SPECIFICATION SHEET

Supply, installation and commissioning of a *Micro-solder-ball Jetting System* for the ICFO, financed by FEDER Catalunya 2021-2027

FILE NUMBER: ICFO-2026-019

CLAUSE 1. Object of the contract

The purpose of this contract is the supply, installation and commissioning of a “**Micro-Solder-Ball Jetting System**” for the ICFO, financed by FEDER Catalunya 2021-2027.

The types of items supplied are linked to the CPV (Common Public Procurement Vocabulary) **38000000-5** Laboratory, optical and precision equipment (except glasses).

CLAUSE 2. Needs to satisfy

PhotonChip is a platform project that will help bring photonic technologies, in particular integrated photonics and photonic chips, from scientific feasibility to prototype stage to be applied in, for instance, communications as 6G transceivers, sensors, quantum computing and technology platforms.

Once operational, PhotonChip will cover the whole photonic chip value chain (design, packaging, testing) and train new experts thanks to dedicated programs.

As part of the Institute of Photonic Sciences (ICFO), PhotonChip will use advanced technologies as quantum technologies for cybersecurity, virtual and augmented reality, artificial intelligence, and machine learning.

In the development of the project, ICFO needs to acquire the supply of a **Micro-Solder-Ball Jetting System.**

This equipment is a key process step in the integration and advanced packaging of Integrated Circuits. Its primary function is the precise deposition of micro-solder-balls (or bumping) onto chips, wafers, or various substrate types, enabling high-density and reliable electrical interconnections.

The bumping process is fundamental to a wide range of packaging technologies, including Flip-Chip, Ball Grid Array (BGA), wafer level packaging, chip scale packaging, and 2.5D/ 3D integration.

To cover all the expected necessities, the **Micro-Solder-Ball Jetting System** will be a laser-based equipment capable of:

- placing solder micro-balls on wide variety of substrates and materials, including chips, wafers, ceramic substrates, PCB and flex substrates.
- performing the reflow of the solder-balls by means of a laser.
- supporting flux-less processes, using nitrogen to avoid oxidation.
- handling solder-balls with diameters from 40 to 250um.
- providing high placement precision with high throughput.
- minimizing the risk of thermal stress or any damage of the substrates during the process
- avoiding contact with the substrate.
- operating in fully automatic, semi-automatic and manual modes. The wafer/substrate loading will be done manually by the operator.

CLAUSE 3. Technical requirements

Technical proposal structure - minimum mandatory equipment characteristics

The equipment shall combine a laser, high-precision motorized axis and a vision system in order to perform the placement, melting and reflow of solder-balls with the following minimum capabilities:

1. Solder-balls with different melting points, including (but not limited to) SnAgCu, AuSn or PbSn alloys.
2. Solder-balls with different diameters ranging from 40µm to 250µm.
    a. The equipment shall provide an upgrade option to support larger solder-ball diameters.
3. Placement accuracy better than ± 5µm
4. Throughput greater than 6 balls/second

The system must include the following characteristics:

5. Laser subsystem for solder melting and reflow, wavelength 1070 nm. It shall also include the following features:
    a. Integrated power meter to measure laser output power and frequency, automatically.
    b. Automatic laser alignment system.
6. Stage or substrate chuck:
    a. Working area above 300 x 300 mm, compatible with 12” wafers.
    b. Compatible with smaller substrates (e.g., 8” wafers, PCBs, ceramics).
    c. Vacuum-based substrate holding.
    d. Capability for substrate heating.
7. Bond head and associated fixtures supporting solder-ball diameters 40 to 250 µm. The system will be capable of singulation, placing and reflowing the solder-balls automatically.
8. Set of tooling, spares parts and solder balls for initial machine setup, required for handling **three** different solder-ball diameters within the specified range: 40 µm, 100 µm and 200 µm.
9. Process Nitrogen supply to avoid oxidation during reflow and enabling flux-less processes.
    a. Automatic regulation valves shall be included
10. Automatic Z heigh measurement system, avoiding contact.
11. Machine vision system including cameras and pattern recognition and automatic fiducials alignment for automatic operation.
12. Compatible with ESD sensitive components.
13. All the components will be integrated in a standalone platform and enclosure, including HEPA filter to improve the cleanness of the bonding area.

Software requirements

14. The system must include the software required to manage all required functionalities described above and shall be supplied with a permanent (non-expiring) license.
15. The software shall be installed on the system,
16. Software backup must be included.

Technical documentation or manuals to be delivered

A set of documentation shall be provided, covering the following topics:

- Comprehensive system user manual, including both hardware and software descriptions, routine servicing and troubleshooting.

CLAUSE 4. Power distributions and safety

The system shall include:

- Electrical Operation: 230V ±10%, 50 Hz (per UNE-EN 61010-1, Spanish adoption of IEC 61010-1)
- Laser safety: Appropriate enclosure and safety interlocks to guarantee compliant laser protection requirements according to European Standards, without requiring specific laser safety area.
- CE-certification
- EMO protection

CLAUSE 5. System layout and services

The proposal shall include a set of “system layout and services documentation”, containing the following information:

- System layout, including overall footprint, weight, drawings and detailed description of the different system components.
- Installation and start-up requirements, including required utilities, service connections, and any applicable environmental specification.

CLAUSE 6. Transportation, installation, start-up.

- Contract includes the installation and start-up of the system, including system checking, functional tests and the supply of all those elements necessary for its correct operation

- The proposal will include transportation to ICFO’s facilities including insurance and all export/import and customs duties.

- Any other customs or miscellaneous expenses, unexpected and not expressly taken into account in the tender, which may arise until the equipment arrives at ICFO, must initially be borne by the Supplier and will be reimbursed by ICFO upon submission of supporting documentation proving the actual incurrence of such expenses.

- The machine will be placed in the designated location by ICFO. The contractor shall cover all costs, organization, and coordination related to the placement, including the provision of any required specialized equipment or vehicles, as well as any necessary component disassembly and reassembly for unloading and transportation inside the building, strictly following the route specified by ICFO.

- The contractor will be responsible for the removal and proper disposal of the packaging when the machine is delivered and unpacked, or its storage during the warranty period in case the original packaging needs to be kept.

Process qualification

Factory Acceptance Test (FAT) and Site Acceptance Test (SAT) will be required as part of the delivery and acceptance process of the equipment.

It shall include, at minimum, the following:
a) Solder-ball placement test. The system shall populate a gold-plated substrate with SAC305 solder balls, demonstrating compliance with the specification.
b) Machine parameters verification, such as laser subsystem operational parameters, axis calibration, measured placement accuracy, etc. demonstrating compliance with the specification.
c) Documentation. All test results, reports and data shall be included in the documentation delivered to ICFO.

CLAUSE 7. Warranty and Follow-on Support

- 1-year Full Warranty on all parts and components of the system irrespective of the manufacturer. The warranty will include the replacement of any faulty or damaged part(s) during normal use of the system, no matter the manufacturer of the component(s). It will cover any cost related with the disassembly, transportation, reparation and re-assembly of the damaged component(s), including all travelling and living costs of the required service engineer(s). An on-site repair, or a justified alternative to reduce the system down time to the minimum, will always be the first service option. A team of properly qualified and skilled service engineers will have to be available.

- System lifetime support.

- Spare parts will be available during, at least, 10 years after system supply.

CLAUSE 8. Training

- The contractor shall provide at least **5 days** of training to the equipment users, scheduled on a mutually agreed date, to ensure proper and safe operation of the system.

- The training shall also include an overview of basic maintenance procedures, covering routine preventive tasks and essential troubleshooting.

- Training will take place at the ICFO facilities.

CLAUSE 9. Delivery and Installation Time

The machine should be delivered within **8 months starting from the contract firm.**

For the purpose of this tender, delivery time is defined as the period from the purchase order (PO) issuance until system delivery at ICFO facilities, including manufacturing, transportation, installation, and acceptance tests.

CLAUSE 10. Target price

- The target price for the system is **500.000 €** (VAT excluded).
- Payment terms: Full payment will be made once the final receipt of supply, installation and commissioning is issued.

Castelldefels, on the date of its digital signature

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