More than 25 years expertise in Wafer Marking & Sorting

INNOLAS-1995

Wafer Marking Equipment

Wafer Sorting Equipment

Metrology Automation

Inning am Ammersee,
30 km from Munich, Germany

High Quality Wafer Marking & Sorting Solutions for the Semiconductor Industry

Soft, Deep & Tape Marking on Semiconductor Wafers

All InnoLas wafer marking systems are capable of marking multible codetypes such as OCR, T7 Data Matrix, Barcode 412 and Engrave Mode. All fonts conform to the SEMI standard and are readable by common character recognition systems.

There are several InnoLas developed laser beam sources available to assure ideal results for all semiconductor material types.

With the **soft laser marking process**, the material is melted by the laser radiation. In this case a shallow **debris free** mark from one to five micron depth will be created. This type of mark is common for **polished wafer surfaces** mostly used at chip but also at wafer suppliers.

On the other hand, the **deep laser marking process** vaporizes the material by the laser beam. With this type of laser mark, the typical dot depth ranges from five and 100 microns. This type of marking is common for **unpolished surfaces** such as as-cut, grinded or lapped which are present during the manufacturing process at wafer suppliers.
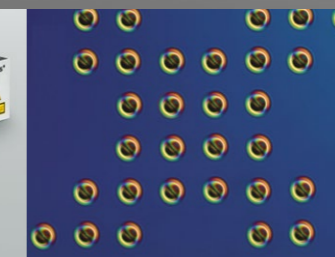
Both types of processes can be done through a tape which is laminated on the wafer.

History

The InnoLas GmbH was founded in 1995 by Andreas Behr amongst others as a specialized service center for laser products and systems. In parallel, InnoLas began with the development of customized lasers and laser equipment such as wafer marking systems.

Due to the successful growth rate of InnoLas GmbH, a new holding company, InnoLas Holding GmbH, was formed in 2008. The new holding company separated the three divisions into three individual companies, so the specific focus could be offered to the semiconductor, laser and micro machining industries.

In the meantime many well-known wafer- as well as chip-manufacturers run their production with high quality machines from InnoLas.

Machines

All InnoLas systems are designed, manufactured and customized at our headquarters in Germany.

Our equipment is designed from the **highest quality components** and assembled by highly educated, skilled and experienced technicians from subcomponent to final **equipment assembly in a clean room** environment. Our systems are designed to be integrated directly into your production line or run as a stand alone tool.

Mission

Designing, engineering and manufacturing products that provide our customers with reliable, high quality technical solutions yielding a favourable price-performance ratio is our mission! As a major global supplier to the Semiconductor industry, InnoLas has established a broad based **international sales and service team** to guarantee excellent long term support to our current and future customer base.

Should you have a specific application or product requirement not fully addressed in this catalogue, we will be delighted to work with you to find a solution that will meet your goals and expectations.

Example for an SEMI OCR 10x18 and a SEMI T7 data matrix font on a 300 mm polished silicon wafer
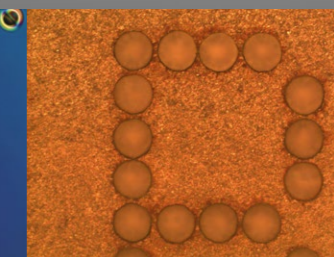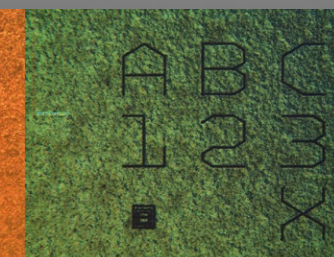
INNOLAS-1995

InnoLas developed laser sources for excellent marking results on every semiconductor material

OCR 10x18 debris free mark on a polished silicon wafer

OCR 5x9 deep mark (depth: 50 µm) on a lapped silicon wafer

Engraved marking on a wafer through a dicing tape

Wafer ID Marking – Semiconductor, LED and Compound Wafer Materials (2 inch to 450 mm)

The InnoLas wafer marking equipment series is designed to mark an unique identification code on wafers using highly advanced laser technology. The ID is used to track each wafer through the entire manufacturing process.

Different types of lasers and optical setups are available to achieve the best process results for various material types. In addition, a large variety of standard and custom options are available to meet specific process requirements.

The highest quality components along with many years of innovative development guarantee superior marking results with low maintenance costs and excellent uptime.

Application: Individual ID marking on wafers

Processes: Deep and debris free marking

Fonts: OCR, BC412 Barcode, T7 data matrix code, fiducial mark and Engrave mode
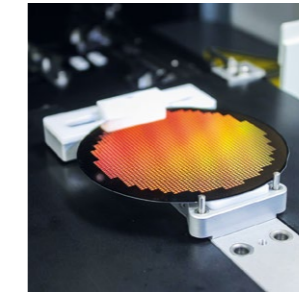
Sizes: 2" to 450 mm wafer

Materials: Al_2O_3, GaAs, GaN, GaP, Ge, InP, $LiNbO_3$, $LiTaO_3$, Si, SiC, SiO_2 and many others

Surfaces: Polished, ground, lapped, as-cut, etched, EPI and others

Handling: Manual, automated vacuum or edge grip handling

Control: Host control via SECS/GEM interface, customized file interface or stand alone system control

Wafer ID Marking – IL 600

The IL 600 is a small wafer marking machine designed for low volume production and R&D labs. Due to the manual handling, it is a cost efficient solution which guarantees a high quality mark like all other systems.

System dimension: IL 600
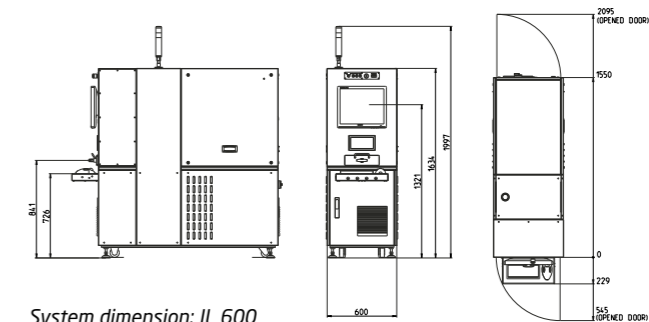
Wafer ID Marking – IL 1000
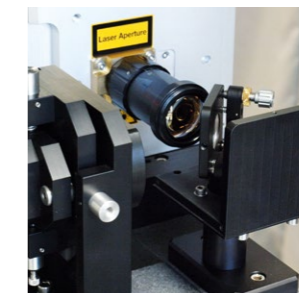
The IL 1000 is a fully automated wafer marking system with one cassette station. The optical path is fixed on a massive granite base to avoid process variations due to external influences.

As a backup or for medium throughputs this system has the best value.

System dimension: IL 1000

Wafer ID Marking - IL 2000

For high demands in throughput, the IL 2000 is the best solution for up to 200 mm wafer. This machine has 4 load/unload stations and can mark up to 180 wph. Furthermore, you can use this system as a wafer sorter!
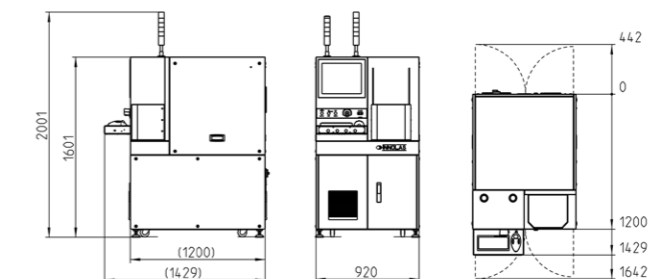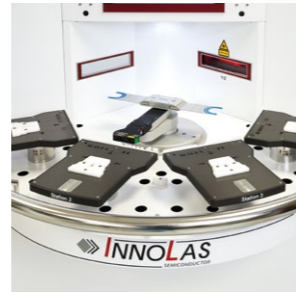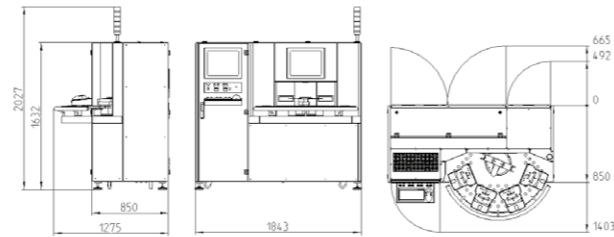

System dimension: IL 2000

Wafer ID Marking - IL 3000

This four station system is designed for deep marking of 300 mm wafers which are loaded in open cassettes. With the additional sorting function, the machine can also be used as a wafer sorter.
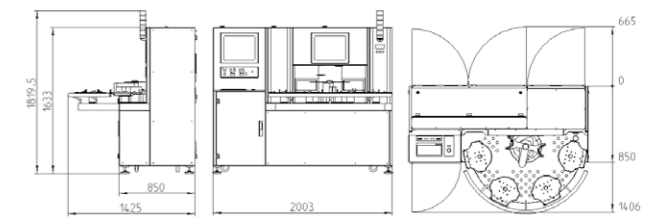
System dimension: IL 3000

Wafer ID Marking - IL C2000
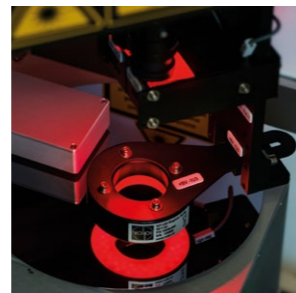
The IL C2000 is the ideal system for debris free marking of 200 mm wafer which are located in a SMIF. The integrated class 3 (ISO EN 14644-1) mini environment keeps the wafer surface clean. Furthermore this system is compatible with PGV or AGV.

System Dimension: IL C2000

Wafer ID Marking - IL C3000

The IL C3000 is the ideal system for debris free marking of 300 mm wafer which are located in a FOUP. The integrated class 3 (ISO EN 14644-1) mini environment keeps the wafer surface clean. Furthermore this system is compatible with PGV, AGV as well as OHT.

System dimension: IL C3000

Wafer Marking Systems – Specification

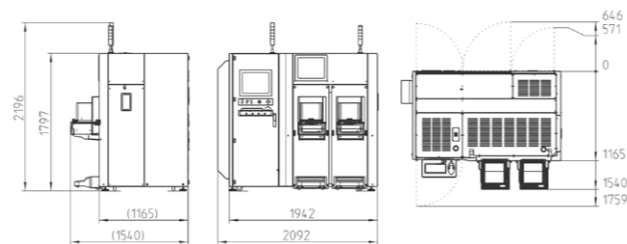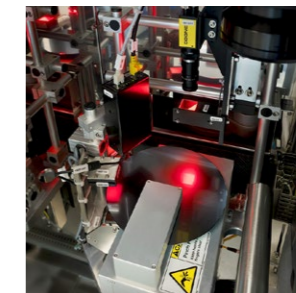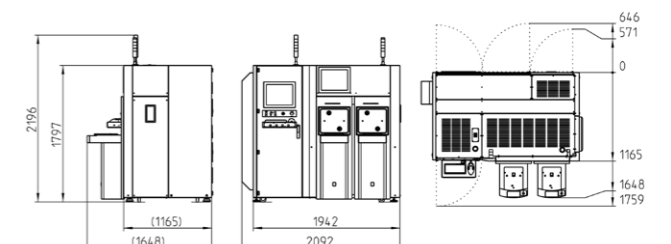| HANDLING SYSTEM	IL 600	IL 1000	IL 2000	IL C2000	IL C2000 HT	IL 3000	IL C3000	IL C3000 HT
Wafer sizes:								
2", 2.25", 3", 3.25" and 100, 125, 150, 200 mm	◆	◆	◆					
200 mm (8")				◆	◆			
300 mm (12"), (optional 200 mm (8") setup)						◆	◆	◆
Wafer transfer:								
Single drawer Station	◆							
Single Arm Robot – single end effector		◆		◆			◆	
Single Arm Robot – double end effector			◆			◆		
Double Arm Robot – single end effector					◆			◆
Wafer alignment:								
Manual fixture adapter	◆							
Opto mechanical		◆	◆	◆	◆	◆	◆	◆
Wafer handling:								
Manual	◆							
Vacuum		◆	◆	◆	◆	◆	◆	◆
Edge grip		◆	◆	◆		◆	◆	
Number of cassette loading stations:	1	1	4	2	2	4	2	2
Throughput (wafers/hr):								
SEMI M13-88 without reading, Single density 5x9 font*	60	100	180	120	180	160	120	180

LASER AND OPTICS

	IL 600	IL 1000	IL 2000	IL C2000	IL C2000 HT	IL 3000	IL C3000	IL C3000 HT
Laser type								
Nd:YAG 1064, 532 and 355 nm (diode pumped)	◆	◆	◆	◆	◆	◆	◆	◆
CO_2: 10,600 nm, others on request	◆	◆	◆					
Laser class:								
Class 1 (Class 4 with open cabinet/service access)	◆	◆	◆	◆	◆	◆	◆	◆
Focus lens: F-Theta objective	◆	◆	◆	◆	◆	◆	◆	◆
Galvo head:								
High precision digitally controlled unit	◆	◆	◆	◆	◆	◆	◆	◆
Laser stability: ± 1 % peak to peak	◆	◆	◆	◆	◆	◆	◆	◆

MARKING

	IL 600	IL 1000	IL 2000	IL C2000	IL C2000 HT	IL 3000	IL C3000	IL C3000 HT
Fonts:								
Dot Matrix (SEMI 5x9, 10x18, 15x23 and 9x17)	◆	◆	◆	◆	◆	◆	◆	◆
Barcode (SEMI 412, IBM 412)	◆	◆	◆	◆	◆	◆	◆	◆
2D Code (SEMI T7)	◆	◆	◆	◆	◆	◆	◆	◆
Engrave Mode (optional)	◆	◆	◆	◆	◆	◆	◆	◆
Fiducial marks (free programmable)	◆	◆	◆	◆	◆	◆	◆	◆
Checksum:								
SEMI, IBM, customized (optional)	◆	◆	◆	◆	◆	◆	◆	◆
Serialization:								
Numeric, alphanumeric, IBM (ascending or descending)	◆	◆	◆	◆	◆	◆	◆	◆
Text position:								
Adjustable in X-axis, Y-axis and angle	◆	◆	◆	◆	◆	◆	◆	◆
Repeatability X and Y direction:								
± 200 µm	◆							
± 100 µm		◆	◆	◆	◆	◆	◆	◆
± 75 µm (optional)		◆	◆	◆	◆	◆	◆	◆
Dot depth: 0.1 µm – 100 µm*	◆	◆	◆	◆	◆	◆	◆	◆
Dot diameter: 25 µm – 150 µm*	◆	◆	◆	◆	◆	◆	◆	◆

depending on material, laser and process

FACILITY REQUIREMENT	IL 600	IL 1000	IL 2000	IL C2000	IL C2000 HT	IL 3000	IL C3000	IL C3000 HT
Electrical:								
230 V AC (1P/1N/1PE) 50 Hz/16 A	◆	◆	◆	◆	◆	◆	◆	◆
Optional supply voltage 115-200-240-370-380-400-420-480 V	◆	◆	◆	◆	◆	◆	◆	◆
Power consumption in Watt:	1000	1200	1200	2000	2000	1500	2000	2000
Communication:								
Ethernet RJ45 connector (SECS/GEM optional)	◆	◆	◆	◆	◆	◆	◆	◆
Vacuum:								
-800 mbar (23.6 Hg)		◆	◆	◆	◆	◆	◆	◆
8 mm OD connection (Festo)		◆	◆	◆	◆	◆	◆	◆
Exhaust:								
33.6 m³/hr (19.8 ft³/min)	◆	◆	◆	◆	◆	◆	◆	◆
50 mm ID connection	◆	◆	◆	◆	◆	◆	◆	◆
CDA – Compressed dry air:								
6 bar (87 psi)		◆	◆	◆	◆	◆	◆	◆
8 mm OD connection (Festo)		◆	◆	◆	◆	◆	◆	◆
PFO – Process fluid outlet:								
8 mm OD connection (Festo)	◆	◆	◆	◆	◆	◆	◆	◆
Cooling water (optional):								
5.0 l/min at 15 °C (1.3 gal/min at 59 °F)	◆	◆	◆	◆	◆	◆	◆	◆
1/2" connection	◆	◆	◆	◆	◆	◆	◆	◆
Water pressure:								
2 - 6 bar (29 - 87 psi)	◆	◆	◆	◆	◆	◆	◆	◆
Weight:								
Approx in kg	450	600	750	1500	1500	1200	1500	1500

GENERAL

	IL 600	IL 1000	IL 2000	IL C2000	IL C2000 HT	IL 3000	IL C3000	IL C3000 HT
System Frame:								
Powder coated	◆	◆	◆			◆		
Stainless steel				◆	◆		◆	◆
System Panels:								
Powder coated	◆	◆	◆	◆	◆	◆		
Stainless steel			◆	◆	◆	◆	◆	◆
Mini Environment:								
Class 3 (ISO EN 14644-1) depends on clean room				◆	◆		◆	◆
Certification:								
CDRH accession #0010530	◆	◆	◆	◆	◆	◆	◆	◆
CE	◆	◆	◆	◆	◆	◆	◆	◆
NFPA 70	◆	◆	◆	◆	◆	◆	◆	◆
NFPA 79	◆	◆	◆	◆	◆	◆	◆	◆

depending on material, laser and process

Wafer ID Sorting – Semiconductor, LED and Compound Wafers (2 inch to 450 mm)

The InnoLas wafer sorting systems can automatically sort, split, merge and transfer 2" to 450 mm wafers by wafer ID, thickness or weight. Different types of handling are available to fulfill your needs in cleanliness and throughput.

The basic configuration of all sorting systems includes fully automated handling components as well as a slot scanner. In addition, a large variety of standard options and even custom made options are available to meet your specific requirements.

High quality sub components and long-time experience guarantee the best results as well as low maintenance costs and excellent uptime.

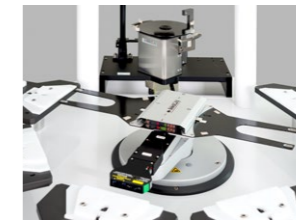**Application:** Individual sorting by wafer ID, thickness or weight

Sizes: 2" to 450 mm semiconductor, LED and compound wafers

Handling: Automated vacuum, edge grip or frame

Throughput: Up to 600 wafers/hr (depends on process recipe)

Control: Host control via SECS/GEM interface or manual control, Customized file interface
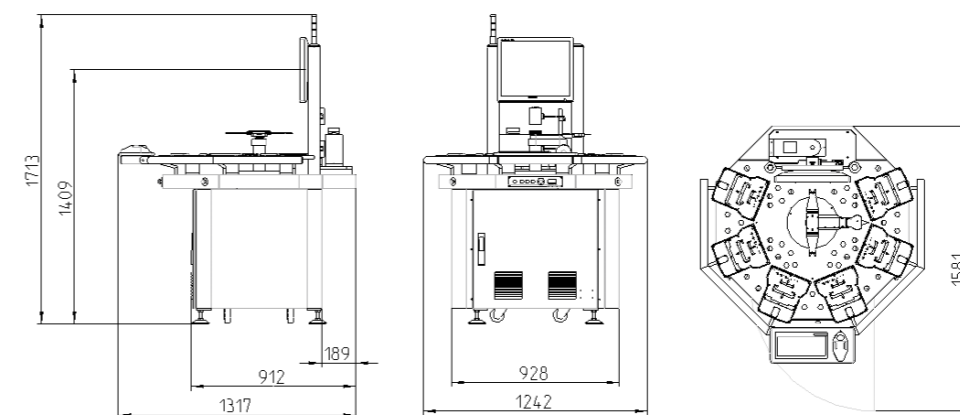
Wafer Sorting – IL 2600

The IL 2600 wafer sorting system is designed to merge, split or sort 2" to 200 mm wafers by ID, weight or thickness. Up to 6 input/output stations for open cassettes guarantee a high throughput with up to 275 wafers/hr in sorting mode and up to 600 wafers/hr in transfer mode. The large variety of optional modules helps to customize this system to meet a broad range of customer requirements.

The machine can be equipped either with vacuum or with edge grip handling. The edge grip handling guarantees highest cleanliness of the wafer backside.

A small footprint of less than 1.5 m x 1.5 m is another advantage of this powerful sorting system.
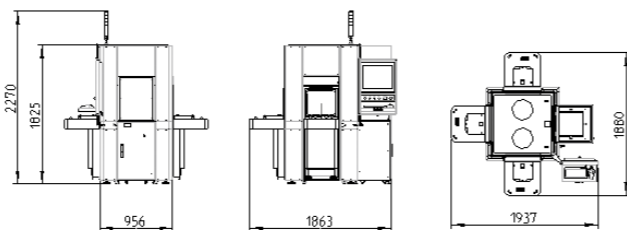

System dimension: IL 2600
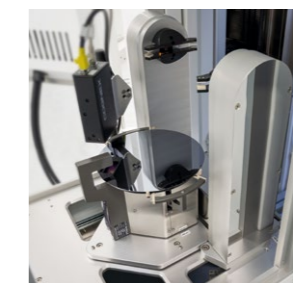
Wafer Sorting - IL C3200

The IL C3200 can be equipped with up to 3 load/unload stations. A class 1 minienvironment and the optional edge grip handling keep the inside of the machine as well as the wafer clean.

System dimension: IL C3200

Wafer Sorting - IL C3600

The IL C3600 can be equipped with up to 5 load/unload stations. An optional edge grip handling avoids making the wafer's backside dirty. The system is also capable to run with AGV or OHT systems.
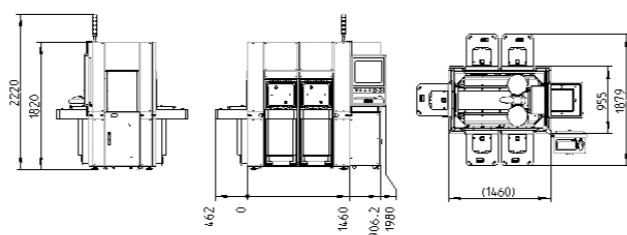
System dimension: IL C3600

Wafer Sorting - IL C3800 (SMIF)

The IL C3800-200 can be equipped with up to 7 SMIF loadports. Edge grip handling is available to guarantee highest cleanliness of the wafer backside. A class 1 minienvironment keeps the machine clean. The system is also capable to run with AGV or OHT systems.

System dimension: IL C3800

Wafer Sorting - IL C3800 (FOUP)

The IL C3800 sorter series is designed to sort and inspect 300 mm wafers in a clean class 1 mini environment. Depending on your needs, this machine can be equipped between one and seven 300 mm loadports and is ready to run PGV, AGV as well as OHT.

System dimension: IL C3800

Wafer Sorting Systems – Specification

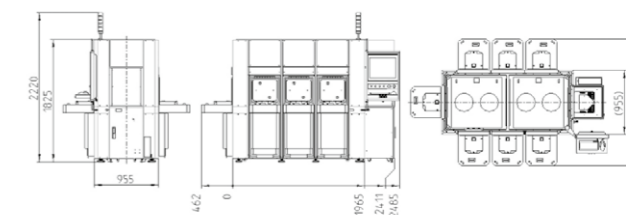| HANDLING SYSTEM	IL 2600	IL C3200	IL C3600	IL C3800	IL C4600
Wafer sizes:					
2", 2.25", 3", 3.25" and 100, 125, 150, 200 mm	◆				
300 mm (200 mm optional)		◆	◆	◆	
450 mm (300 mm optional)					◆
Wafer transfer:					
Single Arm Robot – single or double end effector	◆	◆	◆	◆	◆
Dual Arm Robot – single end effector		◆	◆	◆	◆
Wafer alignment:					
Opto mechanical	◆	◆	◆	◆	◆
Wafer handling:					
Vacuum	◆	◆	◆	◆	◆
Edge grip	◆	◆	◆	◆	◆
Frame		◆	◆	◆	
Cassette Types					
Open cassette	◆				
FOUP/FOSB		◆	◆	◆	
MAC					◆
Cassette Loading					
AGV/PGV	◆	◆	◆	◆	◆
OHT		◆	◆	◆	◆
Number of input/output stations:	6	3	5	7	5
Throughput (wafers/hr)*:					
Transfer mode	600	380	360	360	300
Sorting mode	275	250	240	240	180

READING SYSTEM

	IL 2600	IL C3200	IL C3600	IL C3800	IL C4600
Fonts:					
Dot Matrix (SEMI 5x9, 10x18, 15x23, and 9x17)	◆	◆	◆	◆	◆
Barcode (SEMI 412, IBM 412)	◆	◆	◆	◆	◆
2D Code (SEMI T7)	◆	◆	◆	◆	◆
Engrave Mode (optional)	◆	◆	◆	◆	◆
Checksum:					
SEMI, IBM, customized (optional)	◆	◆	◆	◆	◆

SORTING

	IL 2600	IL C3200	IL C3600	IL C3800	IL C4600
Types:					
ID	◆	◆	◆	◆	◆
Weight	◆	◆	◆	◆	◆
Thickness	◆	◆	◆	◆	◆
Wafer Defect	◆	◆	◆	◆	◆
Modes (ID):					
Sort (ascending, descending, random)	◆	◆	◆	◆	◆
Split (even, uneven, random)	◆	◆	◆	◆	◆
Merge	◆	◆	◆	◆	◆

*depending on type of handling

FACILITY REQUIREMENTS	IL 2600	IL C3200	IL C3600	IL C3800	IL C4600
Electrical:					
230 V AC (1P/1N/1PE) 50 Hz/16 A	◆	◆	◆	◆	◆
Optional supply voltage 115-200-208-240-370-380-400-420-480 V	◆	◆	◆	◆	◆
Power consumption in Watt:	1000	1050	1350	1500	1350
Communication:					
Ethernet RJ45 connector (SECS/GEM optional)	◆	◆	◆	◆	◆
Vacuum:					
-800 mbar (23.6 Hg)	◆	◆	◆	◆	◆
8 mm OD connection (Festo)	◆	◆	◆	◆	◆
CDA – Compressed dry air:					
6 bar (87 psi)		◆	◆	◆	◆
8 mm OD connection (Festo)		◆	◆	◆	◆
PFO – Process fluid outlet:					
8 mm OD connection (Festo)	◆	◆	◆	◆	◆
Weight:					
Approx in kg	450	500	1000	1200	1200

GENERAL

	IL 2600	IL C3200	IL C3600	IL C3800	IL C4600
System Frame:					
Powder coated	◆				
Stainless steel		◆	◆	◆	◆
System Panels:					
Powder coated	◆	◆	◆	◆	◆
Stainless steel	◆	◆	◆	◆	◆
Mini Environment:					
Class 3 (ISO EN 14644-1) depends on clean room		◆	◆	◆	◆
Certification:					
CE	◆	◆	◆	◆	◆
NFPA 70	◆	◆	◆	◆	◆
NFPA 79	◆	◆	◆	◆	◆

# Wafer Transfer Modules for Metrology & Inspection

All of our sorting systems from 2" up to 450 mm can also be used as a so called EFEM, a transfer module which loads/unloads a process chamber from another tool in a very clean condition. Our systems contain the key components needed to unload the wafer, deliver it to the parent tool for processing/measuring/inspecting and return the product to its carrier upon completion. All machines can be equipped with vacuum, edge grip or frame handling depending on the customers application.
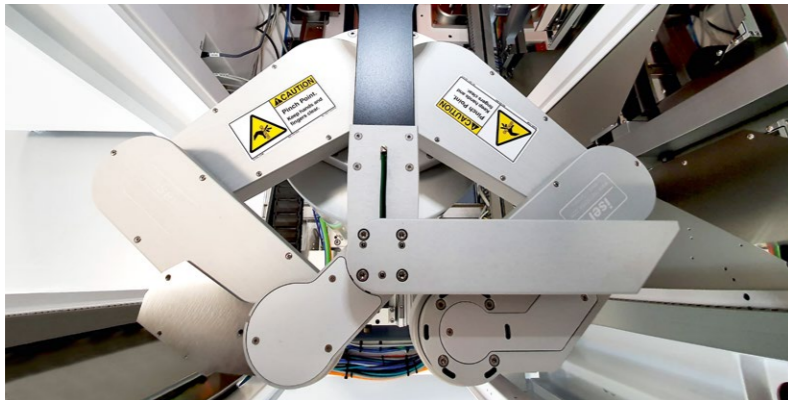
Vacuum Handling

The vacuum handling is the standard handling of our machines. It combines highest acceleration and movement speeds together with a great flexability of use. Our machines can be equiped either with single or with dual arm robots.
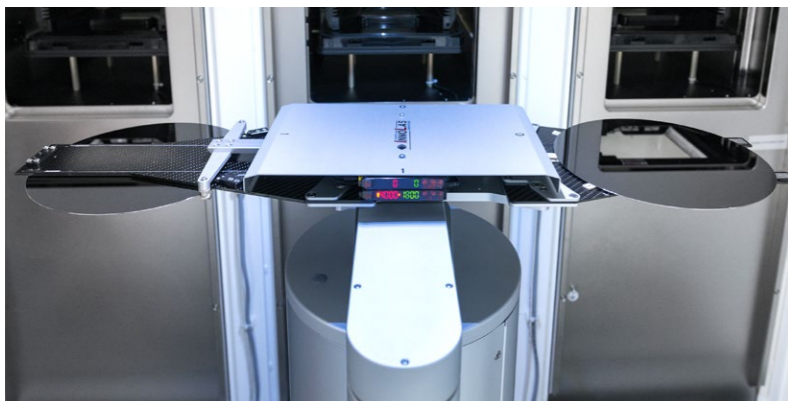
Edge Grip Handling

The picture shows on the left paddle an upside down edge grip endeffector and on the right side an intelligent edge grip endeffector. The intelligent one can detect the position of each individual wafer which minimizes stress to the wafer dramatically. In generell the edge grip handling is used for keeping both sides of the wafer clean.

Frame Handling

With the frame handling the machine can handle a wafer which is laminated on a dicing tape which is again laminated on a frame. This type of handling is common for wafer just before or after dicing into chips.

Our aim:
Higher the yield for the wafer – as well as chip manufacturers

Applications for our Metrology Automation

Crack & defect scan inside the wafer
Used after dicing of the wafer at chip manufacturers.

Defect inspection of wafer back- and frontside
Used before polishing and as final quality control at wafer manufacturers.
Used as quality control in the beginning at chip makers.

Defect inspection of wafer edge and notch
Used as final quality control at wafer manufacturers.

High precision wafer thickness measurement
Used as quality control at wafer manufacturers.
Used to sort wafers for next process steps.

High precision wafer weight measurement
Used to determine layer thickness of wafers for next process steps.

Optional Features

The optional modules available for our wafer marking and sorting equipments are a collection of features developed over many years of addressing specific customer requirements. If there is any requirement that isn't in the options below, please feel free to contact us.

IL Motorized Beam Expander (MBE)

Adjustment of focus level, dot diameter and dot shape by recipe. High accurate piezo drives guarantee best reproducibility of marking results.

IL Edge Grip Aligner (ILA)

Edge grip aligner for highest positioning accuracy without touching the wafer backside.

IL Wafer Flip Module (EGF)

Edge grip flipping of the wafer by recipe from 0 °C to 180 °C.

Pattern Recognition (PRE)

The high resolution camera system detects and reads reference marks or fiducials to mark relative or remark on an existing marking.

IL Intelligent Endeffector (IEE)

This active edge grip endeffector detects the wafer edge during movement and picks up the wafer centred in radial and theta axis to avoid stress.

Thickness measurement (TMO)

Optical or capacitive wafer thickness measurement to sort by thickness or to verify that the correct material will be marked.

Notes

Japan
japan@il-semi.com

United Kingdom
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