Annex No. 3 - Description of the Subject of the Order

Request for Quotation 7/2026

Integrated sample handling and processing system with control software for robotic culturomics setup

1 Subject and Scope of Delivery

The subject of the order is the delivery, installation, integration, and commissioning of an automated system intended for the transport of plates with anaerobic bacterial cultures, microorganism colony picking, sample preparation for MALDI-TOF analysis, and multi-well PCR plate sealing. The system will be installed inside a flexible anaerobic chamber, placed on a laboratory table, which are part of the Purchaser's equipment.

For the purposes of the project and FAT, the Purchaser provides specifications and documentation of the picker PIXL Max (equipment owned by the Purchaser, hereinafter "picker"), liquid dispenser SQWERTY (equipment owned by the Purchaser, hereinafter "dispenser"), control computer, sample plates (provided by the Purchaser, hereinafter "plates"), anaerobic chamber (provided by the Purchaser, hereinafter "chamber"), and laboratory table (provided by the Purchaser, hereinafter "table"). The Purchaser's equipment and accessories excluded from delivery will be physically available at the installation site during SAT.

The Contractor provides the remaining elements, software, and licenses, ensures full integration of the picker, automatic plate transport, and tools to develop the dispenser integration by the Purchaser in accordance with the requirements below. For the components covered by the Contractor's delivery, solutions from any manufacturer meeting the requirements specified in the OPZ are acceptable.

The Contractor provides the means for dispenser integration in accordance with point 6. Preparation of the dispenser for integration is on the Purchaser's side. In the event of failure to integrate the dispenser by the time of SAT, the system is simulated and the plate positions are defined by coordinates in order to enable the execution of SAT.

2 Equipment and Supported Plates

2.1 Robotic Arm. One arm with a built-in 1D and 2D barcode reader and a gripper for SBS plates and MALDI adapters. Collision-free pick-up and drop-off in all devices (for SQWERTY within the scope of transport to designated coordinates in accordance with point 3.6) and carousel positions, plate presence detection, and orientation retention are required. The reader must support at least linear Code 128 (1D) barcodes and Data Matrix and QR Code (2D) matrix codes without obscuring labels with the gripper. The robot arm should have a radial reach of at least 640 mm, with no dead zones in the accessible area.

2.2 Carousel. Automated carousel with min. 6 hotels with min. 14 individually accessible random access positions or an equivalent storage organisation providing at least 84 positions for plates according to points 2.3 and 10. Access to any position without removing other plates. Hotels and positions must have unambiguous markings and assignments in the software. An equivalent organization must preserve the footprint, manual access, and all required transport paths.

2.3 Materials and Format. Handling rectangular single-well culture plates in SBS format (single-well culture plates) with agar medium and colonies obtained from stool sample plating, existing PCR plates, and MALDI targets in adapters. Microplate footprint format: nominally 127.76 × 85.48 mm, in accordance with ANSI/SLAS 1-2004 (R2012) or equivalent. Equivalence means compatibility of geometry, tolerances, and grip allowing handling throughout the system and existing devices.

2.4 Service Platforms. Two independent, manually rotated platforms for the picker and dispenser, with working position lock and repeatable positioning, with tolerance set by the contractor such that table rotation guarantees collision-free and correct system operation. Rotation shall provide service access inside the

chamber without dismantling other devices, damaging cables, or contacting flexible walls. Return to operation requires position confirmation and positioning verification.

2.5 Plate Sealer. Automated plate sealer accessible to the robot, with a scheduler controller, and recipes for PCR plates consistent with points 2.3 and 10. Required support for transparent full-surface gas-permeable and gas-impermeable foils, as well as foils intended for PCR plates of the Individual Access type owned by the Purchaser (Purchaser's consumables). Foil replacement between runs and foil maintenance tasks resulting from manufacturer instructions may be performed manually. Source plates and MALDI analysis plates are not subject to sealing.

2.6 Control. The entire system will be operated from the control computer owned by the Purchaser for the picker (equipment excluded from the scope of delivery). The computer specification: Intel Core Ultra 7 class processor, 20 cores, up to 5.3 GHz; Windows 11 Pro; 64 GB DDR5 RAM; SSD M.2 1 TB; NVIDIA RTX 2000 Ada, 16 GB GDDR6; built-in Wi-Fi; monitor, keyboard, and mouse. Enclosure: 303.5 × 95 × 293 mm, weight 3.97 kg. The computer remains outside the chamber. The Contractor installs and configures software on this computer and ensures cooperation with the picker software without reducing its functionality. Delivery includes necessary interfaces, expansion cards, cables, and licenses; purchasing a second computer is not required.

3 Required Process Workflow

3.1 Loading. The technician manually removes lids and places source and target plates into the carousel. The system registers barcodes, types, and positions of plates, sample map, and protocol. Before starting, it verifies consistency and completeness of the batch.

3.2 Transfer to Picker. The robot sequentially picks up a source plate and appropriate target PCR and MALDI plates in an adapter, reads their barcodes, and places them in the picker. The number and order of plates account for the working capacity of the picker.

3.3 Picking. The picker images and recognizes colonies, selects them according to protocol, picks and dispenses material to designated target positions. The system enables directing material from the same colony to MALDI and PCR, maintaining a shared colony identifier and mapping of replicates (procedure preparation on the Purchaser's side).

3.4 Further Processing. The robot transfers MALDI plates to the dispenser to execute sample preparation protocol (according to Annex 3.1) - in the event of a lack of effective dispenser integration, the process is simulated. PCR plates are transferred to the sealer, applying a recipe prepared by the Contractor and approved by the Purchaser for the given plate and foil type. Source plates return to the carousel without sealing.

3.5 Return and Retrieval. Upon completion of appropriate steps, each plate returns to its registered position in the carousel. The system marks its status and readiness for retrieval. The technician retrieves plates manually in a safe carousel access mode.

3.6 Scope of Commissioning. The full MALDI path with automated execution of the dispenser protocol operates after effective integration of the dispenser based on the means for integration provided by the Contractor in accordance with point 6. The Contractor commissions plate transport to and from the dispenser based on established coordinates. Pending effective implementation of the dispenser driver by the Purchaser, simulation of plate delivery to the dispenser is permitted; this event must be logged in the control data. Preparation of picking algorithms in the picker is on the Purchaser's side. Development and execution of the plate transport process using the robotic arm as well as sealing, hotel storage, plate barcode scanning, and process control via the scheduler software are on the Contractor's side.

4 Scheduler and Picker Integration

4.1 Software. Scheduling and control software meeting functional requirements of the OPZ, regardless of manufacturer. The Contractor specifies the software version. In the bid price, the Contractor delivers scheduling software (scheduler), drivers, modules, and perpetual licenses for device connections and

procedure editing, including developing dispenser integration, without requiring the Purchaser to pay recurring subscription fees for the right to use the software.

4.2 Planning. Event-driven and time-driven control, graphical creation and editing of procedures, run queues, support for various plate types, MALDI/PCR branching, concurrent operation of available devices, and reservation of resources and positions. View of progress, estimated completion time, and schedule, e.g., Gantt chart.

4.3 Process Handling. Configurable timeout limits. Batch validation, loading instructions, messages and error log, pause, controlled stop, and process resumption after software verification or manual confirmation by the operator of the actual status and location of plates.

4.4 Picker Integration. The Contractor provides a working driver and full integration with the existing picker software and ensures at least: access control to the picker working chamber, start, status reading, completion, and errors, as well as automatic retrieval of results. Serial operation without manual interaction with picker software between plate movement stages.

4.5 Status and Data. Device status registry and plate locations, operation history with date and time. Automatic saving of results, configuration backup, and ability to restore them. Separated operator and administrator permissions; local operation without permanent dependence on cloud services.

5 Traceability and Output Data

5.1 Identification Chain. The scheduler automatically links picker data with plate barcodes and sample maps. Each transfer has a unique identifier and association: run → sample → source plate → colony → target plate → PCR well or MALDI position. Replicates and MALDI/PCR splits preserve relation to the same colony.

5.2 Minimum Log. Sample ID, source plate barcode, colony ID, coordinates, and link to picker image, target plate barcode, target position, date and time, protocol, transfer result/status, and status of further processing and sealing. Errors, omissions, and interventions must be visible in export. Images and colony parameters provided by the picker are retained along with results.

5.3 Sample and MALDI Identification. If a sample lacks a readable barcode, its ID comes from an imported sample map linked to plate and position; missing mapping blocks start. For MALDI, log includes the ID of the proper plate or target and adapter ID if labeled. Reusable adapter code alone cannot replace the identity of an interchangeable MALDI plate.

5.4 Export. Automated tracking data export in CSV UTF-8 with documented schema. A separate batch list generated for the Purchaser's Bruker MALDI Biotyper system contains at least target ID, position, sample and colony ID, and preparation status, in format matching the MBT Compass software version used by Purchaser. Contractor provides a sample file and demonstrates valid data import in format accepted by MBT Compass software. Erroneous, missing, or duplicate barcode triggers controlled exception handling.

5.5 MALDI Plates. Required support for single-use, 96-position targets compatible with Bruker MALDI Biotyper system; reference format (standard consumable material used by Purchaser): MBT Biotarget 96, cat. no. 1840375, with a unique barcode. Supply of adapters is on the Purchaser's side and not required on offer.

6 Means for Dispenser Integration

6.1 Developer Access. The Contractor provides and licenses scheduler interface documentation, API/SDK or equivalent supported driver creation mechanism, configuration and testing environment, and required tools. The Purchaser has the right to independently create, modify, and run its driver without commissioning changes to Contractor each time.

6.2 Integration Package. Package includes scripting tools and documentation allowing Purchaser to independently create, modify, and run integration scripts in widely used programming languages (e.g., Python or equivalent). Disclosure of proprietary source code of Contractor software is not required.

6.3 Boundaries of Responsibility. The Contractor activates the interface and demonstration driver/simulator on the delivered control system side. The Purchaser develops drivers using available dispenser interface and pipetting protocols. Before project approval, parties confirm permissions, licenses, and compatible versions.

7 Installation in Anaerobic Chamber

7.1 Fitting. The Contractor delivers and mounts the system inside an existing chamber placed on the Purchaser's table. The robotic system must be installed inside the anaerobic chamber in a way that avoids membrane puncture or compromising anaerobic atmosphere efficiency. Before execution, after consultation with Purchaser, Contractor prepares and submits for approval a layout drawing showing robot reach, motion envelope, platform rotation, service/operating zones, and access via gloves/mounting ports, no later than 30 days from contract signing.

7.2 Operating Conditions. Chamber powered by anaerobic gas mixture ANO (10% H_2, 10% CO_2, 80% N_2 vol.); system compatible with working atmosphere obtained per approved chamber manufacturer procedures, maintaining safeguards, O^2< 5 ppm. Contractor confirms compatibility of devices, sealer, and media with this atmosphere, including presence of hydrogen, and provides permissible temperature/humidity ranges, weight, local table loads, power, and heat emission during documentation submission per 7.1. Pneumatics and gas exhaust must not impair anaerobic parameters of the chamber.

7.3 Safety and Cleanliness. Required protection against collisions and unintended motion, accessible emergency stop, safe manual access mode, and operation interlock upon improper platform position. Installation must not damage the shell or airtightness of chambers. Ensure emergency stop upon hydrogen safety limit alarm triggered from chamber.

8 FAT and SAT Acceptances

FAT at Contractor site: prior to shipment; SAT: after installation in Purchaser chamber according to timelines in point 10. Detailed protocol, representative batch, materials, and time criteria are subject to Purchaser approval prior to FAT. Biological tests performed on safe biological material designated by Purchaser.

8.1 Functional Test. FAT includes delivered hardware, access to at least 84 positions, listed plate types, barcode reading, and three consecutive runs without unplanned intervention. Unavailable Purchaser elements are mirrored with simulators or compatible Contractor equipment. Communication, transport geometry, and workflow execution are verified, marking simulated outcomes. Full integration of actual picker and physical interfaces verified during SAT.

8.2 Data and Exceptions Test. Verification of 100% source–colony–target links in test batch, MALDI/PCR replicates, and MALDI file import, without record loss or duplication. Testing missing/duplicate barcode, missing plate, device error, pause, and controlled resume; omitted or failed operations must have explicit status.

8.3 Plate Sealing. Testing PCR plate–foil–adapter sets: coverage and tightness of gas-impermeable foil for Individual Access PCR plates.

8.4 SAT Test. SAT covers functional, sealing, data, and safety tests with real picker, dispenser (if integrated), and Purchaser computer in target chamber and atmosphere, including platform rotation. Requires full picker integration, OPZ compliance, and complete data. In the absence of dispenser integration by the Purchaser, transport to and from defined coordinates applies, as well as interface readiness; software communication checked via simulator.

9 Documentation, Training, and Service

Delivery includes as-built documentation, wiring diagrams, editable and reproducible labware configurations, drivers and procedures, operation/cleaning manuals, backups, and list of licenses and consumables. The contractor will conduct workplace training for one operator and administrator and provide the required EC/EU declaration of conformity (CE marking). Warranty: minimum 12 months from date of signing defect-free SAT acceptance protocol. Bid price must include full technical support and software updates during warranty period; system must not require mandatory recurring or subscription fees.

10 Installation Parameters and Supplementary Data

Parameter	Value or Annex
Maximum Footprint	1900 × 1300 ± 100 mm; motion envelope of complete system
Chamber	2000 × 1400 × 1280 mm, internal, ± 100
Table	maximum permissible dimensions 2200 × 1600 mm, maximum load 300 kg/m²
Atmosphere	$O_2 \leq 5$ ppm; ANO: H_2 10%, CO_2 10%, N_2 80% vol.; temperature and humidity: 20 - 40 C, 40 - 60% RH
Layout Drawing	Annex showing component layout in chamber [Annex 3.2]
MALDI Plates	Reference format (Purchaser consumable): Single-use Bruker MBT Biotarget 96 plates, cat. no. 1840375 together with SBS adapters, or equivalent providing compatibility with the MALDI Biotyper analyzer.
Multi-well Plates	Reference format (Purchaser consumable): PCR Azenta Individual Access 96 Well Skirted PCR Plate 4ti-0960/RA or equivalent.
SBS Culture Plates	Reference format (Purchaser consumable): Nunc™ OmniTray™ Single-Well Plate 140156, with lid or equivalent
Acceptance Dates	FAT: no later than 28.02.2027; SAT: no later than 31.03.2027.

11 Equivalence and Data for Bidders

Equivalent solutions with respect to standards and specified configurations consistent with the OPZ are permitted. The Contractor presents confirmation of compliance with requirements per points 1-10.

Additional technical information is made available upon request, on equal terms to all bidders and within time limits specified in the request for quotation. Data necessary for the bid remain in the procurement documentation; essential clarifications are provided according to the proper procedure. Brand names and types of existing equipment owned by the Purchaser indicated in the documentation serve exclusively to define requirements for technical, dimensional, and integration compatibility.

Annexes to OPZ:
Annex No. 3.1 - Process Scenario and Performance Tests
Annex No. 3.2 - Layout Drawing of Components in Chamber