# *ANNEX II + III:* TECHNICAL SPECIFICATIONS + TECHNICAL OFFER

**Contract title: Supply of** PM air monitoring system **p 1 /…**

**Publication reference:** RORS00090/RDASB/TD4

**Columns 1-2 should be completed by the contracting authority**

**Columns 3-4 should be completed by the tenderer**

**Column 5 is reserved for the evaluation committee**

Annex III - the contractor's technical offer

The tenderers are requested to complete the template on the next pages:

* Column 2 is completed by the contracting authority shows the required specifications (not to be modified by the tenderer),
* Column 3 is to be filled in by the tenderer and must detail what is offered (for example the words ‘compliant’ or ‘yes’ are not sufficient)
* Column 4 allows the tenderer to make comments onits proposed supply and to make eventual references to the documentation

The eventual documentation supplied should clearly indicate (highlight, mark) the models offered and the options included, if any, so that the evaluators can see the exact configuration. Offers that do not permit to identify precisely the models and the specifications may be rejected by the evaluation committee.

The offer must be clear enough to allow the evaluators to make an easy comparison between the requested specifications and the offered specifications.

| **1.**  **Item number** | **2.**  **Specifications required** | **3.**  **Specifications offered** | **4.**  **Notes, remarks,  ref to documentation** | **5.**  **Evaluation committee’s notes** |
| --- | --- | --- | --- | --- |
| 1 | **Direct mercury analyzer - Quantity: 1** |  |  |  |
|  | Manufacturer’s name: |  |  |  |
|  | Product type, model: |  |  |  |
|  | **Specifications** |  |  |  |
| 1.1 | **Measuring Principle:**  Thermal decomposition, amalgamation and atomic absorption |  |  |  |
| 1.2 | **Measurement:**  Direct mercury analyzer must not require sample preparation (eg. acid digestion);  The system must be in compliance with US EPA 7473 or equivalent |  |  |  |
| 1.3 | **Range:**  from 0,003 ng to 1500 ngHg |  |  |  |
| 1.4 | **Carrier gas:**  synthetic air or oxygen |  |  |  |
| 1.5 | **Detector:**  double-beam spectrophotometer with three UV-enhanced photodiodes or better |  |  |  |
| 1.6 | **Lamp:**  wavelength 253.65 nm |  |  |  |
| 1.7 | **Detection limit:**  0.0003 ng Hg or better |  |  |  |
| 1.8 | **Accuracy:**  < 1.0% at 1ng |  |  |  |
| 1.9 | **Time of analysis:**  5 minutes or better |  |  |  |
| 1.10 | **Auto-sampler:**  built-in, 40 positions auto-sampler suitable for liquid, solid and gas samples |  |  |  |
| 1.11 | **Maximum sample weight:**  1.5g solid samples, or 1ml liquid samples |  |  |  |
| 1.12 | **Sample boat materials:**  metal (Ni) or quartz |  |  |  |
| 1.13 | **Calibration of the system:**  standard solutions and/ or certified reference materials |  |  |  |
| 1.14 | **Catalyst-filled quartz tube in the combustion furnace must have a dual-temperature zone:** drying and thermal decomposition |  |  |  |
| 1.15 | **Software:**  The system is controlled via a dedicated software allowing the user the edit, save and run an unlimited number of methods  The software must be equipped with auto-blank function |  |  |  |
| 1.16 | **Air compressor 230V 50/60Hz** |  |  |  |
| 1.17 | **Consumables kit:**  1 catalyst tube, 1 amalgamator, 1 Hg trap, 10 quartz sample boats, 40 metal sample boats, 1 sorbent trap for gas analysis |  |  |  |
| 1.18 | **Others:**  The system must have a possibility to upgrade with gas kit for direct gas analysis |  |  |  |
| 1.19 | **Additional services before the provisional acceptance:**  Unloading product at the place of delivery.  When delivering equipment, it is required to install the equipment and verify performance of hardware and software.  Basic training of employees (up to 5 people) in Serbian language for use of the installed equipment and instruments during 5 days. Instructions manual must be provided. The original operating instructions for all system components can be in English. A brief instruction manual should be in Serbian. Instructions manual, original operating instructions and brief instruction manual should be in electronic form. |  |  |  |
| 2 | **Microwave digestion and extraction system - Quantity: 1** |  |  |  |
|  | Manufacturer’s name: |  |  |  |
|  | Product type, model: |  |  |  |
| 2.1 | The system must be able to perform microwave digestion and solvent extraction in closed vessels in the same unit |  |  |  |
| 2.2 | Housing made of 316 stainless steel or better, with multi-layer of corrosion resistant coating |  |  |  |
| 2.3 | Door completely made of stainless steel; |  |  |  |
| 2.4 | Protection against acids and solvents with polymer coating on both inner and outer surfaces; |  |  |  |
| 2.5 | Self-resealing pressure responsive door mounted on sprigs, to ensure maximum safety even in case of overpressure release; |  |  |  |
| 2.6 | An automatic door locking system ensures to keep the door closed until the set temperature is reached; the set temperature can be modified by the user |  |  |  |
| 2.7 | Built-in exhaust system located on the back the microwave cavity and separated from the electronics to prevent corrosion |  |  |  |
| 2.8 | Dual magnetron system with rotating diffuser for homogeneous microwave distribution in the cavity; simultaneous microwave emission from both magnetrons |  |  |  |
| 2.9 | Magnetron output: 2 x 950 Watt, continuous and PID-controlled microwave emission at all power levels |  |  |  |
| 2.10 | Magnetron protection from reflected microwave power |  |  |  |
| 2.11 | Touch-screen display with software allowing the user to edit, save, and run an unlimited number of methods |  |  |  |
| 2.12 | Rotor diagram visualizes the temperature of individual vessels during the digestion/extraction process. The software must display simultaneously time, power, temperature and pressure in real-time |  |  |  |
| 2.13 | All parameters can be simultaneously monitored and actively optimized during the run |  |  |  |
| 2.14 | The system must have a built-in magnetic stirrer that provides software-controlled in-vessel magnetic stirring of solution up to a speed of 3400 rpm |  |  |  |
| 2.15 | The system must be able to work with a segmented rotor for microwave digestion with a minimum capacity of 15 PTFE-TFM-Teflon vessels;  The system must be delivered with a complete rotor |  |  |  |
| 2.16 | Safety shields must be made of high resistant PEEK material to prevent lateral deformation of the vessels |  |  |  |
| 2.17 | Vessels must have a minimum volume of 100 ml, operating temperature of maximum 300°C and pressure of maximum 100 bar |  |  |  |
| 2.18 | Direct contactless temperature control in all positions of the microwave digestion rotor via a dedicated sensor. The temperature of all samples and solutions is controlled through the bottom of the vessel. Display of the temperature in all positions is done through a dedicated page in the software. All temperature profiles can be exported |  |  |  |
| 2.19 | Every vessel must have a safety mechanism for safe and controlled release of overpressure when gases in excess are generated. Only the excess pressued is released, without rupture or damage of the cover, permitting the operator to continue with the digestion without any loss. Covers with built-in safety mechanism must not contain metal parts |  |  |  |
| 2.20 | The software must automatically regulate the microwave power according to number of samples being digested and control the microwave emission according with the vessel at the highest temperature; If a set temperature limit value in the software is exceeded, microwave irradiation is stopped, until the temperature returns below the pre-set limit value;  The system must be able to work with a rotor for microwave solvent extraction with a minimum capacity of 24 PTFE-TFM vessels; the system must be delivered with a complete rotor and dedicated accessories for easy rotor and vessel handling; |  |  |  |
| 2.21 | Vessels must have a total volume of minimum 145 mL. The vessels and dedicated vials must allow extraction of large sample amount up to 30 g; |  |  |  |
| 2.22 | Direct contactless temperature control in all positions of the microwave extraction rotor via a dedicated sensor. The temperature of all samples and solutions is controlled through the side of the vessel. All temperature profiles can be exported; |  |  |  |
| 2.23 | System must ensure extraction with polar and non polar solvents; |  |  |  |
| 2.24 | System must have an option to upgrade to perform microwave evaporation and ashing in a single platform; |  |  |  |
| 2.25 | Both set-ups must operated with the same control terminal via a dedicated software; |  |  |  |
| 2.26 | **Additional services before the provisional acceptance:**  Unloading products at the place of delivery.  When delivering equipment, it is required to install the equipment and verify performance of hardware and software.  Basic training of employees (up to 5 people) to use the installed equipment and instruments) in Serbian languagefor 5 days. Instructions manual must be provided. The original operating instructions for all system components can be in English. A brief instruction manual should be in Serbian.Instructions manual, original operating instructions and brief instruction manual should be in electronic form. |  |  |  |
| 3 | **PM10, PM2.5 sequential standard reference sampler - Quantity: 4** |  |  |  |
|  | Manufacturer’s name: |  |  |  |
|  | Product type, model: |  |  |  |
| 3.1 | **Flow rate**  Variable from 1.0 m³/h up to 2.3 m³/h |  |  |  |
| 3.2 | **Pump:**  Vacuum pump with maximum flow rate of 6 m3/h (no blower type). Controlled flow rates: 1.0 – 2.3 – 3.0 m3/h  Converted to ambient temperature (T) and  ambient air pressure (P), built-in P and T sensors. |  |  |  |
| 3.3 | **Sampling time**  1 h – maximum 168 h per filter. |  |  |  |
| 3.4 | **Magazines for filters:**  4 (four) magazine boxes in total: (two) magazine boxes: 1 (one) magazine box for the blank filters and 1 (one) magazine box for sampled filters; 1 additional set of 2 (two) magazines (for sampled and clean filters) with transportation box should be included in the offer  Magazine boxes should be able to load min 16 filter holders, each;  Sampled filters must be covered within their magazine. |  |  |  |
| 3.5 | **Filter Holders:**  The filter holders must be made of polyoxymethylene(POM).  The filter holders must be able to take in filters  of 47 mm or 50 mm diameter.  The height of the filter holders must be 12 mm and the outer diameter 71.5 mm. The free filter area must be 37.5 – 40.0 mm.  16 filter holders must be delivered with each sampler. |  |  |  |
| 3.6 | **Deviation from the set point of flow rates according to EN 12341:2023:**  < 2% over the sampling period  < 5% instantaneous value |  |  |  |
| 3.7 | **Power:**  220 -- 240 V AC, 50 -- 60 Hz. |  |  |  |
| 3.8 | **Interface**  RS232;  USB 2.0. or SD card |  |  |  |
| 3.9 | **Temperature Range**  - 30°C up to more than 50°C |  |  |  |
| 3.10 | **Housing, sampling system:**  The housing must be made of stainless steel sheet metal of 1.2 mm thickness. Stainless steel have to be for outdoor use.  Dimensions:  Width max. 600 mm  Depth max. 400 mm  Height with inlet max 170 cm  Weight max 80 kg  The housing must be equipped with casters.  The sampling system must be equipped with sheath air. The sampling tube must be made of stainless steel.Temperature measurement directly downstream the filter. |  |  |  |
| 3.11 | **Noise level:**  in a distance of 8 m << 35 dBA |  |  |  |
| 3.12 | **Inlets:**  Impactor inlets with exchangeable jets (1set 8 pieces, each):  PM10 (according to EN 12341)  PM2.5 (according to EN 12341)  designed for the flow rate of 2.3 m3/h, each. |  |  |  |
| 3.13 | **Data output:**  All measuring data and results such as sampling time, sampled volume in operating-m3 and standard-m3 (Nm3), mean temperature etc. must be recorded and stored on a USB stick / SD card. Further, all current measuring data and signals per currently sampled filter must be logged on the USB stick / SD card every minute or every 5 minutes (data logger function) such as elapsed sampling time, current flow rate, ambient temperature and pressure, current pressure drop across the currently sampled filter etc.  A real-time data transmission to a central data acquisition system must be also possible. |  |  |  |
| 3.14 | **Leak test:**  The sampler must be equipped with an internal leak check, which complies with the requirements as laid down in the EN 12341. This leak check must include the complete pipe work between pump and sampling head and the filter holder at the sampling position (without inlet). |  |  |  |
| 3.15 | **Remote Support:** The sampler must be equipped with an additional interface in order to connect a mobile phone for data transfer.  This application allows to check and control all functions of the sampler remotely by customer or supplier in case of trouble-shooting. |  |  |  |
| 3.16 | **Additional services before the provisional acceptance:**  Before delivery, the device must be calibrated in a laboratory accredited according to the requirements of the EN ISO/IEC 17025 standard for the flow, temperature and pressure.  Unloading products at the place of delivery.  Basic training of employees (up to 5 people) to use of the installed equipment and instruments in Serbian language for 5 days. Instructions manual must be provided. The original operating instructions for all system components can be in English. A brief instruction manual should be in Serbian. Instructions manual, original operating instructions and brief instruction manual should be in electronic form. |  |  |  |
| 4 | **Chemicals and standards – 1set** |  |  |  |
| 4.1 | Nitric acid HNO3(>68%) trace analysis grade (Quantity: 30L, packing 2,5L or smaller) |  |  |  |
| 4.2 | Hydrogen peroxide H2O2(min 30%)(Quantity: 5L, packing 1L) |  |  |  |
| 4.3 | Quartz microfibre disk, R47mm,1/50 (MunktellL & GmbH, Sartorius or similar) (Quantity: 25 boxes) |  |  |  |
| 4.4 | Filter paper R185, 1/100 (Whatman 42, Machereynagel 640d or similar)(Quantity: 15boxes) |  |  |  |
| 4.5 | Lead standard for AAS, concentration 1g/L, 100mL (Quantity: 1) |  |  |  |
| 4.6 | Arsenic standard for AAS, concentration 1g/L, 100mL (Quantity: 1) |  |  |  |
| 4.7 | Nickle standard for AAS, concentration 1g/L, 100mL (Quantity: 1) |  |  |  |
| 4.8 | Cadmium standard for AAS, concentration 1g/L, 100mL (Quantity: 1) |  |  |  |
| 4.9 | Mercury standard for AAS, concentration 1g/L, 100mL (Quantity: 1) |  |  |  |
| 4.10 | Certified reference material ERM - CZ 130 FINE DAST or similar, 0,5g(Quantity:4) |  |  |  |
| 4.11 | Certified reference material mercury in fine dust, 0,5g (Quantity: 4) |  |  |  |
| 4.12 | Plastic petri dishes(Quantity:500) |  |  |  |
| 4.13 | Certified reference material gas mixture BTEX in N2, concentration 20ppb, volume of the bottle 10L (Quantity: 1) |  |  |  |
| 4.14 | Certified reference material gas mixture NO in N2, concentration 500ppb, volume of the bottle 10L (Quantity: 1) |  |  |  |
| 4.15 | Certified reference material gas mixture CO in N2, concentration 10ppm, volume of the bottle 10L (Quantity: 1) |  |  |  |
| 4.16 | Certified reference material gas mixtureSO2in N2, concentration 400ppb, volume of the bottle 10L (Quantity: 1) |  |  |  |
| 4.17 | Argon purity 5.0 B50/200 (17,881 kg)  (Quantity:20) |  |  |  |
| 4.18 | Hydrochloric acid HCL(>36%) , trace analyses grade (Quantity: 5L, packing 2,5L or smaller) |  |  |  |
| 4.19 | Certified reference material Montana soil I or Montana soil II or similar (Quantity 1) |  |  |  |
| 4.20 | Certified reference material Tomato leaves or  spinach leaves or similar plant material (Quantity 1) |  |  |  |
| 4.21 | Aluminum standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.22 | Zinc standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.23 | Magnesium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.24. | Potassium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.25 | Sodium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.26 | Selenium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.27 | Calcium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.28 | Chromium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.29 | Copper standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.30 | Molybdenum standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.31 | Barium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.32 | Boron standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.33 | Iron standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.34 | Lithium standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.35 | Silver standard for AAS, concentration 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.36 | Rare earth elements mix for AAS or ICP, concentration at least 50mg/L, 100mL (Quantity 1) |  |  |  |
| 4.37 | Multielement standard solution (20 elements or more), 1g/L, 100mL (Quantity 1) |  |  |  |
| 4.38 | PAH Calibration Mix, certified reference material, 10 μg/mL each component, 1mL (Quantity 3) |  |  |  |
| 4.39 | PAH in Dust or similar, certified reference material (Quantity 1) |  |  |  |
| 4.40 | PAH standards Mix, at least 16 analytes, 100ug/mL in Acetonitrile (Quantity 10mL in total) |  |  |  |

**Important Notes:**

* The eventual documentation supplied should clearly indicate (highlight, mark) the models offered and the options included, if any, so that the evaluators can see the exact configuration. Offers that do not permit to identify precisely the models and the specifications may be rejected by the evaluation committee.
* The offer must be clear enough to allow the evaluators to make an easy comparison between the requested specifications and the offered specifications.
* **Unless otherwise specified, the requirements in these Technical Specifications are presented as a minimum standard which the offered goods must meet.**
* **For all required standards required in technical specification tenderer may offer equipment with equivalent standard compliance if applicable.**

**Warranty:**

Tenderers must provide local reliable warranty service agent providing maintenance and the rapid supply of equipment spare parts and consumables for the Warranty duration of one year.

Offer must include warranty service description including:

• Service organisation contact data including name, postal address, telephone number, fax number and e-mail address;

• Help Desk (phone) support, which must be available during working hours, 8AM – 4PM;

• Guaranteed maximum response time to submitted maintenance support request (fax or e-mail) of 1 (one) working day;

• Guaranteed that any requests for services will be attended to within 24 hours;

• Guarantee that all items can be repaired or alternatively replaced within a maximum of 72 hours;