FEMTO-ST
MIMENTO
Technology Centre

femto-st
SCIENCES & TECHNOLOGIES

FEMTO-ST a joint Research Institute from

members of

FINANCIAL SUPPORT

avec le Fonds européen de développement régional (FEDER)

OUR CLEANROOM

MIMENTO technology centre is identified as a reference center for **Micro-nano-optics**, **Micro-nano-acoustics**, **Micro-Opto-Electro-Mechanical Systems** (MOEMS) and **Micro-Robotics**.

A few figures:

865m² of cleanroom (ISO5 to ISO7 classes)
15 engineers and technicians
15 M€ of high technology equipments

How to work with us:

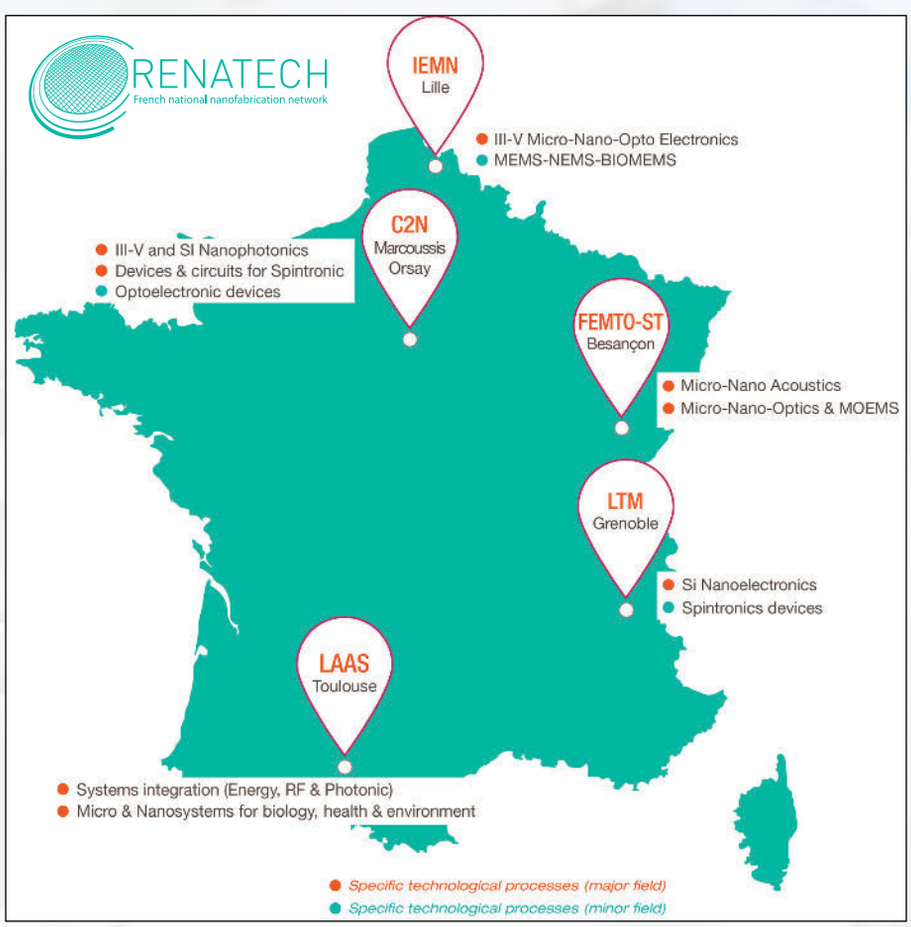
Within the framework of the French technological centres opening (Renatech network), the FEMTO-ST Institute is committed to support at MIMENTO projects from external laboratories or from industrial partners for research collaboration. Each request will be examined by a local committee and will lead to a discussion with the technical staff to check the feasibility of the project, its cost and the fabrication time. Depending on the technological project, external people will be invited to perform themselves some technological steps in the cleanroom.

To submit a project: **www.renatech.org/projet**

Contact
mimento@femto-st.fr

Christophe GORECKI: +33 (0)3 81 66 66 07 **Jean-Claude JEANNOT**: +33 (0)3 63 08 24 78

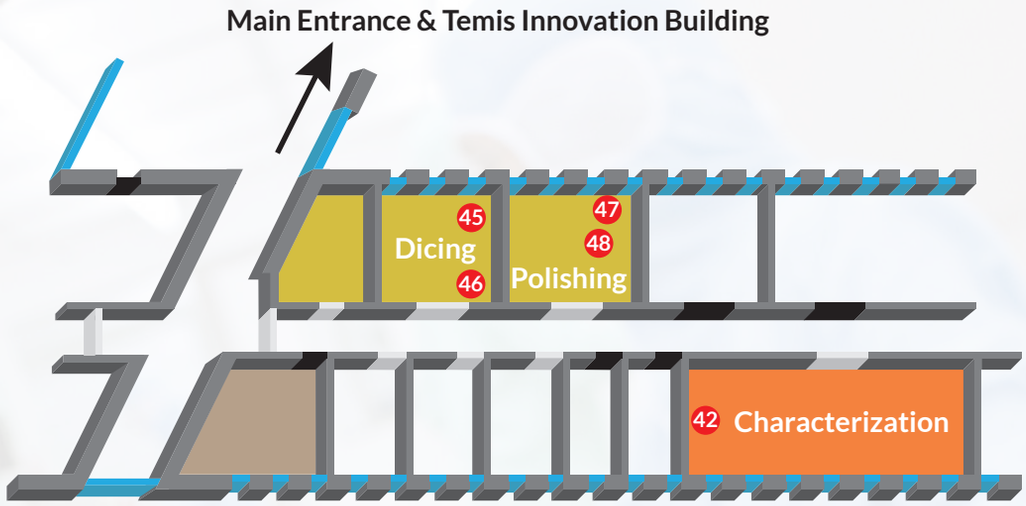
RENATECH NETWORK



MIMENTO is a member of the "RENATECH" network (French national network for large facilities involved in technological research in the field of micro and nanotechnology). This network is a partnership between five CNRS academic technology centers (LTM (Grenoble), C2N (Orsay / Marcoussis), IEMN (Lille), LAAS (Toulouse), FEMTO-ST (Besançon)) and CEA – LETI (Grenoble). The purpose of this network is to support French research by providing access to fabrication facilities and technology experts for interested research teams. It is also open to regional, national and international industrial partners for research collaboration.

Regionally, the FEMTO-ST Institute is associated with the "Pôle des Microtechniques" (a regional cluster of microtechnology-based companies and research centres) and with the proximity Technological centres of Nancy/Strasbourg. It is also a partner of The Competencies Centre in Nanosciences and Nanotechnology Grand Est (C'Nano Grand Est).

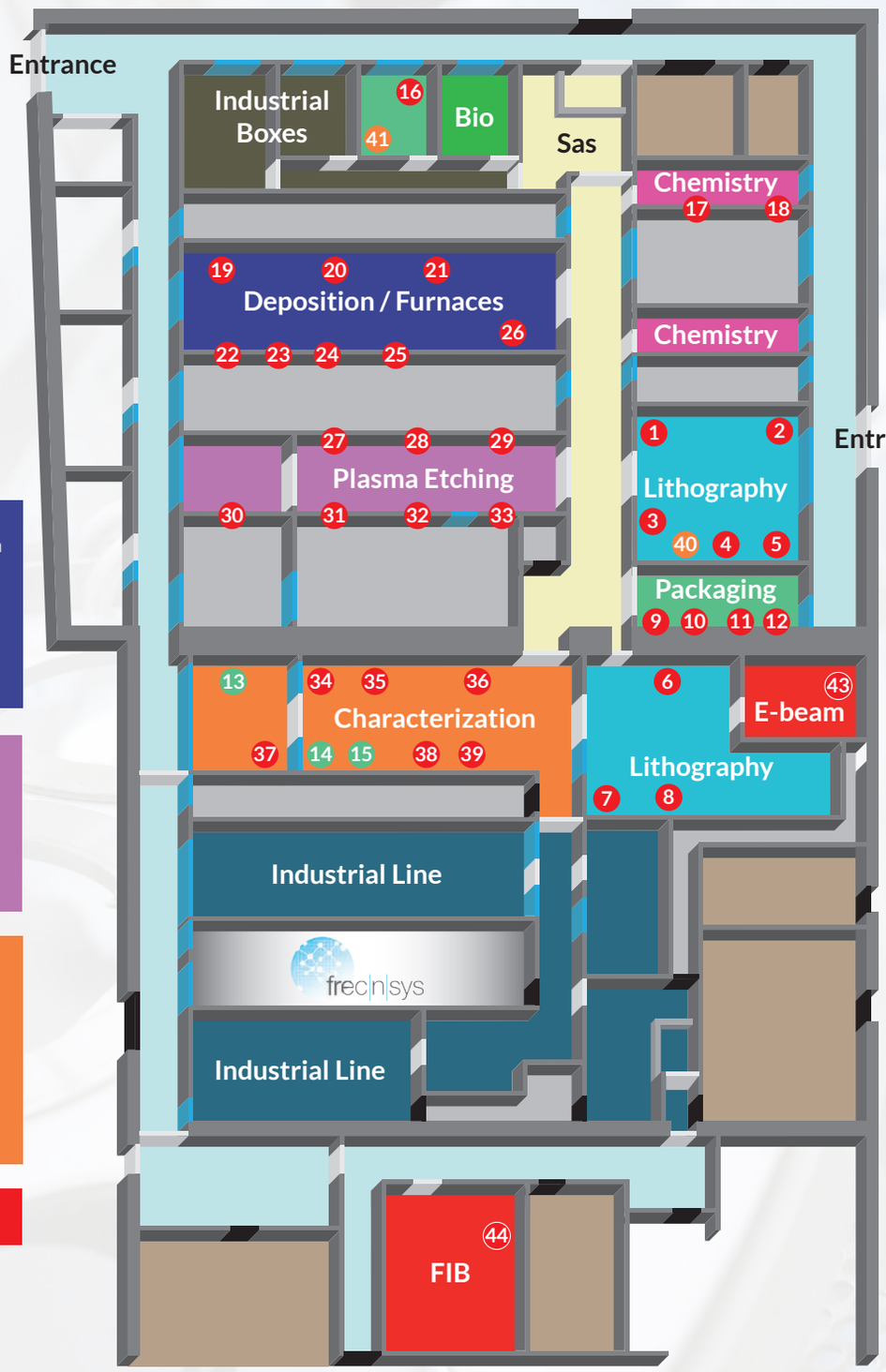
MAIN BUILDING



42: MEMS analyser

45: Dicing Saw 6"
46: Dicing Saw 4"
47: Lapping & polishing
48: CMP system

TEMIS INNOVATION BUILDING



19: Cathode sputtering system
20: Magnetron sputtering system
21: DC sputtering system
22: E-Beam evaporator
23: ICP-PECVD
24: E-Beam evaporator
25: Oxidation furnace
26: RTA system

27: RIE-CCP
28: Surface treatment system
29: DRIE-ICP 4"
30: Si DRIE-ICP 6"
31: Si DRIE-ICP 4"
32: Si DRIE-ICP 4"
33: Chlorine ICP 4"

34: Ellipsometer
35: Fizeau Interferometer
36: Surface profiler
37: SEM & EDS
38: Confocal microscope
39: Stress measurement
40: Thin layer measurement
41: Contact angle metrology
42: MEMS analyser

43: E-Beam lithography
44: FIB

1: Spin-coater
2: Auto spin-coater
3: Metrology platform
4: UV alignment system
5: DUV alignment system
6: Mask generator
7: Spray coater
8: Cleaning system

9: Surface activation system
10: Megasonic wafer cleaner
11: Multi-wafer bonder
12: Multi-wafer bonder
13: Flip-chip bonder
14: Wire bonder
15: Die bonder
16: Femto-print

17: Ni electroplating
18: HF acid bench

Lithography

1 Spin-coater with integrated hot plate

Solar-Semi
OC ST22

Use:
Photoresists spin coating

Spin speed: ≤ 7000 rpm
Cover: Close, middle or open (with some speed limitations)
Wafer Chuck: diam. 100 mm max and small pieces (only vacuum fixation)
Recipes: Selection and edition with touch screen display
Hot Plate: 250 °C max, diam. 152 mm max
Vacuum contact baking

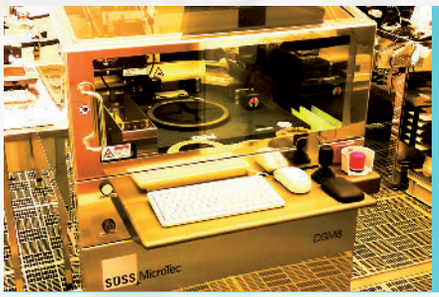
2 Automatic spin-coater, baking and developer

ACS
200 GEN3

Use:
Adherence promotor
Photoresist coating
Photoresist development

System: Cassette to cassette (high throughput fully automated)
Substrate size: 3" & 4" circular wafers
Resists: 4 dispense lines + 1 syringe (thick resist)
Baking: 4 hot plates (contact and proximity mode)
Developer: 3 developer lines (TMAH, KOH & PGMEA)
Spray and puddle
Recipes: Library of recipes

3 Semi-automatic metrology platform

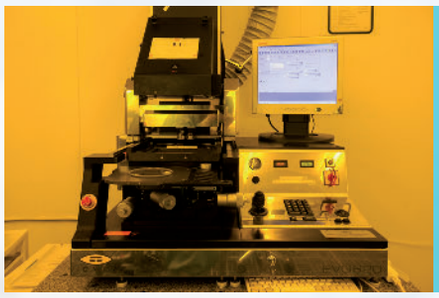


Süss Microtec
DSM8 GEN2

Use:
Top & bottom / Top & top Alignment control

Substrate size: 4" & 6" circular wafers
Substrate thickness: from 200 µm to 1000 µm
Front to back measurement accuracy: 0.2 µm
Accuracy: Tool induced shift compensation by wafer & pattern rotation
Graphical user interface: Including graphical display of results
ASCii output files (.CSV)

4 UV Double-side alignment system

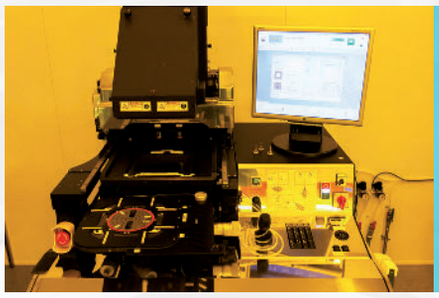


EVG
620

Use:
Top and bottom side alignments
Alignment for bonding

Resolution: Vacuum ≤ 0.8 µm
Hard Contact ≤ 1.5 µm
Soft Contact ≤ 2.0 µm
Proximity ≥ 5.0 µm
Mask size: 4" and 5"
File: gdsii
Alignment stage: Manual precision micrometers
Alignment accuracy: Top side alignment: ± 1.0 µm
Bottom side alignment: ± 1.25 µm
Substrate size: 2", 3" and 4"
Thickness: 0.1 to 2.5 mm (more on demand)
Exposure: Broadband (mercury arc lamp: 350 W)
Long pass filter for SU-8 photoresist
Time / Time interval
Sector exposure

5 DUV Double-side alignment system



EVG
620

Use:
Top and bottom side alignments

Resolution: Vacuum ≤ 0.8 µm
Hard Contact ≤ 1.5 µm
Soft Contact ≤ 2.0 µm
Proximity ≥ 5.0 µm
Mask size: 4" and 5" glass
5" flexible film
File: gdsii
Alignment stage: Autofocus and automatic positioning
Manual precision micrometers
Alignment accuracy: Top side alignment: ± 1.0 µm
Bottom side alignment: ± 1.25 µm
Substrate size: 2", 3" and 4" and small pieces (≥ 7x7 mm²)
Thickness: 0.1 to 2.5 mm (more on demand)
Exposure: Broadband (mercury arc lamp: 500 W)
Long pass filter for SU-8 photoresist
Time / Time interval
Sector exposure

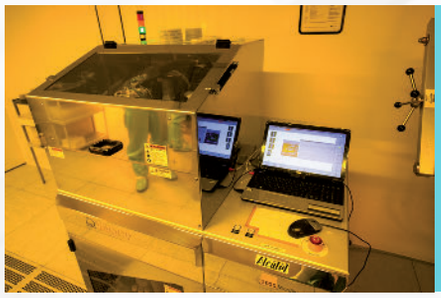
6 Optical mask generator

HEIDELBERG
DWL200

Use:
Optical masks
Direct exposure
3D photolithography

Features: Resolution 0.8 µm
Files format: gdsii, CIF, DXF, GERBER
Writehead 4 mm/10 mm
Substrates: Mask soda lime 7*7*0,12
Mask Quartz 6*6*0.25
Mask soda lime 5*5*0.09
Mask soda lime 4*4*0.09
Wafer 4" and 3"
Chuck: Stage X/Y with vacuum
Optics: Laser He-Cd (λ = 442 nm, 180 mW)

7 Spray Coater



Süss Microtec
Alta Spray

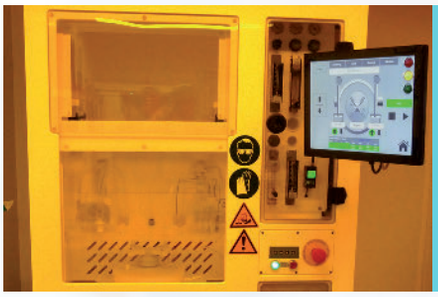
Use:
Conformal resist coating on substrate with high topology

Resist thickness: Standard process: 5 µm
Other process: several tens of microns

Parameters: Dilution and solvent
Resist flow
Speed of the nozzle
Number of meanders
Chuck temperature
Nitrogen pressure
Distance between nozzle and substrate

Nozzles: 2 (one dedicated for S1813)
Process time: 5 minutes (for 5 µm)
Resist dilution: Acetone
MEK
Substrate size: 4" max

8 Semi automatic cleaning system



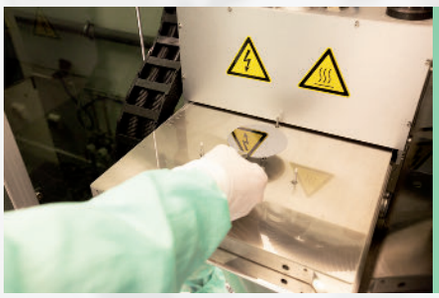
Solar-Semi
QS W300

Use:
Mask & wafer cleaner

Chuck by clamp: Wafer 3", 4" and 6"
Mask 4", 5" and 7"
Cleaning: Deionised water (30 to 180 bars)
Heated solvent (80 °C max)
Piranha
Back side rince

Packaging

9 Plasma Surface activation system



Nanoprep
NP12

Use:
Surface activation for low-temperature bonding applications

Features: Activation in cold plasma (low temperature, ambient conditions), based on dielectric barrier discharge
Very fast process (<<1 min)
Plasma: Oxygen, nitrogen, argon
Power: max. 500 W (typ. 200 W for Si wafer)
Programmable number of passage
Wafers: Silicon, Glass, Quartz, $LiNbO3$ ...
Wafers with metallic layers **NOT ALLOWED**
Size range: 10 mm up to diam. 300 mm
Thickness: typical 0.5 mm, 1.0 mm
Chuck: Vacuum fixation of substrate

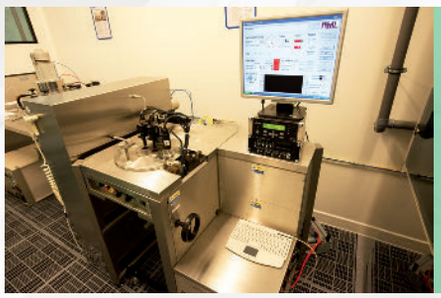
10 Megasonic wafer Cleaner & Wafer bonding inspection systems

CL200 &
IR200

Use:
Final rinsing of wafers before bonding (reduction of particles)

Features: Dedicated for removing particles from wafer surface
by megasonic DI-water jet
Drying the wafers by IR heating and spinning
Vibratory motor and tilt applied to align wafers
Pre-bonding of wafers
Wafers: Size of round wafers: 2", 3", 4", 5", 6"
Size of square substrates: 4"x4", 5"x5"
Via-holes not allowed (vacuum chucks)
Chucks: Vacuum chucks
Spin speed: max. 4000 rpm
Inspection IR System: Infra-Red inspection system for bonded Si stack
IR Camera, manually adjustable Optical Zoom
Field of view: diam. 75 mm max

11 Multi-wafer bonder

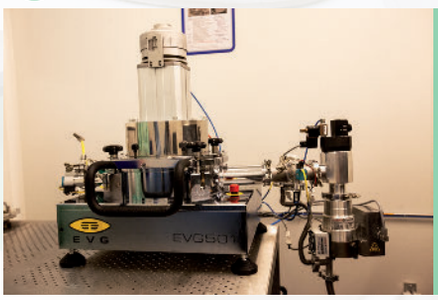


AML
402P

Use:
Special bonding process *(Anodic, Eutectic, Thermo-Compression & Direct)*

Features: Wafer-level bonding (**NO FLAGS**, clean processes only)
Big separation between wafers (up to 10 mm)
In-situ wafer alignment: Visible/IR (± 5 / 20 µm)
Control of atmosphere with inert gas (He, Ne)
Chamber: Vacuum down to 1E-6 mba
Wafers: Size of 3" & 4" (Si, SOI, Glass, $LiNbO_3$, Quartz)
Max. thickness of wafer stack: 8 mm ±0.5 mm
Min. thickness of top wafer: 0.4 mm
Heating: Top: Halogen lamps (max. 560 °C)
Bottom: Resistance heater (max. 560 °C)
Fast or controlled heating
Voltage: Max. bonding voltage/current: 2.5 kV / 40 mA
Constant voltage or constant current operation
Contact Force: Top Graphite Tool: max. 500 N (anodic bonding)
Top Molybdenum Tool: max. 2.5 kN (1E-5 mbar)
Cooling: Natural or controlled cooling

12 Multi-wafer bonder



EVG
501

Use:
Special bonding process *(Anodic, Eutectic, Thermo-Compression, Adhesive & Direct)*

Features: Wafer-level bonding
Separation set by **3 FLAGS** (thickness 50 µm or 200 µm)
Alignment of wafers possible in EVG601 (±5 µm)
Gas: Vacuum down to 1E-4 mbar (turbo pump)
Purge gas: N_2 / Process gases: N_2
Wafers: Size of 3" & 4"
Silicon, SOI, Glass, $LiNbO3$, Quartz
Max. thickness of wafer stack: 6 mm
Heating: Top: Resistance heater (max. 550 °C)
Bottom: Halogen lamps (max. 550 ° C)
Voltage: Max. bonding voltage/current: 2 kV / 50 mA
Force: Quartz Tool: max. 2 kN (anodic bonding)
Stainless steel Tool: max. 4 kN
Cooling: Natural or ramp cooling

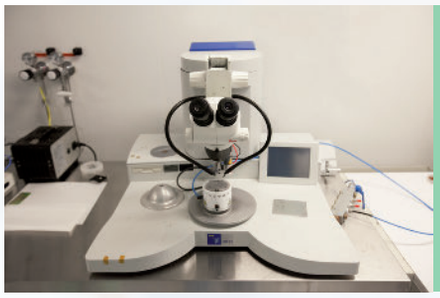
13 Automatic Flip-chip bonder

Süss Microtec
FC250

Use:
Die to substrate bonding and interconnecting

Features: Automatic pick & place of die
In-situ die-to-substrate alignment
Bonding of components with excellent process control (heating/cooling rate, compression force, time)
Operations Modes: Bonding – Interconnecting, Hot embossing, Dispensing
Technical specifications: Size of die: 0.2-10 mm, height max. 2 mm
Size of substrate: 0.5-200 mm
Heating: 20 °C up to 500 °C (die) & 450 °C (substrate)
Force: 0.3-500 N

14 Semi-Automatic Wire Bonder

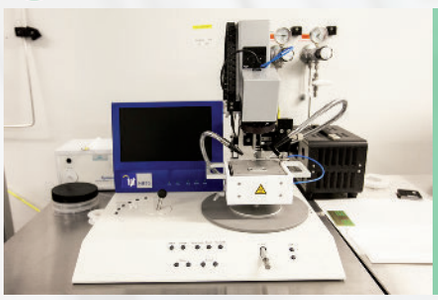


TPT
HB-16

Use:
Wire bonding of electronic components

Features: Ball, edge , bump & ribbon bonding. Stud bump fabrication
Bonding Tool: Au wire (25 & 19 µm) or Al wire (25 µm)
Ultrasonic Power: 0 – 10 W (63.3 kHz)
Bond Time: 0 – 10 s / Bond Force: 5 - 150 cNm
Motorized and Programmable Z-axis (17 mm), Y-axis (10 mm)
Electronic Ball Size Control (typical diam. 75 µm)
Programmable Loop Profile
Chuck: Heated stage (diam. 90 mm)
Mechanical/Vacuum substrate fixation
Height range: 70-90 mm
Heating: ambient to 250 °C
Optics: Optical Microscope 20x Optical Zoom
Adjustable viewing angle

15 Pick and Place Die Bonder



TPT
HB-70

Use:
Die bonding, Assembly of micro- components

Features: Die adhesive bonding, assembly of micro-components
Epoxy stamping, epoxy pneumatic dispensing
Manual or semi-automatic modes
Die Tool: Pick Up vacuum tools available:
Metal Tip: 100 µm, Hole 50 µm
Plastic Tips: 500 & 1016 µm, Hole 200 & 508 µm
Force range: 1-100 cN
Motorized and Programmable Z-axis (25 mm)
Die Chuck: Large heated stage (100x100 mm²)
Mechanical/Vacuum substrate fixation
Height range: 70-90 mm
Heating option: ambient to 250 °C
Rotatable table with alignment ± 10 µm
Option: Mechanical stage for miniature substrates
Optics: HDMI Camera 11x Optical and 125x Digital Zoom
Adjustable viewing angle
Epoxy: Stamping capillary (dot < 150 µm, ceramic tip)
Stamping tool (cross, dot ~1 mm, metal tip)

16 3D Laser Microfabrication System

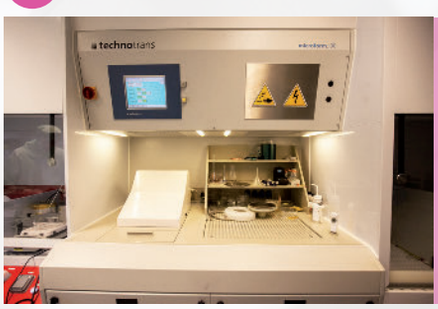
FEMTO-Print
f100 aHEAD

Use:
3D micromachining of transparent materials & local index modifications

Features: Fabrication of highly accurate 2.5D / 3D geometries by direct femto-second laser writing and wet etching
Sealing, welding, selective ablation, micro-cracks generation
Modification of refractive index
Alignment to marks with ± 1-2 µm precision
Laser Source: Power: >5 W, λ=1030 nm
Controllable pulse duration and repetition rate
Writing head: Objective lens: 10x, 20x, 50x
Materials: Compatible with a large spectrum of transparent substrates
Different types of glass (e.g. Borosilicate ...)
Fused silica, Sapphire, Lithium niobate ...
Performances: Max. precision: ± 1 µm (2.5D), ± 2 µm (3D)
Aspect ratio >1:500
Substrate: 2'', 3'' & 4'' wafers, smaller samples possible
Microscope slides (76x26 mm² and 76x30 mm²)
Max. sample size: 200x200x10 mm

Chemistry

17 Ni Electroplating system



Technotrans
Microform 100

Use:
Hard mask for etching
Items in nickel
Vias filling

Type of deposit: Matt Nickel
Substrate: Wafer 4 inches
Stress: About 90 MPa
Speed of growth: 1.5 A/dm² = 20 µm/h
10 A/dm² = 100 µm/h

Roughness: Ra(µm) 0,211
Rq(µm) 0,274
Rt(µm) 1,925

18 Hydrofluoric Acid Bench

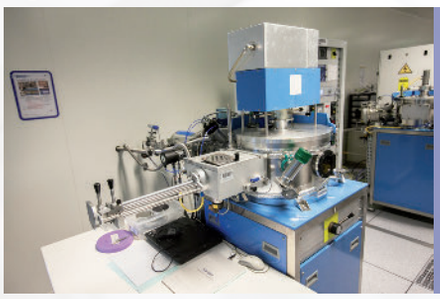
Idonus
HF VPE-100

Use:
SiO2 and Ti etching
Vapor HF Etching

Solutions: BHF
HF 48%
Etch Speed: SiO2 by BHF: 57 nm/min at 20 °C
BF33 by HF 48%: 4.2 µm/min
BF33 by vapor HF: For 9 µm: 15 min (0,6 µm/min)
For 120 µm: 80 min (ou 1,5 µm/min)

Deposition / Furnaces

19 Cathode reactive sputtering system



Plassys
MP 450S

Use:
Metal, Oxide &
Nitride deposition

Features: RF sputtering of metallic (Ti, Zn, Al) & oxide or nitride (AlN, TiN) targets
6'' targets
Substrates cleaning by RF sputtering
Heating substrate until 600 °C
Wafers: One 4'' wafer per run

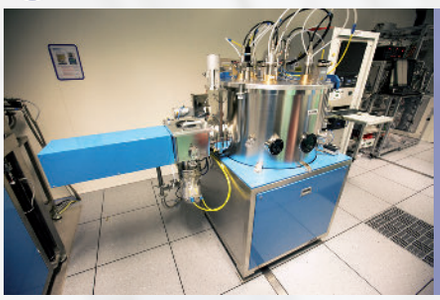
20 DC magnetron sputtering system

Plassys
MP 500

Use:
Metal deposition

Features: DC sputtering of metallic targets: Au, Cr, Ni reinforced magnetron Al 6'', Mo, Ta, Pt, Ti, W
Substrates cleaning by RF sputtering
Wafers: 4'' substrates (max height: 7 mm)
4 different positions during the same run

21 DC sputtering system



Plassys
MP 700S

Use:
Metal deposition

Features: DC sputtering of metallic targets: Au, Cr, Ni reinforced magnetron Al 6'', Cu 6'', Pt 3'' (tilted target)
Substrates cleaning by RF sputtering
Heating substrate until 600 °C
Enhanced thickness uniformity with the tilted target
Wafers: One 4'' wafer per run

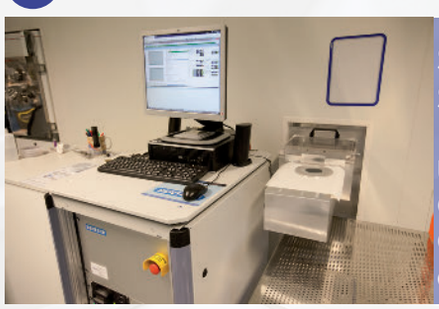
22 Electron-Beam evaporator

Plassys
MEB 600

Use:
Metal & Oxide
deposition for lift-off
processes

Features: Electron beam evaporation
Metallic or oxide compounds (Al, Au, Cr, Pt, Ti, SiO_2, Al_2O_3)
End-Hall ion source for surface activation & enhanced layer density
Wafers: 5 wafers of 4'' or 7 wafers of 3'', double planetary substrate holder

23 ICPECVD



Sentech
SI 500D

Use:
Oxide & Si_3N_4 deposition
Good conformal
deposition

Features: Low temperature chemical vapor deposition of silica & silicon nitride by means of an inductive coupled plasma
He back-cooling & RF Ar plasma: activate the surface
polarize the wafer
Wafers: 4'' or 3'' substrates

24 Electron-Beam evaporator

Alliance Concept
EVA 450

Use:
Metal deposition
for lift-off processes

Features: Electron beam evaporation
Metallic or oxide compounds (Au, Cr, Ni, Al, Ag, Pt, Ti, SiO_2, Al_2O_3)
Wafers: 5 wafers of 4'' or 7 wafers of 3''

25 Oxidation and Annealing furnace

AET

Use:
Thermal oxidation
& diffusion

Features: 3 different furnaces: one for silicon oxidation
one for wet or dry oxidation
one for titanium diffusion in $LiNbO_3$
Annealing under Ar, N_2 (up to 1200 °C) or air (up to 1000 °C)
Wafers: 1 to 25 wafers of 3'', 4'' & 6''

26 Rapid thermal processing

Annealsys
AS-Premium RTP

Use:
Densification &
Crystallization
Contact annealing

Features: Strain reduction or layer crystallization of thin layer
Thermocouple (from 20 to 1000 °C)
Pyrometer (from 700 to 1250 °C)
Susceptor: TMax = 1250 °C
Ramp ≤ 20 °C/s
Wafers: 6'' wafer or 4'' and little samples in a susceptor
No metal in contact with SiC (Peek tweezers)

Plasma Etching

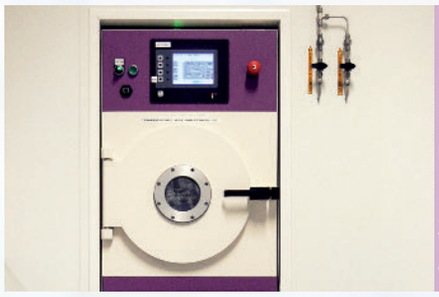
27 RIE-CCP system

Plassys

Use:
Nano-metric & sub-µ etching on variety of materials (dielectrics, SC, piezo-electric ...)

Features: CCP source: 300 W
Clamping chuck: Electrostatic
Gas: SF_6, C_2F_6, O_2, CHF_3
Mask: PR, SiO_2, Metallic masks are allowed
Wafers: 4 inch, samples can be glued on 4'' Glass carrier wafer
End point detection: OES system can be used

28 Asher & Surface treatment system



Nanoplas
DSB 6000

Use:
PR stripping
Surface treatment, preparation, functionalization

Features: ICP source: 600 W
Clamping chuck: No
Temperature Process for both chamber & substrate: 60 to 180 °C
Gas: O_2, Ar, SF_6, CF_4
Mask: PR, SiO_2, Metallic masks are allowed
Wafers: 4 inch, samples can be glued on 4'' Glass carrier wafer
End point detection: OES system can be used

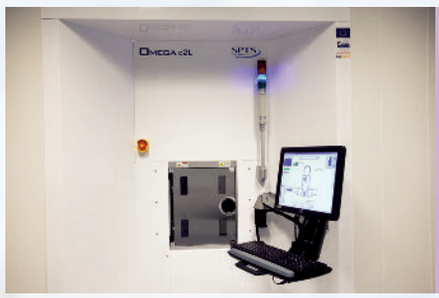
29 Multi-material DRIE-ICP system 4''

STS
APS

Use:
Dielectric, isolated & piezo-electric materials etching

Features: ICP power source: 3 KW
Bias power source: 1.5 KW
Process temperature: -20 to 40 °C
Clamping chuck: Mechanical
Gas: SF_6, C_4F_8, O_2, Ar, CF_4, He
Mask: PR, SiO_2, Metallic masks are allowed
Wafers: 4 inch, samples can be glued on 4'' carrier wafer
End point detection: OES system can be used

30 Si DRIE-ICP system 6''



SPTS
Rapier Omega C2L

Use:
Si deep, sub-micronic & isotropic etching
Vias etching

Features: ICP power source: 5.5 KW
Bias power source: 1.5 KW
Dual source
Process temperature: 0 to 40 °C
Clamping chuck: Electrostatic
Gas: SF_6, C_4F_8, O_2, Ar, N_2, He
Mask: PR, SiO_2
Wafers: 6 inch, samples can be glued on 4'' carrier wafer
End point detection: CLARITAS OES system integrated

31 Si DRIE-ICP system 4''

SPTS
Rapier

Use:
Si deep, sub-micronic & isotropic etching
Vias etching

Features: ICP power source: 5.5 KW
Bias power source: 1.5 KW
Dual source
Process temperature: 0 to 40 °C
Clamping chuck: Electrostatic
Gas: SF_6, C_4F_8, O_2, Ar, N_2, He
Mask: PR, SiO_2
Wafers: 4 inch, samples can be glued on 4'' carrier wafer
End point detection: CLARITAS OES systems integrated

32 Si DRIE-ICP system 4''

Alcatel
601E

Use:
Si deep etching
Si isotropic etching

Features: ICP power source: 2 KW
Bias power source: 0.5 KW
Process temperature: -20 to 30 °C
Clamping chuck: Mechanical
Gas: SF_6, C_4F_8, O_2
Mask: PR, SiO_2, Metallic masks are allowed
Wafers: 4 inch, samples can be glued on 4'' carrier wafer
End point detection: OES system can be use

33 Chlorine ICP system 4”

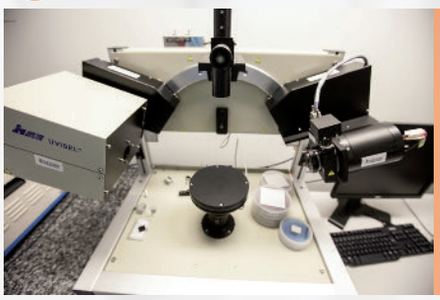
Trikon
Omega 201

Use:
Metallic materials &
SC materials etching

Features: ICP power source: 0.6 KW
Bias power source: 0.6 KW
Process temperature: 0 to 45 °C
Clamping chuck: Electrostatic
Gas: Cl_2, NH_3, HBr, O_2, N_2, Ar, CF_4
Mask: PR, SiO_2, Metallic masks are allowed
Wafers: 4 inch, samples can be glued on 4” Glass carrier wafer
End point detection: OES system can be used

Characterization

34 Spectroscopic Ellipsometer

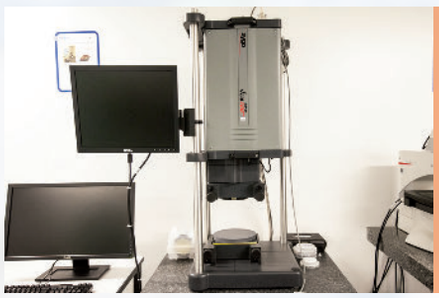


Jobin Yvon HORIBA
UVISEL-NIR

Use:
Optical measurements
Surface roughness
Material properties

Measurement capabilities: Thin film thickness: from 0.1 nm to >45 µm
Single layer or multiple layers thin-films
Lateral resolution (spot size): 50, 100 µm and 1 mm
Holder: 150 mm diam. with manual height (4 mm)
Tilt adjustment Maximum thickness: 20 mm
Materials: Transparent dielectric: SiO_2, TiO_2, Ta_2O_5, Si_3N_4, SiOxNy , polymers ...
Semi-conductors: Si, AsGa, ...
Metals
Optics: Spectral range: 245 nm < λ < 2100 nm
Goniometer: manually adjustable incidence angle from 55° to 90° by 5°

35 Fizeau Interferometer

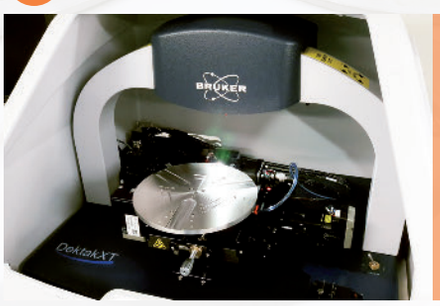


ZYGO
Verifire GPI XP/D

Use:
Measurement of surface
profile & Roughness

Measurement capabilities: Z Resolution: <0.1 nm
XY resolution: 100 µm (100 mm field)
15 µm (15 mm field)
Z measurement range: >50 µm
Smooth profile with step < 300 nm
Sample: Large stage suitable for diam. ≤100 mm
Thickness range: 0 to 100 mm
Reflective materials: glass, silicon, metal...
Optics: Fizeau phase shifting interferometer
He-Ne laser (λ = 633 nm)
Camera 1000 x 1000 pixels
Motorized zoom x1 to x6 (not indexed)
Motorized focus (not automatic)

36 Surface Profiler



Bruker
Dektak XTA

Use:
Step and roughness
3D mapping
2D Stress measurement

Stylus: Diamond tip 2 µm
Force: Adjustment: 1 to 15 mg
Vertical range: 1 mm
Resolution: 0.1 nm vertical
Stages: 3 Motorized axes
X and Y: 150 mm / θ: continuous 360 degrees
Wafer Chuck: 2”, 3”, 4”, 6” & 8” wafers
Scan Length range: 55 mm with scan stitching capability
Sample thickness: 50 mm max

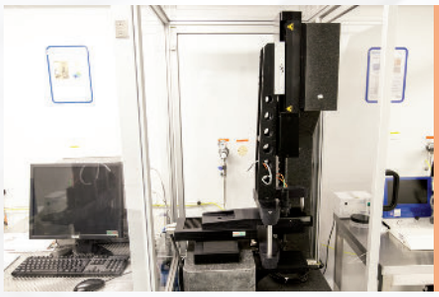
37 Environnemental SEM & EDS systems

FEI Quanta 450W &
EDAX APEX 21

Use:
Surface observations
3D reconstruction
Chemical analyses (EDS)

Features: Filament: W
Voltage: 200 V to 30 kV
Current < 2 µA
High vacuum (10-4 Pa), low vacuum (<130 Pa) and ESEM (<2600 Pa)
IR Camera / NavCam
Detectors: Everhart-Thornley SE detector (res. 5 nm @ 30 kV & 10 nm @ 3 kV)
vCD semi-conductor BSE detector (res. 5 nm @ 30 kV)
Gaseous SE detector for environnemental mode
EDS SDD 10 mm^2 (qualitative and quantitative analysis, mapping)
Element detection from Boron, res. < 133 eV for tx > 100.000 cps
MiniCL detector for cathodoluminescence
Stage: 5 axes 100 mm x 100 mm (tilt until 70°)

38 Scanning confocal microscope

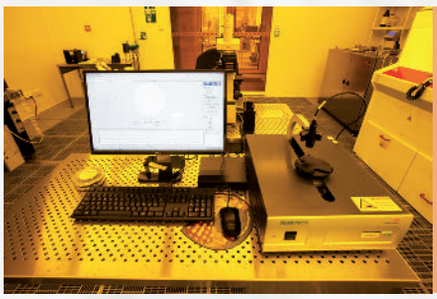


NANOJURA
UHP

Use:
Surface profile measurement

Measurement capabilities: Z Resolution: a few nm
XY resolution: 7 µm (Nobis 400) / 11 µm (Nobis 1000)
Maximum slope on smooth surface: 30°
Sample stage: Large stage suitable for diam.>100 mm
Thickness range: 0-100 mm
XY scanning range: 100 mm x 100 mm
XYZ translation table resolution: 0.1 µm
Optics: Confocal probe Nobis 400 and 1000
Z measurement range: 400 µm / 7 µm spot or 1000 µm / 11 µm spot

40 Thin layer measurement system

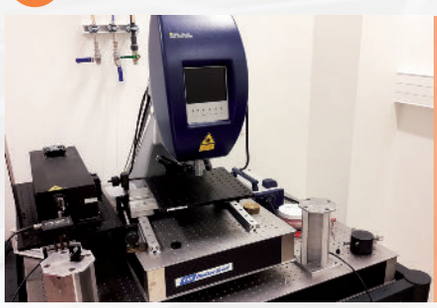


Filmetrics
F50-EXR

Use:
Automated film thickness measurment
Index mapping

Models: Spectral reflectance & Fast Fourier Transform
Thickness: From 20 nm to 250 µm
Wave-length range: 380 < λ < 1700 nm
Wafer chuck: Motorized rotation stage (diam. 100 mm max)
Vacuum substrate fixation
Mapping: Custom map patterns (polar, rectangular, linear…)
Acquisition speed: 2 pts/s
Spot size: 1.5 mm
Filter: High-Pass Filter (λ > 550 nm)

42 MEMS Analyser



Polytec
MSA-500

Use:
MEMS/MOEMS dynamical analysis

Out of plane vibration LDV:
VD-09: wide bandwith Velocity Decoder (0 - 2.5 MHz),
max. velocity ± 10 m/s, typical resolution 0.02 - 0.7 µm/s/√Hz
VD-06: high res. & precision digital Velocity Decoder (0 - 350 kHz),
max. velocity ± 0.5 m/s, typical resolution 0.01 - 0.06 µm/s/√Hz
LDV (Laser Doppler Vibrometry):
DD-300: high freq. analog Displacement Decoder (-3 dB: 0.03 - 24 MHz)
Amplitude range limit: ± 75 nm, noise limited resolution < 0.05 pm/√Hz
In plane motion SVM (Stroboscopic Video Microscopy):
Frequency range: 1 Hz – 1 MHz
1.4 Mpixel (1392 x 1040) progressive scan camera,
IEEE 1394 FireWire interface
100 ns time resolution
L imited to repetitive motion and nanometer resolution
3D topography WLI (White Light Interferometry):
Z direction scan range: 250 µm
Z resolution < 1 nm
Lateral resolution < 1 µm (magnification dependent)
Mirau x10 objective

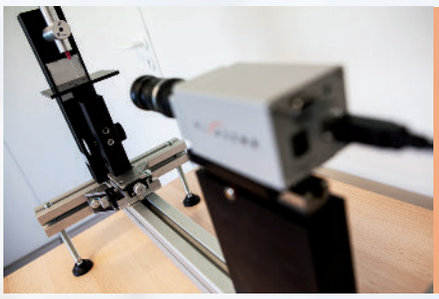
39 Thin film stress measurement system

FSM
500 TC

Use:
Stress measurement
Thermal expansion coef.
Wafer bow height

Features: Measurement of the wafer curvature before and after film deposition
Stress range: 1 x 10^7 to 4 x 10^{10} dynes/cm²
Wafer sizes: 200 mm or smaller
Laser: Dual wavelength (780 nm, 650 nm) diodes
Repeatability: 1.5 % (1σ) of average
Scan & Mapping: Scan range: Up to 170 mm
Scan line: Single scan line at any wafer orientation
Mapping: Multi scan line mapping by manually rotating wafers
Max of 6 line mapping with 30° between each line
Heating: Maximal temperature: 450 °C
Heating and cooling ramps: max 6 °C/min

41 Contact Angle Metrology



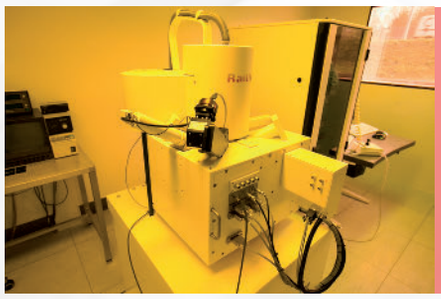
GBX
MCAT

Use:
Dynamic contact angle
Liquid surface tension
Wetting hysteresis

Measurement capabilites: Precision: ± 0.1° on reference droplet
± 2° on standard droplet
Angle measurement range: 0 – 180°
Surface tension range: 0,5 – 1000 mN/m
Dynamic measurement: 50 images/s
Borosilicate glass or plastic syringe with Teflon tip
Liquids: DI water (others possible)
Sample stage: Large stage suitable for diam. 100 mm
Thickness range: 0-60 mm
Z-table with fine adju stment X screw
Optics: USB Camera / Optical x10 Zoom / Backside LED illumination

Nanotechnologies

43 Electron beam lithography system



Raith
E_Line

Use:
Electronic lithography

Filament: Schottky TFE
Spot size: < 2 nm @ 20 keV
Current: 5 pA – 20 nA
Stability: < 0.5 %/h

Resolution: Min feature size: 20 nm
Stitching: 60 nm
Overlay: 40 nm
File: gdsii

Stage: 100 mm x 100 mm x 30 mm
Detectors: In Lens, Everhart Thornley

44 Focused Ion Beam system

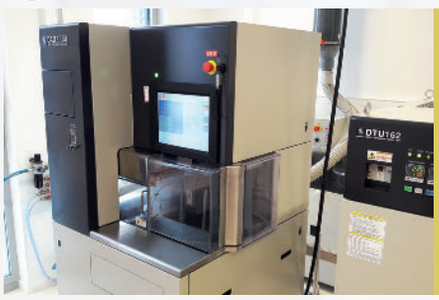
FEI Helios
Nanolab 600i

Use:
Ion Beam Lithography
SEM observation
3D reconstruction

Electron column: Resolution < 1 nm, 50 V-30 kV, 1 pA-22 nA
Ion column: Resolution < 5 nm, 500 V-30 kV, 1 pA-65 nA
Stage: 150 mm x 150 mm x 10 mm
Detectors: In Lens, Everhart Thornley, BSE, Secondary Ions
Gas Injection system: Deposition: Pt –C – SiOx
Assisted Etching: I_2 – XeF_2
Others: 3D reconstruction (slice and view), Flood gun
Pattern generator: Raith Elphy Multibeam, drift correction, Overlay & Stitching
File: gdsii

Dicing / Polishing

45 High Precision Dicing Saw 6”



DISCO
DAD 3350

Use:
Separation &
Structuration of chips

Features: Substrate & Wafers can be processed
Max size: diam. 6" / 4.3 mm thick
Axes precision: 1 µm (X, Y & Z) / 1.0” (θ)
Speed feed: 0.1 to 10 mm/s
Water cooling
Holding: UV tape on porous vaccum chuck
Processed materials: Si, Glass, Quartz, $LiNbO_3$, $LiTaO_3$, PZT, Si_3N_4, Langasite, Langatate, Sapphire
Blades: Resin, Metal or Vitrified bond

46 Precision Dicing Saw 4”

DISCO
DAD 321

Use:
Separation &
Structuration of chips

Features: Substrate & Wafers can be processed
Max size: diam. 4" / 4.3 mm thick
Axes precision: 1 µm (X, Y), 5 µm (Z) / 1.0” (θ)
Speed feed: 0.1 to 10 mm/s
Water cooling
Holding: UV tape on porous vaccum chuck
Processed materials: Si, Glass, Quartz, $LiNbO_3$, $LiTaO_3$, PZT, Si_3N_4, Langasite, Langatate, Sapphire
Blades: Resin, Metal or Vitrified bond

47 Precision Lapping & Polishing system

Logitech
PM5

Use:
Optical polishing
Material thinning

Features: Substrate & Wafers can be processed
Max size: diam. 4" / 10 mm thickness
Min size: 10 mm²
Thickness precision: 1 µm
Speed: 1 to 70 rpm
Automatic flatness control & fix
Pressure of work adjusted with loads
Plate size: diam. 300 mm
Holding: UV tape on vaccum chuck
Processed materials: Si, Glass, Quartz, $LiNbO_3$, $LiTaO_3$, PZT, Si_3N_4, Langasite, Langatate
Abrasives: Aluminium oxyde, Silicon Carbide, Diamond, Colloïdale Silica

48 CMP system

Alpsitec
E460

Use:
Wafer optical polishing
Hard materials process

Features: 2" to 6" Wafers can be processed
Process program (10 steps)
Max thickness: 10 mm
Speed: 1 to 120 rpm
Hydraulic pressure of work
Plate size: diam. 465 mm
Holding: Vaccum chuck
Ring
Processed materials: Si, Glass, Quartz, $LiNbO_3$, $LiTaO_3$, PZT, Si_3N_4, Langasite, Langatate
Abrasives: Colloïdale Silica, Diamond on different nozzle

Industrial Line

This industrial production line is managed by a spin-off of FEMTO-ST : Frec|N|Sys. Its activity is dedicated to the fabrication of micro and nano-piezoelectric components as Acoustic Waves devices for RF and high quality structures for optics and microsystems markets. In that context, the company develops new competencies in the field of MEMS, particularly exploiting composite materials combining piezoelectric thinned wafers bounded to any single crystal wafer.

The originality of the project is to share this clean-room area between Research and Industry. In fact, this technology platform is unique in France, placing itself right at the heart of the worldwide competition.

The area of the clean-room is about 200m² in ISO 5. The main equipments available on this industrial line are: a high resolution lithography body9 i-line stepper, automatic coating and development tracks, one sputtering cluster, a high accuracy evaporation machine and several characterization set-ups (CD SEM equipment, probe station ...).

frec|n|sys

www.frecnsys.fr

Contact
frecnsys@frecnsys.fr

Sylvain BALLANDRAS: +33 (0)3 81 25 53 63
(CEO)

Emilie COURJON: +33 (0)3 81 25 53 54
(Production manager)

SVG
88 series

Use:
Automatic coating & development tracks

Substrate size: 4" & 6" circular wafers

Nikon
NSR2005i9C

Use:
Stepper
(High resolution lithography machine)

Substrate size: 4" circular wafers **Resolution:** 350 nm

Perkin Elmer
740

Use:
Aligner
(Projection photolithography machine)

Substrate size: 4" circular wafers **Resolution:** 1.2 µm

Trikon
Sigma 200

Use:
Cathode sputtering

Substrate size: 4" circular wafers **Materials:** AlN, Ti, AlCu, Mo

Balzers
BAK760

Use:
Evaporation

Substrate size: 2", 3", 4" & 6" circular wafers
Materials: Ti, Cr, Al, AlCu, Au, Pt

Hitachi
S9220, S8840

Use:
CD SEM
(Critical dimension measurement system)

Substrate size: 4" & 6" circular wafers

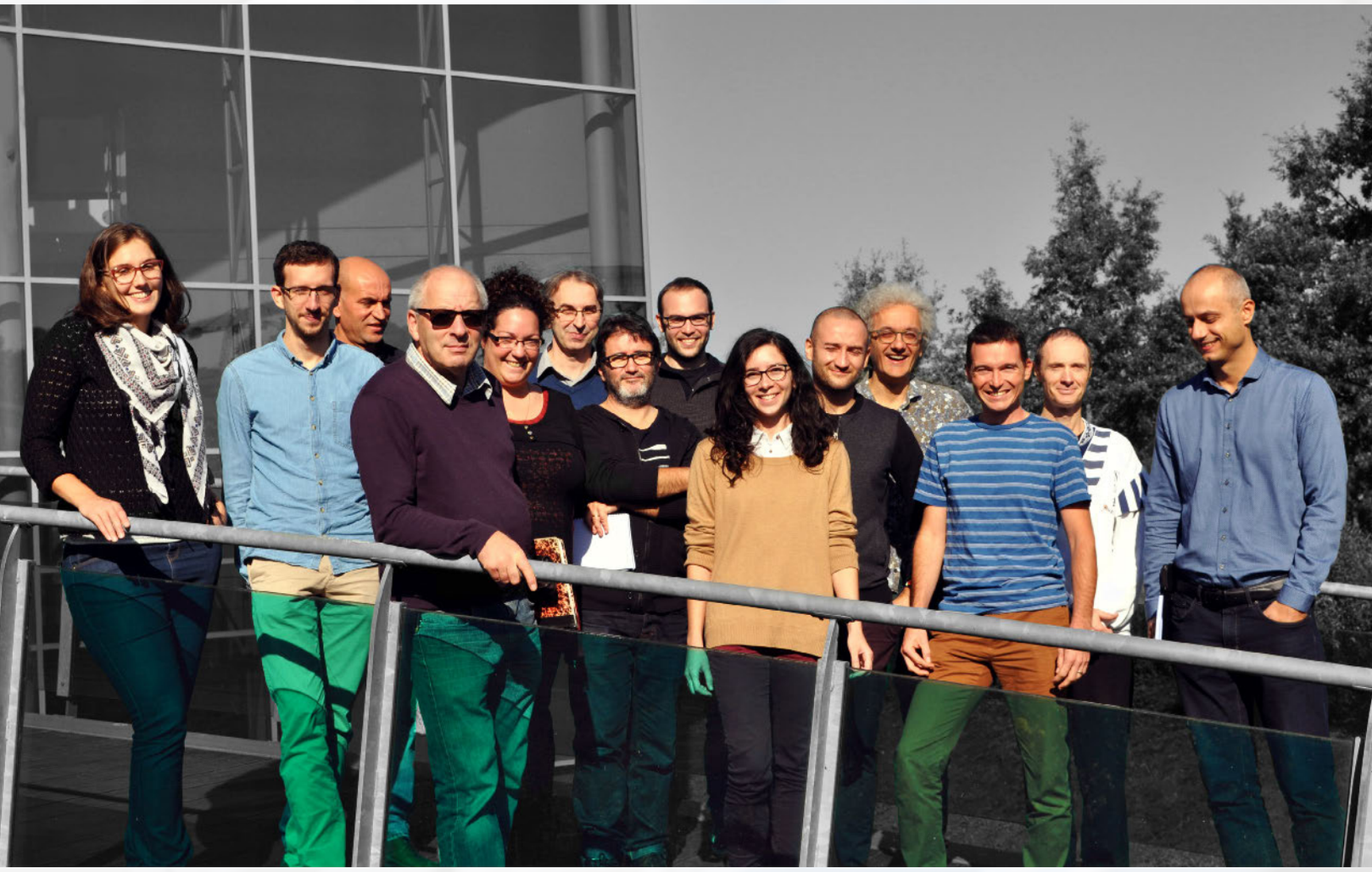
Süss Microtec
MA6-GEN4

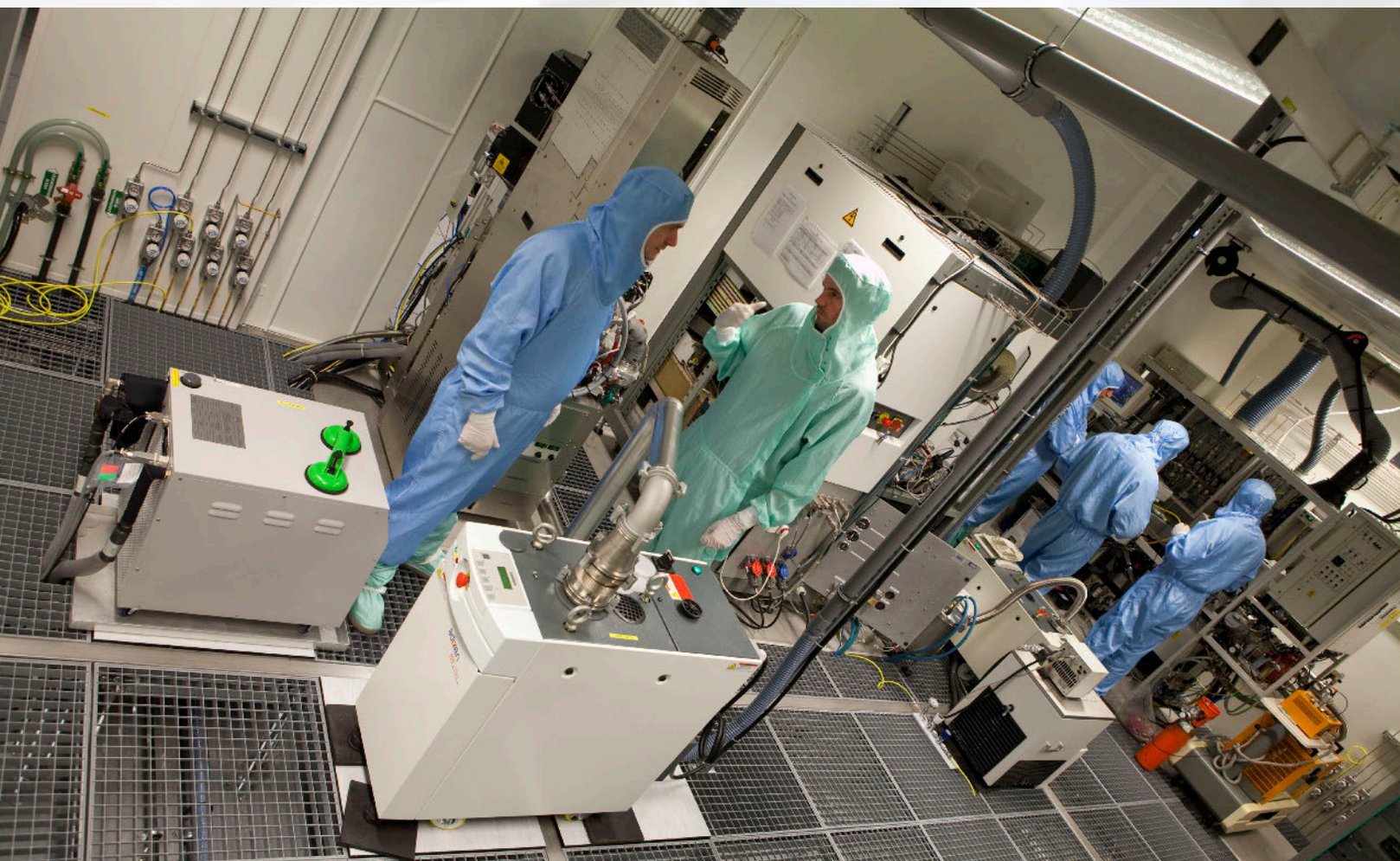
Use:
DUV Aligner
(Contact photolithography machine)

Substrate size: 4" & 6" circular wafers
Resolution: <0.8 µm

ISO 9001:2015
BUREAU VERITAS
Certification

MIMENTO TEAM





FEMTO-ST Institute
Main Building
15B avenue des Montboucons
25000 Besançon

Tel: +33 (0)3 63 08 24 00

www.femto-st.fr

MIMENTO Technology Centre
TEMIS-Innovation - Maison des Microtechniques
18 rue Alain Savary
25000 Besançon

afaq ISO 9001 Qualité AFNOR CERTIFICATION

Contact
mimento@femto-st.fr

Christophe GORECKI: +33 (0)3 81 66 66 07

Jean-Claude JEANNOT: +33 (0)3 63 08 24 78

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