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Packaging, assembly, inspection and design capabilities

Our cleanroom dedicated to functional packaging and our expertise in integration for microsystems, photonics and life sciences are available to you for feasibility studies, prototyping and small series production. Our experts help you with design and process flows for industrial manufacturing.

Our capabilities at a glance

- **ISO9001:20015 certified**
- **91 m^2 clean room class ISO7 / ISO5**

- **Packaging equipment**
  - Wire bonder
  - Flip chip bonder (sub-micron accuracy)
  - Die bonder
  - Micro-welding/soldering laser
  - Laser machining
  - Seam welder
  - Reflow ovens
  - High temperature furnace
  - Plasma chambers
  - Laser scanning microscope
  - Environmental chambers
  - Helium leak tester
  - X-ray phase contrast imaging
  - 3D prototyping fused deposition modelling and stereo-lithography
  - Sample preparation tools

- **Packaging expertise**
  - Hermetic sealing
  - Low temperature bonding
  - Packaging for harsh environments
  - Packaging with biocompatible materials
  - Adhesive bonding
  - Micro-components soldering
  - Thermo-sonic/compression flip-chip bonding
  - Thermo-sonic/compression wire-bonding
  - Surface preparation
  - Micro-joint inspection
  - FEM modelling
  - Optical system design
  - Sub-micron optical alignment and assembly
  - Photonic packages
  - System Integration

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Design

Process	Equipment	Comments
PCB Design	Altium Software	Schematics, Simulation (Spice), Layout
3D CAD Construction	Solidworks	Incl. FEM (machine dynamics, drop testing, fatigue, statics, thermal) and kinematic simulations
Multiphysics FEM simulation	COMSOL	Thermo-Mechanical, Thermo-fluidic, RF, Thermal & Wave Optics, Multi-phase fluids, many other physics combinations possible upon request
Optical ray tracing	ZEMAX OpticStudio	Optical design of imaging lenses, waveguide and fiber coupling, laser and illumination systems; including tolerance analysis and custom component manufacturing support

Photonics assembly

Process	Equipment	Comments
Semi-automatic high precision adhesive bonding	Physik Instrumente F206 Hexapod; Thorlabs Nanomax-TS; Infotech IP500	Optical transparent/absorbing adhesives, UV-, thermal- and dual-curing adhesives
Active & vision based alignment of optical components		Sub µm (200 nm) final bonding accuracy
Optical fiber and waveguide assembly		Fiber-fiber, fiber-waveguide

Hermetic sealing

Process	Equipment	Comments
Laser assisted diffusion bonding (LADB)	BS Optics VisioWelder	CSEM's proprietary process for miniature packages for harsh environments in space and medtech
Laser soldering & welding	BS Optics VisioWelder	Inert atmospheres possible
Laser ball-soldering	BS Optics VisioWelder	A round opening in the lid is closed with a solder sphere. Inert or tailored atmospheres possible
Seam welding, soldering & brazing	Benchmark SM 8500	Processes on a variety of metals, metal alloys, plated materials and solder pre-forms
High temperature brazing	Carbolite Gero tube furnace	Quartz tube furnace with thermocouple. Temperatures up to 1200 °C. High vacuum
Diffusion bonding / metal annealing	Carbolite Gero tube furnace	E.g. platinum, titanium
Adhesive bonding	Infotech IP500 pick & place	Near-hermetic seal Time-pressure or jetting dispensing unit

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Wire bonding

Process	Equipment	Comments
Au-ball/wedge thermosonic bonding	TPT HB-16	Typical wire ∅ 17 µm to 75 µm
Au or Al ribbon thermsonic bonding	TPT HB 16	Up to 200 µm wide ribbons
Au-stud bumping	TPT HB-16	For subsequent thermocompression die bonding or securing wedge bonds on difficult to bond surfaces
Al-wedge ultrasonic bonding	TPT HB-16	For heat-sensitive components Typical wire ∅ 17 µm to 75 µm
Pt or Cu wedge to Pt or Cu surface thermocompression bonding	DTHB (Itasca)	High temperature process (up to 500 °C). Wire ∅ from 20 µm – 200 µm

Die bonding

Process	Equipment	Comments
Micro-component soldering in N_2 or forming gas atmosphere	SET FC150	Sub-micron placement accuracy. Solder pastes, preforms or PVD solder layers are common
Micro-component flip-chip bonding	SET FC150	Sub-micron placement accuracy. Compatible with soldering, adhesive, thermocompression bonding
Flip-chip thermocompression bonding	SET FC150	Max force 400 grams
Micro-component soldering with protective atmosphere or formic acid	Finetech Fineplacer pico ma	± 5 µm placement accuracy
Thermocompression bonding	Finetech Fineplacer pico ma	Max force 40 kg. Max temperature 450 °C on arm and substrate
Thermosonic bonding	Finetech Fineplacer pico ma	Up to 40 W power at 60 kHz. Max force 10 kg
Micro-component soldering	Reflow oven ATV SRO-702-R	Temperatures up to 400 °C, pressures down to $6x10^{-2}$ mbar. Inert or reducing atmospheres. Formic acid or forming gas
High vacuum micro-component soldering	Unitemp Rss-210-HV	Temperatures up to 400 °C, pressure down to $5x10^{-5}$ mbar
Adhesive bonding	EFD Ultimus I Pressure-time unit	Automated dispensing and pick&place with Infotech's IP500
High precision dispensing	VERMES MDS 3200A Jetting unit	Automated. For dispensing and underfilling of medium to high viscosity adhesives/solder pastes

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Surface treatment

Process	Equipment	Comments
Plasma cleaning	Diener Zepto	Removal of organics and silicone residues with RF O_2 plasma (13.56 MHz)
Plasma treatment	ATV SRO-702-R	40 kHz, 2.5 kW Ar, O_2, H_2, ArH_2 and mixtures
Surface priming	Diener Zepto	Plasma activation of polymers, application of specific primers and surface silanization
Ultrasonic cleaning	Sonorex Digitec DT 510 H	At room or elevated temperatures, de-ionised water and alcohols
CO_2-snow cleaning unit	OZ Optics Ltd.	Removal of trace residues and particles

Inspection

Process	Equipment	Comments
Surface profilometry	Keyence VK-X100	3D micrographs with Laser scanning microscope Max resolution in depth: 5 nm Max lateral resolution: 10 nm
3D metrology	Raytrix R12/R42	Light field camera for one shot 3D measurements
Image quality control	VIDI/Cognex	Automated quality check based on deep learning
Helium fine leak testing	Inficon UL1000Fab	Fine leaks down to $5x10^{-12}$ mbar l/s
Helium bombing	LACO Technologies LBC083-100	Up to 6.8 bar overpressure
Shear and pull tester	Dage 4000	Chip and ball shear, and wire pull test
2-point / 4-point measurement	Keithley 2750	Compatible with small probes suitable for wire bond pads. In vacuum possible
RF measurement	Keysight VNA E5071C	Vector Network Analyzer, 300 kHz to 20 GHz with bias tees, 2-port test set, enhanced time domain analysis (TDR)
On-wafer RF Probe System	MPI TS150	150 mm Manual Probe System, RF wafer chuck, platen for 4 RF and 10 DC micro-positioners, RF probes (DC to 26 GHz, DC current up to 2A)
Environmental testing	Espec SH-240 Espec TSE-11 A	Humidity controlled for moisture resistance & temperature cycling. Standards e.g. Mil 883, IEC 61300-2-47, JEDEC JESD47E, JESD22-A104
Sample preparation	Struers LaboPol21	Potting and cross sectioning
	Metkon MICRACUT 151	Benchtop cutter with diamond blade
	BOC Edwards E096-01-000	Sputtered gold or carbon evaporated coatings

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