SPECIFICATION SHEET

Supply, installation and starting-up of a Maskless Aligner for the Pilot Line PIXEurope at ICFO

FILE NUMBER: ICFO-2026-020

Contents

CLAUSE 1. Object of the contract

The purpose of this contract is the supply, installation, commissioning and starting-up of a Maskless Aligner system for the Pilot Line PIXEurope at ICFO for ICFO's laboratory.

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

While Electron Beam Lithography can be dedicated for prototyping down to the nanometer scale, it suffers from writing speed limitations especially for large areas. Optical lithography tool can allow to write micron scale features at a much faster throughput. This tool will enable to expose designs down to the micron range for a full 200 mm wafer, scaling the fabrication of functionalised devices developed for the Pilot Line, including electrical contacts and the largest structures. It will allow overlay alignment with precision down to 1 micron for multiple exposures and backside alignment.

CLAUSE 3. Technical requirements

Technical proposal structure

The proposal has to follow as much as possible the structure of this technical requirements document to facilitate evaluation. Any optional accessories not included in the proposal will have to be put in a separate section, and not mixed with the included items.

Machine / Process overview

The system will be used as a maskless photolithography system. The system must:

- Perform photolithography exposures, compatible with all broadband UV resists (including SU-8), and directly from a computer design (so without Cr mask).
- Allow fast photo-exposure of substrates with a resolution <1µm and alignment accuracy <0.5µm.
- Allow exposure of substrates with sizes ranging from 5mm*5mm up to 8" diameter wafer.
- Have an option for backside alignment of samples maintaining a minimum alignment accuracy of <1µm.

The system must include the following features:

1. Light sources

   a. A UV source, solid state laser or LED, with an emission wavelength in the range of 266 to 405nm so that the tool is compatible with most photolithography processes. In case of having the option of different solutions the one allowing for the fastest writing speed will be chosen.
   b. The system should be able to expose common positive and negative resists, including SU-8, AZ-nLOF, AZ ECI 3007 and others. For this purpose, it should include a primary or secondary source with wavelength equal or below 375 nm.
   c. The light source should have a power output > 2 W. There must be an intensity measurement tool integrated in the system to check the laser power.

d. The system should be able to reverse a resist, such as AZ5214 which becomes negative tone after a reverse baking and a flood exposure.
e. The light sources must have a lifetime of at least 10 000 hours of use.

2. Environmental control, Stage and Sample size

a. Environment chamber with pre-cooling and filter system providing a stable environment.
b. Laminar airflow 0.3 – 0.5 m/s inside the environment chamber.
c. Temperature stability ±0.1 °C guaranteed if ±1.0 °C is guaranteed in the environment where the tool is installed.
d. The air quality should be improved to Class 10 if the tool is located in a Class 100 cleanroom (or better) environment.
e. A sample chuck that can host substrates of arbitrary lateral shape ranging from 5mm * 5mm up to 8-inch diameter and height up to 12mm.
f. The base of the stage needs to have air cushions for vibration insulation as a passive damper
g. Stage system with linear motors, interferometric control (resolution ~ 10nm) and vacuum chuck.
h. High resolution camera for fast/easy inspection and alignment.
i. Real-time air-gauge and optical autofocus with dynamic range of 80µm to provide ultimately superior focus stability and to allow to pattern samples with lateral size inferior to 10 mm.

3. Writing accuracy and speed

a. The minimum feature size must be ~ 0.6µm with linewidth variations across the structure of maximum ~ 100nm (3σ).
b. The overlay alignment of a successive layer compared to a previously patterned layer should not exceed for misalignment of 500nm globally and 250nm locally (3σ).
c. Backside alignment (so-called BSA) with a maximum overlay misalignment of 1µm (3σ).
d. The estimated time for writing a 4'' wafer should be ~ 40 minutes or less, both with the 405nm and with the 375nm source.
e. The writing speed with a feature resolution size of 0.6µm should be > 250 mm^2/min.
f. The writing speed in the case of the 375nm light source should be > 250mm^2/min when a resolution of ~ 0.6µm is required.
g. The system must have an optimization system for skipping/optimization of empty areas in the pattern.
h. The optical system should include some high reflective mirrors and Digital Micromirror Device for the exposure of the pattern on the sample.
i. The optical system must be able to adjust the depth of focus in order to optimize the profile of sidewalls in thick photoresists.
j. The supplier must provide proof of such capabilities.

4. Software

a. The system should be delivered with a state-of-the-art and user-friendly software for designing patterns and handling their exposure, including communication with system

control electronics, real time control of the interferometer stage, the autofocus system, the design exposure generator and image processing.

b. The software should accept or be able to convert standard DXF (including DXF grayscale), CIF, GDSII and Gerber file formats.
c. The software should possess an efficient system for labelling samples, substrates and recipes. It also needs to be able to store a database of common photoresists and relative recipes.
d. Have a “drawing mode” to allow drawing of the desired structures without CAD file, directly on a screenshot camera image of the sample. Have a series mode to easily scan focus and dose of the same pattern to find the correct dose/focus settings. for the exposure.
e. The software must run with Microsoft Windows on 2 state-of-the-art PCs, one with USB ports for system control and another one for data conversion. Ethernet connection to the PCs must be possible.

5. Tools, system spares and options

a. A spare write head, allowing to write to a minimum feature size of 0.6um
b. Spare fuse kit (where applicable).
c. Compatibility with greyscale lithography, with 128 levels at least, and compatible with DXF or BMP files.
d. The system must be enhanced to adjust the depth of focus in order to optimize sidewalls in thick photoresists (for example vertical sidewall of up to 800um thick SU8 resist layer with aspect ratio of 1:8).

CLAUSE 4. Power distributions and safety

- The system should be configured for EU (Spain) power grid (voltage, sockets, etc.) and be CE marked.
- The system will be fully protected against unexpected power cuts and, in that case, will be fully safe for the operators. A quick and easy turning on of the system has to be possible after a power cut.
- Component wiring routed to a centralized power distribution panel.
- EMO protection.
- Appropriate hardware and software safety interlocks. Extended error diagnostics.

CLAUSE 5. System layout and services

- The body of the system cannot overcome the dimensions height × width × depth of 2.0m × 1.5m × 1.5m in order to be accommodated in our cleanroom.
- The proposal will include a complete set of pictures, drawings and layouts of the system, including dimensions, location and details of the different components.
- The proposal **will include full installation and start-up requirements (Unpack all system components; Assembly; Pump; Run system to helium liquid production ratio; During the installation process, instruction should be provided on proper procedures for**

operation and maintenance of the system), clearly specifying connection type, tubing materials, pressures, flows, etc, for the specific configuration of the offered system.

- A set of documentation should be delivered in English and Catalan including the following topics:
- Complete set of manuals, drawings, schematics and layouts about system assembly and configuration (mechanical assembly, vacuum system layouts, electrical schematics, system modules interconnection, etc)
- Complete system user manual, including routine servicing, troubleshooting and basic repairs
- System components spare list, specifying quantity, manufacturer, part number, etc

- All the above documentation will be supplied in English and Catalan, in electronic format (CD/DVD or USB memory stick]]
- In case the system hosts refurbished optional items, they should be explicitly specified in the proposal. When possible, it should be detailed which refurbishment process they have been through

CLAUSE 6. Transportation, installation, start-up and training

- The proposal will include transportation to ICFO's facilities including insurance and all export/import and customs duties. **DAP incoterm will apply.**
- The machine will be placed in the designated location by ICFO. The contract winner 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 machine will be equipped with its own wheels to facilitate transportation and with levelling pads to ensure a stable and properly levelled position once installed.
- Depending on the size, machine crate may need to be disassembled outside ICFO building. The contract winner will be responsible for taking accurate measurements of the transportation route outside and inside ICFO and plan in advance any required component dis-assembly and re-assembly. The contract winner will be responsible for checking the selected location and for taking any required measurements to guarantee the suitability of it for the offered system. The compatibility with the operation of the systems already installed in the lab and the mobility of users will have to be guaranteed as well. The contract winner will take care of the move to the final destination.
- Installation and start-up of the system, including system checking, functional tests and process qualification
- The contract winner 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

The following specifications must be demonstrated at the factory prior to shipment and at the installation site.

1. Writing speed on a 4-inch wafer, with features of 0.6um size. Resolution and overlay misalignment, smaller than 0.5um, will be checked.
2. Back side alignment with related minimum feature size.
3. Patterning of 100um thick SU8 photoresists.
4. Drawing mode capability.

5. Patterning of a resolution test on a 8-inch diameter wafer and on a 5mm * 5mm chip

CLAUSE 7. Warranty and Follow-on Support

- **2-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:
- - By phone and e-mail with a response within 3 hours
- - Emergency visit after a system breakdown within 10 working days
- - Spare parts will be available during, at least, 10 years after system supply and, in case of failure, will be delivered within 10 working days
- An estimation of the cost of a warranty extension or available support contract options after warranty period will be included

CLAUSE 8. Training

- System training for ICFO personnel shall be included. The proposal must specify the number of training days (with a minimum of one training day) and the approximate schedule. Training will cover both system operation and process use for ICFO users at ICFO facilities, as well as specific maintenance and advanced service training for ICFO lab technicians.

CLAUSE 9. Delivery and Installation Time

The machine should be delivered within **8 months starting from tender assignment.**

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.

Installations record

- Such a system must have been fabricated at least 5 times by the same provider with a proven record of installation. The record list should be provided upon request.
- For these systems, compliance with the specifications set out in paragraph “Process qualification” (clause 6) must be demonstrated.

CLAUSE 10. Target price

- The target price for the system is 535.000,00 € (VAT excluded).
- Payment terms:
  - Payment on order - 30% total price. This payment is optional for the contratist, but in case the contractor requests a payment of 30% of the contract, he will have to constitute a guarantee for an amount equivalent to the amount that was advanced. The payment of this amount does not imply

conformity in the equipment, is an advance payment that the contractor must return in the event of non-compliance or deficient compliance.

- Payment on delivery, commissioning and training - 70% total price

CLAUSE 11. Environmental clause

It is hereby stated that, in compliance with the provisions of the Recovery Plan, Regulation (EU) 2021/241 of 12 February 2021 establishing the Recovery and Resilience Facility, and its implementing regulations, in particular Commission Communication (2021/C58/01) Technical guidance on the application of the principle of "do no significant harm", as well as the requirements of the Council Implementing Decision concerning the approval of the assessment of Spain's Recovery and Resilience Facility (RDF), all financed actions carried out under this contract must respect the principle of not causing significant harm to the environment (the "Do No Significant Harm" principle). This includes compliance with the specific conditions set out in component 17, measure I1, under which this contract falls. During the execution of the actions covered by the contract, no significant damage will be caused to the environment, in accordance with Article 17 of Regulation (EU) 2020/852.

The activities carried out will not cause direct environmental impacts, nor will they have primary indirect impacts throughout their life cycle, understood as those that may materialize once the activity has been completed.

The activities carried out by the successful bidder under this contract will not generate waste that, in its long-term disposal, could cause environmental damage, as this is one of the situations excluded from funding by the Recovery, Transformation and Resilience Plan, in accordance with the Technical Guidance on the application of the principle of "not causing significant harm" under the Regulation on the Recovery and Resilience Facility (2021/C 58/01), the Council's Proposal for an Implementing Decision on the approval of the assessment of Spain's recovery and resilience plan, and its annex. The activities carried out by the successful bidder will be adapted, where appropriate, to the characteristics set for the measurement and sub-measure of the assigned component, and reflected in the Recovery, Transformation and Resilience Plan.

The activities carried out will comply with all applicable environmental regulations in force.

For the transport, installation, and commissioning of the equipment covered by this contract, the contractor will implement waste minimization measures and, should any waste be generated, will be responsible for its collection, preparation for reuse, recovery, or recycling, or appropriate treatment.

Methods for monitoring and controlling compliance with the conditions

With regard to compliance with environmental and social requirements, the contractor remains obligated to:

- The contractor must sign, before the contract is formalized, the declaration of commitment regarding the implementation of actions under the Recovery, Transformation, and Resilience Plan (RTRP) and compliance with the principle of not causing significant harm to the environment, included as Annex of the Special Administrative Clauses.

- Issue a manual detailing the dismantling instructions for the equipment, including the reuse, recovery, or recycling operations, or appropriate treatment, including the disposal of fluids and selective treatment, applicable to each of the materials or parts that comprise it. The manual must include a table summarizing, expressed as a percentage by weight, the expected fate of the materials that make up the equipment at the end of its useful life, according to the following options: reuse (including recovery and recycling), energy recovery, and rejection/disposal.

- For the transport, installation, and commissioning of the equipment covered by the contract, the contractor will implement waste minimization measures and, should any waste be generated, will be responsible for its removal and management.

Castelldefels, on the date of its digital signature

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