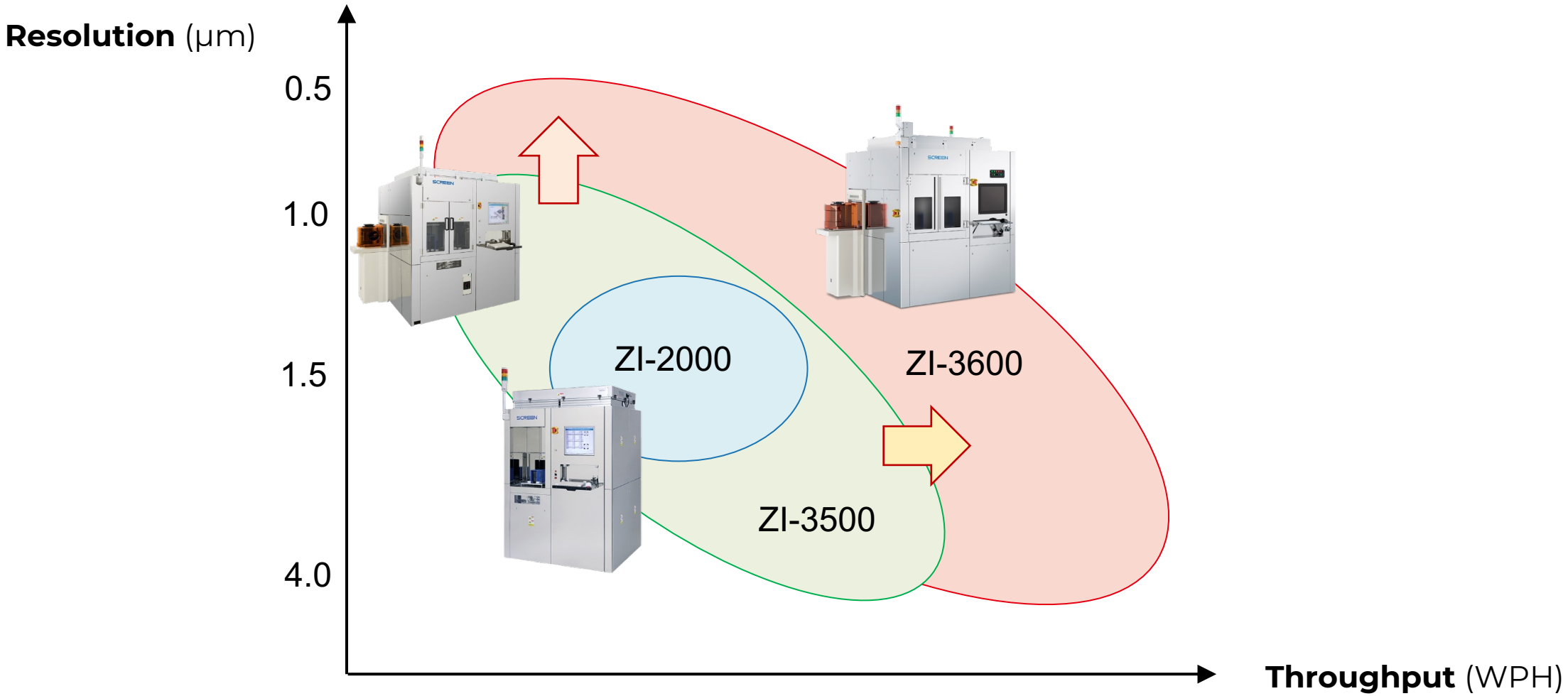
High resolution

Best-in-class resolution 0.5μm

Various options

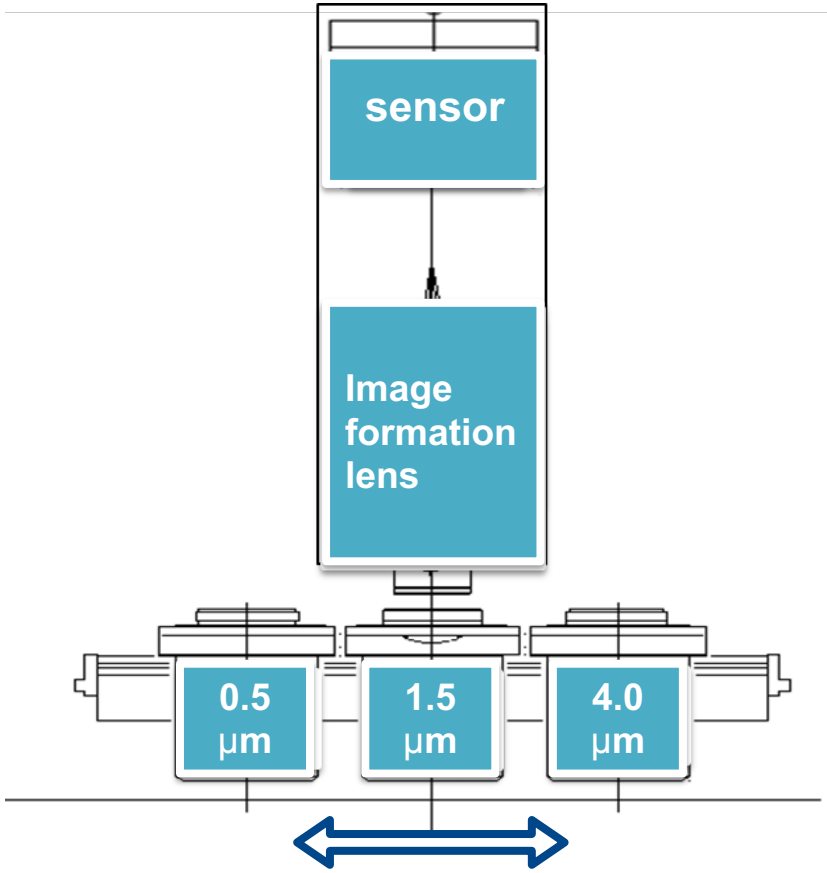
Able to meet customers request flexibly

Fast inspection



Achieve high-speed processing regardless of chip-size or number!

High resolution



0.5µm Resolution New!!

Best-in-class resolution
Suitable for fine defect detection and analysis of 1 µm or less

1.5µm Resolution

All-rounder for product inspection
High-speed detection of defects of about 1 to 10 µm

4.0µm Resolution

Instead of microscopic visual inspection
High-speed inspection of macro defects of 5 µm or more

3 auto-selectable resolutions(0.5 / 1.5 / 4.0 µm)

Specification summary of ZI-3600

Fast inspection

Twice the throughput compared to ZI-2000 / 3500 (Independent of chip number and chip size)

High resolution

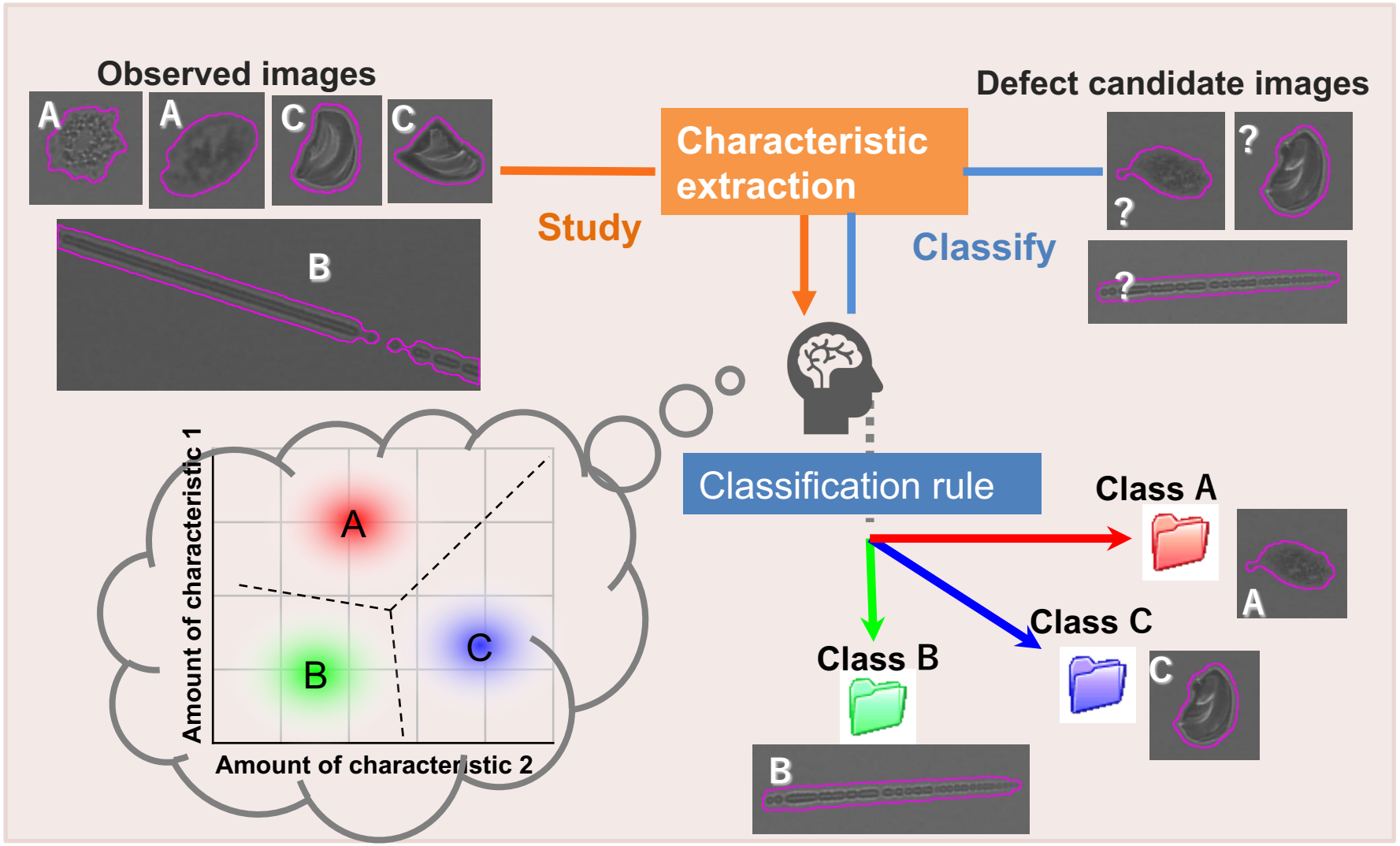
Best-in-class resolution 0.5μm (Suitable for fine defect detection and analysis of 1 μm or less)

Various options

Comfortable operation by using real images like ZI-2000 / 3500

Wafer size	150, 200, 300 mm (2 open cassette stages, 1 or 2 FOUPs can be installed)
Resolution	0.5μm, 1.5μm, 4μm automatic switching method
Throughput	Twice the throughput compared to ZI-2000 / 3500
Inspection method	Die to Die, Die to Reference and Cell to Cell (Free combination)
Light source	BF: Fiber type Red, Green, Blue, White LED DF: Red LED ring lighting (Option) Maintenance-free with automatic light amount adjustment function
Review function	Color CCD camera with x10-x50 zoom function and Fast ADR (Option)
Options	ADC software, CD/Overlay measurement function, GEM, Output to various data formats, etc.

ADC: Auto Defects Classification

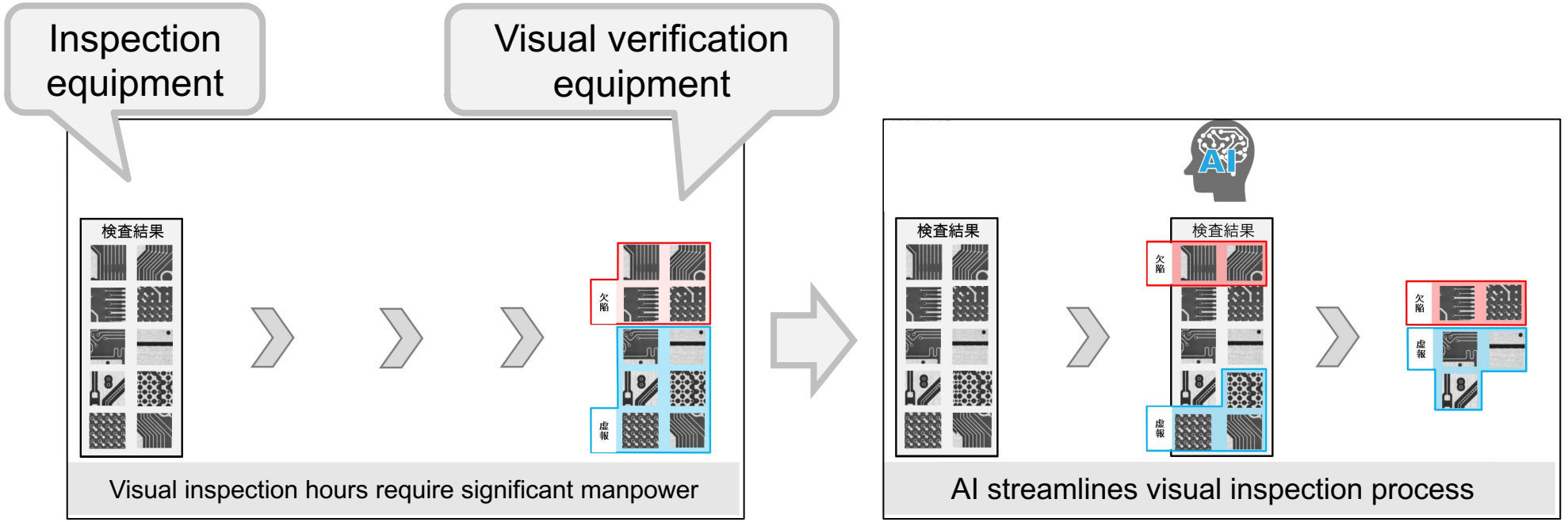


SCREEN has launched SCRAIS as an AI approach.

- AI-based approaches to solve a range of problems:
  1. AI-based false defect filtering system
     - Already in use at several companies
     - Accelerate development to expand the scope of application
  2. Reduce labelling man-hours for AI model development
     - Developing methods to minimize labelling man-hours, which account for the majority of AI development man-hours
  3. Applying deep learning to ADC（Auto Defect Classification）
     - Under development for more accurate defect classification

  Many other technologies in development...

AI approaches to inspection equipment



Conventional workflow

AI-based false defects filtering system flow

Input \ Output	True defect detection	False defect detection
True defect image	99.9% (2943)	0.1% (4)
False defect image	12.6% (260)	87.4% (1807)

Percentage of defects missed by AI
※ No critical defects

Percentage of false defects detected by AI

Line up

SE SWE SR

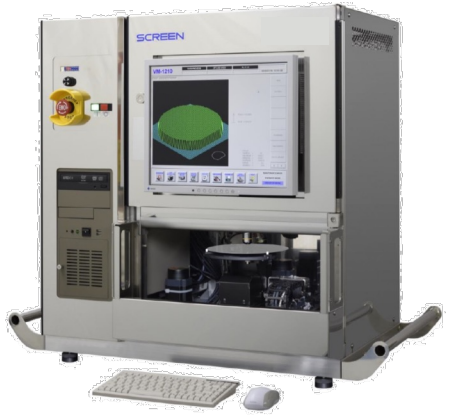
RE-3500

Spectroscopic Ellipsometer
Dual head with Reflectometer
Bridge tool concept

SR

VM-2500/3500 series

Spectroscopic Reflectometer
Auto handling type
> 500 points measurement with HTP



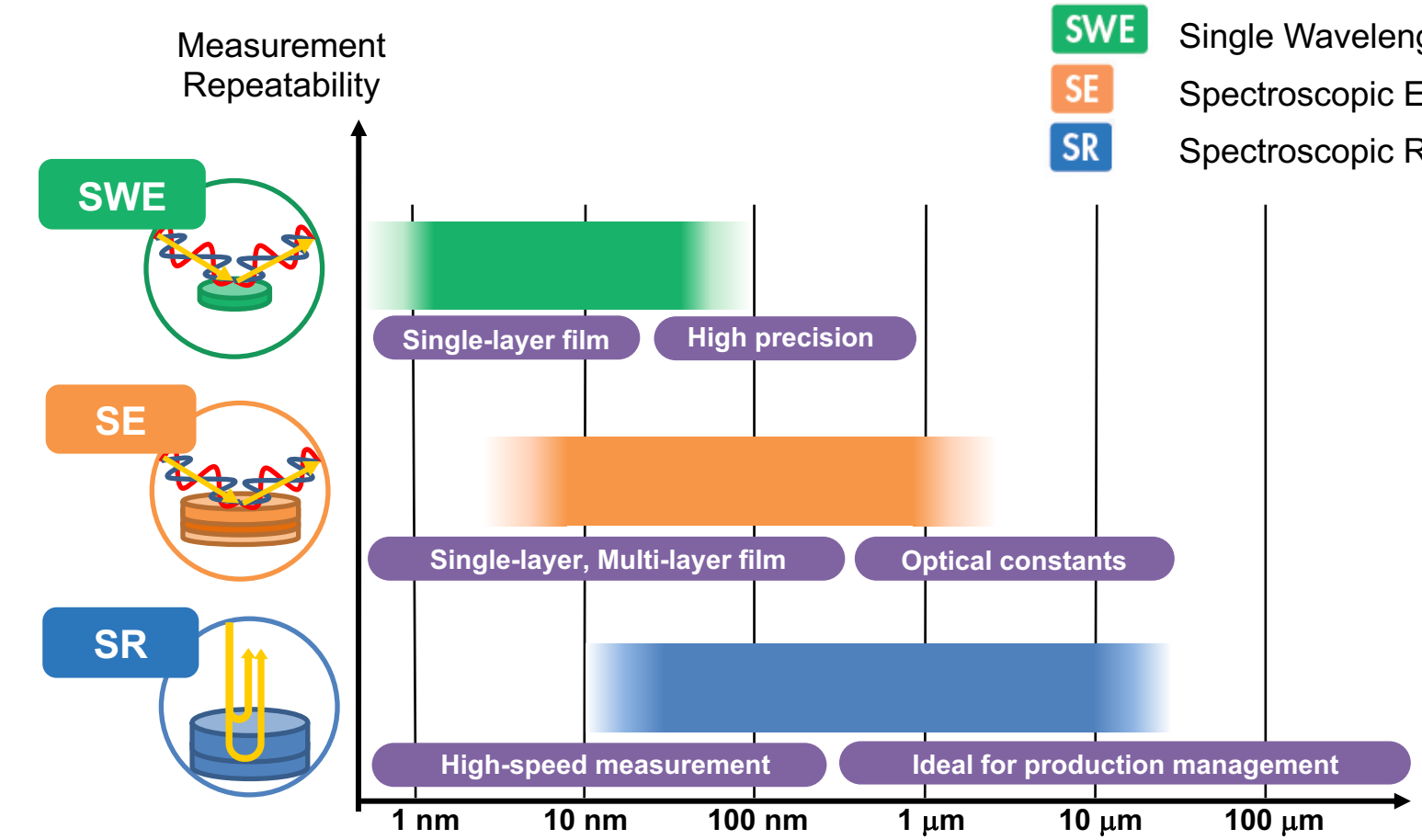
SR

VM-1200/1300 series

Spectroscopic Reflectometer
Table-top type

SE Spectroscopic Ellipsometer
SWE Single Wavelength Ellipsometer
SR Spectroscopic Reflectometer

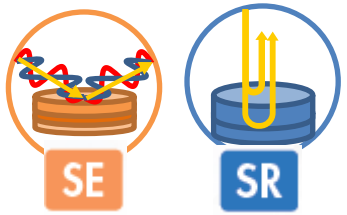
Various Measurement for Various Wafers



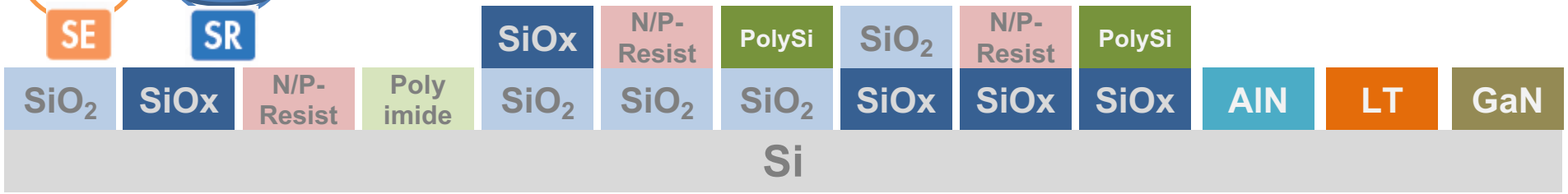
Experience

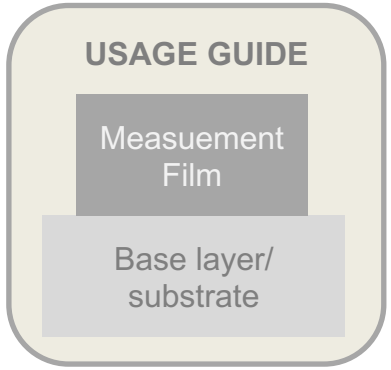
SiC | GaN | GaAs | Glass | Si | LT/LN | SOI | etc.

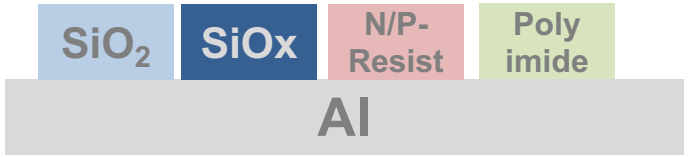
Film library



Other than those listed below of the standard program. Please contact us for details.







User-friendly GUI

Recipe creation of measurement system is too difficult

Recipe creation flow

Recipe creation takes only 10 min. !

- Recipe creation start
- Measurement mode select
- Film structure select
- Mapping
- Recipe creation finish

Operation of measurement system is too difficult

Sample measurement flow

Easy to sample measurement !

- Recipe setting
- Recipe setting (Edit information)
- Start measurement
- Data view

RE-3500

SE
SWE
SR

Wafer size 125 mm ▶ Wafer size 300 mm

New Platform

SE mode : 2 times compared with old model

New Ellipsometry

Wavelength 230 nm - 800 nm with MSE
High accuracy and Repeatability
Film thickness Range: up to 1um

Spectroscopic Reflectometer

Wavelength 400 nm - 800 nm: spot size : φ10 μm
Film thickness Range : 10 nm - 20 μm

High Flexibility

Transfer the various Wafer size and Thin wafer without any modification
New Recipe creation support

VM-2500/3500

SR

Wafer size 100 mm ▶ Wafer size 300 mm

Compact Design

VM-2500 (200 mm)
VM-3500 (300 mm)

Spectroscopic Reflectometer

Standard Wavelength type: 400 nm – 800 nm
UV Wavelength type : 220 nm - 800 nm
IR Wavelength type : 400 nm - 1000 nm

Thickness Range

Standard Wavelength type: 10 nm - 20 μm
UV Wavelength type : 2 nm - 20 μm
IR Wavelength type : 10 nm - 120 μm

High Throughput and Flexibility

Transfer the Small Wafer size and Thin wafer without any modification
New Recipe creation support

VM-3500-Trench specification

SR Trench

SR

Wafer size 100 mm ▶ Wafer size 200 mm

Compact Design

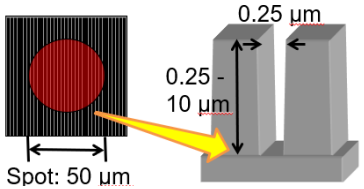
VM-3500 (200 mm)

Spectroscopic Reflectometer

Standard Wavelength type: 400 nm - 800 nm
UV Wavelength type : 220 nm - 800 nm
IR Wavelength type : 400 nm - 1000 nm

Trench depth measurement

Wavelength : 200 nm - 400 nm
Trench depth : 0.25 - 10 μm
Line and space : 0.25 μm over size
Measurement time: within 2 sec.



ZI-2000

Wafer size 76 mm ▶ Wafer size 200 mm

Compact Design

Front Side Inspection

Microscopic automatic visual inspection

1.5μm or 4.0μm

Main features, options

Automatic Defect Review (color images)
Automatic Defects Classification
Easy interface
Various wafer handling capability
CD/Overlay

ZI-3500 / ZI-3500 with BSI

Wafer size 100 mm ▶ Wafer size 300 mm

Compact Design

Front Side Inspection

Microscopic automatic visual inspection

Selectable 1.0μm, 1.5μm, 4.0μm

Backside – Backside Edge Inspection

Macro automatic visual inspection

Backside edge: 5μm
Backside: 20 μm

Main features, options

Automatic Defect Review (color images)
Automatic Defects Classification
Easy interface
ADC / Screen AI Solution
Various wafer handling capability
CD/Overlay

ZI-3600 High throughput

NEW

Wafer size 100 mm ▶ Wafer size 300 mm

Compact Design

Front Side Inspection

Microscopic automatic visual inspection

Selectable 0.5μm, 1.5μm, 4.0μm

Main features, options

High throughput
Automatic Defect Review (color images)
Automatic Defects Classification
Easy interface
ADC / Screen AI Solution
Various wafer handling capability
CD/Overlay

Summary

More than **40 years** experience	More than **1500 sets** install base	**Low CoO, AI-supported**	**-45%** less foot print
Same long history as Wet Cleaning	Japan, Korea, Taiwan, US, EU	Designed for cost saving	From Competitor
Experience for **Compound Wafer**	**High T-Put:** **5** min./**500** pts 180 WPH	**Trench depth** and **thickness** measurement tool	**DEMO** is available In Japan
SiC,GaN,GaAs and also LT/LN	By VM-2500 HTP By ZI-3600	Si and SiC wafer	Any time WELCOME

SCREEN

ADVANCING TECH & INNOVATION

SCREEN Semiconductor Solutions Co., Ltd.

Innovation for a Sustainable World


SCREEN