

Should your offer be accepted, the Requirement Specifications as set out in this Part and shall govern the Contract between the Authority and your company.

Specifications for a High-Performance Liquid Chromatograph – Diode Array Detector with Fluorescence Detector (HPLC-DAD-FLD)

The system shall comprise the following:

- I) Quaternary Solvent Delivery Pump
- II) Degassing Unit
- III) Auto-injector
- IV) Thermostat Column Compartment
- V) Diode Array Detector (DAD)
- VI) Fluorescence Detector (FLD)
- VII) Data processing and chromatographic software
- VIII) Computer, printer and others
- IX) Data management software system
- X) Installation, commissioning and training
- XI) Warranty

TECHNICAL SPECIFICATIONS

(I) Quaternary Solvent Delivery Pump

- 1. The pump must have:
 - (a) A maximum operation pressure of at least 130 MPa (1300 bar) at not more than 2ml/min; and
 - (b) A maximum operation pressure of at least 80 MPa (800 bar) at 5 ml/min.
- 2. A minimum settable flow range of 0.001 – 5 mL/min, in 0.001 mL/min increments
- 3. The flow accuracy shall not exceed $\pm 1\%$ or $\pm 10 \mu\text{L/min}$, whichever is greater.
- 4. Flow rate precision: $\leq 0.07\%$ RSD
- 5. The pump must be able to withstand pH range of 1.0 -12.0.
- 6. The precision of composition must be less than 0.2% RSD.
- 7. The accuracy of composition shall not exceed $\pm 0.4\%$.
- 8. Active seal wash kit must be included for improved seal life if buffer solvent is used.
- 9. It must have a leak sensor as safety feature

(II) Degassing Unit

- 1. Membrane degassing unit for at least 4 flow lines must be available
- 2. Internal volume per channel is at least 1.5ml.

(III) Auto-Injector

1. Maximum operating pressure range must be at least 130 MPa at 0 – 2 ml/ min and ramping down to 80 MPa (800 bar) at 5 ml/min
2. Sample injection volume is variable, between 0.1 µl to 40 µl in 0.1 µl increments, with the option to expand the injection volume to 1800 µl when needed.
3. It must come with a flush port or equivalent.
4. Sample capacity must be able to hold at least 100 x 2ml vials.
5. It must be capable of injection cycle time of not more than 20s.
6. The system must come with thermostat with minimum settable temperature from 4°C to 40 °C in 1 °C increments.
7. It must be capable of a carry-over less than 0.005 %
8. The injection precision is less than 0.25% RSD
9. Must have a leak sensor, automatic rack and vial recognition as safety feature

(IV) Thermostat Column Compartment

1. Temperature range is at least 20°C below ambient to 110 °C.
2. Temperature precision: not be more than ± 0.05°C.
3. Temperature accuracy: not be more than ±0.5°C.
4. Column Capacity: Can hold up to at least eight columns of 10 cm length. Minimum 8 columns must come with column tag

(V) Diode Array Detector (DAD)

1. Detection must be via 1024-element photodiode array or equivalent to demonstrate similar resolution.
2. The temperature operating range must be at least from 4°C to 40°C.
3. Linearity must be equal or greater than 2.0 AU (shall not exceed +/- 5%).
4. Wavelength accuracy must not be more than ± 1 nm for self-calibration.
5. Wavelength precision < ± 0.1 nm.
6. Wavelength range must be at least 190 nm and not more than 640 nm, settable in 1 nm increments.
7. Maximum data acquisition rate must be at least 240 Hz.
8. Signal drift must be ≤ 0.5 x 10⁻³ AU/h.

(VI) Fluorescence Detector (FLD)

1. The temperature operating range must be at least 4°C to 40 °C.
2. The detector must be able to acquire spectra (excitation or emission) during the analysis without any stop flow.
3. The excitation and emission wavelength range must be at least 200-1200 nm and 280-1200 nm respectively.
4. The lifespan of the lamp provided must be at least 4000 hours.
5. In single wavelength mode, the system must have Raman signal to noise of more than 3000 with Ex 350nm / Em 397 nm using dark value at 450nm as standard reference point with standard flow cell filled with water.
6. The lamp must be able to turn on directly before the analysis with no warm up time is required.

7. Dual wavelength operation: Raman (H₂O) > 300 Ex 350 nm, Em 397 nm and Ex 350 nm, Em 450 nm, standard flow cell

(VII) Data processing and chromatographic software

1. The system must be able to acquire the signal of all detectors seamlessly. Thus, additional software or communication module must be provided for processing of data from the 2 detectors if required.
2. Original copy of application software must be provided. Electronic licenses are accepted.
3. Operation of the system must be very easy and intuitive via a Windows 10 based software.
4. Cover full one-point digital instrument control, qualitative and quantitative processing, report creation and self-diagnosis.
5. Must have an on-line help function.
6. The report format to be generated via software must be flexible and customizable by the Laboratory.
7. The data can be converted to other formats but not limited to “.doc”, “.xls”, “.pdf” and “.csv” files.
8. The software must allow automatic execution of system checks, auto-purge and baseline checks
9. The software must allow the setting of accessibility to folders and data for different user roles.
10. Software must have its own log files.
11. System suitability, System security as well as System check functions must be provided which comply with Good Laboratory Practice (GLP)

(VIII) Computer Hardware, Printer and others

1. A data acquisition/processing computer and a laser printer shall be provided with equivalent or better configurations as follows:
2. PC specifications (minimum):
 - Operating System: Microsoft Windows 10 (latest build version) and Microsoft Office software 365 which is compatible with the data management software.
 - Processor: Intel® Core™ 9th Gen i7 Processor or better
 - Monitor: Minimum 22” IPS LED Monitor with resolution 1280 x 1024 dpi
 - Hard Disk: 1TB 7200 rpm SATA 6Gb/s HDD or better
 - Memory: Minimum 16GB DDR4 RAM
 - Available Network Interface Ports: Shall be built-in to the computer board or PCI card based with minimum 2 ports. (Depending on system requirements; 1 of the ports will be used for connecting to HSA Network)
 - DVD-ROM drive
 - 104 key Keyboard
 - Optical mouse and mouse pad
 - Must be able to support HSA supplied managed Anti-Virus software
3. Printer specifications (minimum):
 - Monthly duty cycle: 3000-5000 pages per month
 - Memory: 128MB
 - Speed: at least 40 pages per minute
 - Size: A4
 - Duplex: Yes (automatic)
 - Paper Tray: 500 sheets

- Print Technology: Monochrome Laser
- Print resolution: 1200 x 1200 dpi
- Network printer: yes

(IX) Data Management Software System

1. The software shall be able to control the GC through local area network (LAN) technology. The internet protocol (IP) address used on the system shall be in accordance to the standards of HSA Network plan.
2. The Tenderer shall ensure that the PC/notebook provided with the system is network ready and be able to connect to the HSA's network for interfacing with HSA's LIMS (Laboratory Information Management Software) system, e.g. LISA, LabWare, etc.
3. The system software must be able to interface with HSA's LIMS for the following:
 - a. Raw Data Files archival & retrieval.
 - b. System test result report output to PDF for archival.
 - c. System test result report for result uploading.
 - d. To accept work list upload from HSA's LIMS, if applicable.
4. System shall be able to import and run a sequence file generated by the LIMS. The sequence file generated shall be in csv or txt file format.
5. The Contractor shall work with HSA personnel for the following:
 - a. To define and assign a Hostname and/or PC name given by HSA IT infrastructure team to facilitate the system management on HSA network.
 - b. To define the raw data file structure & directory assigned by HSA to facilitate the automation of electronic archival and retrieval of files.
 - c. To perform SIT and UAT to ensure the integration to HSA's LIMS system is running fine.
6. For the system report printing and extraction, the Contractor shall work with Laboratory to ensure the seamless integration and interface with HSA's LIMS.
7. The Computer system shall supply with Microsoft Windows Operating system that support Microsoft Active Directory Domain infrastructure.
8. The Computer system supplied shall use active directory-based user accounts without the requirement of having domain administrator privileges.
9. The Computer system together with the operation of the required scientific software must not require the use of local system privilege's account or rights for its functional use.

(X) Installation, Commissioning and Training

1. At least 2 on-site trainings for operating and performing maintenance of the system must be provided respectively for approximately 30 laboratory staffs.
2. Contractor shall also provide training to perform comprehensive maintenance and troubleshooting for at least 2 lab staffs at Contractor's training centre or on-site.
3. Proper documentation is to be supplied along with the delivery of the system. These shall include the operator's electronic manuals/software manual, equipment manuals, electrical circuits/ manuals and service manuals whichever is applicable.

(XI) Warranty

1. System must come with at least one-year warranty upon successful of commissioning. Warranty shall cover overall system (both hardware and software) and minimally include:
 - Annual preventive maintenance (PM) includes PM kit;
 - Supply of replacement parts;
 - Unlimited breakdown calls during Office Hours i.e. 8am to 6pm from Monday to Friday excluding Saturday, Sunday and Public Holidays; and
 - Provision of updates for all software including operating software.

Please indicate any non-compliance to requirement specifications here should there be any.

Reference To	Remarks