

INTRODUCTION

This tender includes the specifications for the procurement of one (1) unit of liquid chromatograph ion mobility spectrometry tandem triple-quadrupole mass spectrometer system. The Authority shall reserve all rights to award as a whole or partially for this tender.

Equipment: LIQUID CHROMATOGRAPH ION MOBILITY SPECTROMETRY TRIPLE-QUADRUPOLE TANDEM MASS SPECTROMETER (LC-IMS-MS/MS) Location: Pharmaceutical Laboratory Quantity: 1	Compliances (Yes/ No) <i>**If No, please indicate reason of non-compliances.</i>
<u>Technical Specifications</u>	
General A robust and sensitive bench top/stand-alone liquid chromatograph ion mobility spectrometry tandem triple-quadrupole mass spectrometer (LC-IMS-MS/MS) shall offer configurations as follows: • Liquid chromatograph (LC) mainframe • Auto Sampler • Column Oven • Built-in or external infusion system/syringe pump • Tandem triple-quadrupole mass spectrometer (MS/MS) with ion mobility spectrometry (IMS) feature • Computer hardware and software • Data management software system • Roughing pump sound proof enclosure • Instrument benches and Uninterrupted Power Supply (UPS) • Installation, commissioning and warranty • Application and hardware maintenance training • Technical support	Yes/ No
The LC-IMS-MS/MS unit shall offer equivalent or superior functions as follow: 1. Liquid Chromatograph Mainframe 1.1 Must offer a high pressure binary pump system to enable at least 2 individual solvent lines to be utilised concurrently; 1.2 Must offer integrated diagnostic functions that pre-empts instrument malfunction; 1.3 Must offer an integrated degassing unit; 1.4 Must enable settable flow range set points from 0.001- 5 mL/min, in 0.001 mL/min increments; 1.5 Must offer flow precision of ≤ 0.07 % Relative Standard Deviation (RSD) or ≤ 0.02 min Standard Deviation (SD), whichever is greater; based on retention time at constant room temperature; 1.6 Must offer flow accuracy of $\pm 1\%$ or better; 1.7 Must offer operating pressure (with LC column) with at least 100 MPa (1000 Bar); 1.8 Must offer user selectable compressibility compensation, based on mobile phase compressibility; 1.9 Must support and function in the pH range of 1.0 – 12.5; 1.10 Must permit gradient formation such as low pressure binary mixing/gradient capability using high-speed proportioning valve;	Yes/ No

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1.11 Must offer user-selectable flow composition ranges from 0 – 100 % in 0.1% increment; 1.12 Must offer composition precision of ≤ 0.2 % RSD or ≤ 0.04 min SD, whichever is greater; 1.13 Must offer software and local control functions; 1.14 Must enable communications via controller-area network. Remote: ready, start, stop and shut-down signals with optional LAN; 1.15 Must offer safety and maintenance features to support extensive diagnostics, error detection and display, leak detection, safe leak handling, leak output signal for shutdown of the pumping system. Low voltage in major maintenance areas; 1.16 Must be able to notify the lab when the maintenance is due, early maintenance feedback to be provided for continuous tracking of instrument usage in terms of seal wear and volume of pumped mobile phase with pre-defined and user settable limits and feedback messages. Electronic records of maintenance and errors shall be provided.		
2. Auto Sampler 2.1 Handles a minimum of 100 pieces of 2 mL HPLC vials with thermostat cooling function; 2.2 Programmable injection volume range: minimum 1 - 40 μ L; 2.3 Must have the injection volume accuracy of $\pm 1\%$ or better; 2.4 Must have the injection precision of $\leq 0.2\%$ RSD or better; 2.5 Sample washed out from needle on-line; 2.6 Temperature should be settable from 4°C to 40°C in 1 °C increments; 2.7 Injection cycle of ≤ 25 s without needle wash and ≤ 40 s with needle wash; 2.8 Must have random, programmable access to vials and adjustment of needle depth; 2.9 Must offer operating pressure (with LC column) with at least 100 MPa (1000 Bar).		Yes/ No
3. Column Oven 3.1 Temperature range: minimum 15°C to 80°C; 3.2 Temperature stability: ± 0.1 °C or better; 3.3 Temperature set point accuracy: ± 0.5 °C or better; 3.4 Heat up rate: Shall not exceed 5 minutes from ambient to 40 °C; and Cool down rate: Shall not exceed 10 minutes from 40 – 20 °C; 3.5 Column capacity: must be able to hold a minimum of 3 columns; 3.6 Able to handle column length from 10 – 300 mm.		Yes/ No
4. Built-in or external infusion system/syringe pump 4.1 Must offer a built-in or external mechanical infusion system/syringe pump to support real-time data acquisition for MS method optimisation. A minimum infusion flow rate at 5 μ L/min must be achieved.		Yes/ No

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5. Tandem Triple-quadrupole Mass Spectrometer with Ion Mobility Spectrometry (IMS)		
5.1 The mass spectrometer must have an ion mobility spectrometry device which should at least meet the following requirements.		
5.1.1	The device must be user mountable and dis-mountable without the use of tools or breaking vacuum.	
5.1.2	The device must have an integrated liquid pump for the purpose of introducing chemical modifiers into the mobility cell	
5.1.3	The device must be able to acquire data for a single multiple reaction monitoring transition in not more than 25 msec including inter-scan pause time of not more than 20 msec.	
5.1.4	The optimum Compensation Voltage (COV) for the analyte should be stable: COV for clenbuterol will not shift by more than 10% of the Mobility Spectrometry peak width (full width at half height) at a fixed separation voltage over 24 hours on an equilibrated system operating under standard Mobility Spectrometry resolution gas setting.	
5.1.5	The device must be useable with software that provides automatic, dynamic adjustment of the acquiring multiple reaction monitoring transitions such that only compounds that elute within a specified time window are monitored.	
5.1.6	The device should demonstrate good separation capability that must be able to separate the analyte triazole from the analyte angiotensin II (2+ charge state) in a single analysis with a multiple reaction monitoring cycle time of less than 100 msec with a separation of greater than 30 V.	Yes/ No
5.2	The mass spectrometer must have a minimum scanning speed of 10,000 Da/sec;	
5.3	The mass spectrometer must offer linear dynamic range of greater than 5 orders of magnitude inter-scan linear dynamic range without signal reduction;	
5.4	The mass spectrometer must offer computer controlled concurrent polarity switching functions, preferably with not more than 10 msec of polarity switching time;	
5.5	The mass spectrometer must offer a minimum mass range of 5 – 2000 m/z;	
5.6	The mass spectrometer should have a mass stability of at least 0.1 amu over 24 hrs with normal operating temperature and after the mass spectrometer has reached vacuum and electronics equilibrium;	
5.7	The instrument must be equipped with a source housing hosting interchangeable APCI probe and ESI probe;	
5.8	The ESI source must be provided as standard with the instrument. The ESI must be able to allow effective optimization of ionization with minimal adduct formation;	
5.9	The ESI source must be able to operate at flow rate from 5 to 2000 ul/min without splitting.	
5.10	The mass spectrometer should allow both qualitative and quantitative analyses to be carried out in a single experiment.	

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5.11	The mass spectrometer should be able to provide at least full scan MS, selected ion for both Q1 and Q3, product ion scan, multiple reaction monitoring, and MS ³ scan.	
6.	Computer Hardware & Software A data acquisition/ processing computer and a laserjet printer shall be provided with equivalent or better configurations as follows: 6.1 3.0 GHz dual core processor enabled; 6.2 8 GB RAM with system managed memory enabled; 6.3 CD-ROM/DVD drive included; 6.4 Resolution display 1280 x 1024 (XGA); 6.5 2x2 TB hard disk storage space; 6.6 21" LCD wide monitor; 6.7 Keyboard; 6.8 Mouse and mouse-pad; 6.9 Pre-installed with Windows 7, Microsoft office 2013 and antivirus software which is compatible with the data management software system of the instrument; 6.10 One laserjet printer capable of double-sided printing; 6.11 All computer interfaces, cables and software drivers; 6.12 Must offer additional Ethernet slots to support inter-computer and network data transfer function.	Yes/ No
7.	Data Management Software System 7.1 Must be a flexible Windows-based data system that provides instrument control and data analysis; 7.2 Must work seamlessly with application-specific software modules; 7.3 Must generate results that can be quickly reviewed with the qualitative, quantitative and library browsers; 7.4 Must have a workflow-oriented approach to high-throughput quantitation, integrating the processes of acquisition, processing and data review with a set of predefined and customisable data-oriented reports; 7.5 Must have the ability to run in a fully automated manner, while also providing for sophisticated manual data evaluation; 7.6 Must include the following features: • Preconfigured processing methods • User-defined flags for different parameters • Automated retention time and ion ratio adjustment • The ability to associate a processing method with any previously saved calibration • Automatically generate reports 7.7 Must have the feature to protect testing methods from being tampered.	Yes/ No

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8. Roughing Pump Sound Proof Enclosure		Yes/ No
8.1	Enclosure box equipped with sound proof walls for minimisation of pump noise required.	
9. Instrument benches		Yes/ No
9.1	The company shall provide two mobile-tables to house the instrument and the peripherals. The design and actual dimensions of the mobile-tables will be given to the vendor when the tender is closed and evaluated. The vendor is required to fabricate the mobile-tables according to the design given, and is required to make a visit to the laboratory to finalize the dimensions and the material / colour scheme of the table(s) with the laboratory personnel, before the actual fabrication.	
9.2	The company shall provide UPS which is single phase with battery for not less than 5 mins back up time	
10. Installation, Commissioning & Warranty		Yes/ No
10.1	The power supply must be 230 V 50/60 Hz for single phase power or 400 V 50/60 Hz for three phase power;	
10.2	Prices quoted are to include delivery, installation, commission, calibration and training of operators. All proper documentation is to be supplied along with the equipment. These shall include the operator's manuals/software manual, and equipment manuals;	
10.3	The quotation must also include Installation Qualification and Operation Qualification (IQ/OQ) that shall be performed during the commissioning of the LC-IMS-MS/MS system.	
10.4	The warranty period for the entire system shall be minimum one (1) year and covers all hardware (e.g. electronic boards, pumps etc.), software, consumables (inclusive of all related tuning solutions with certified validity for the entire duration of the warranty period) or parts and labour. Tenderer shall quote for the option to exercise a 2-year post-warranty comprehensive maintenance contract in Price Summary as set out in this tender, please refer to Clause 13 Post-warranty Comprehensive Maintenance Contract for details. At least one (1) preventive maintenance (PM) shall be performed annually within the warranty period as part of the delivery as agreed with the laboratory;	
10.5	Malfunctioned instrument must be fully repaired and verified to be fully functional in accordance to specifications within 10 working days. Under the scenario where full repair cannot be performed within 10 working days due to unforeseen circumstances, written agreement by end-user has to be obtained;	
10.6	Under the circumstances when instrument malfunctioned for longer than 30 working days, corresponding extension of the comprehensive maintenance contract must be offered for the affected calendar year;	
10.7	The contractor must be able to perform risk assessment for the LC-IMS-MS/MS instrument that is located in the designated air-conditioned laboratory. A risk assessment report must be submitted before the installation of the instrument.	

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10.8 During the installation of the instrument, the contractor must make sure the instrument is properly connected to the gas pipeline in the laboratory using necessary tubing, connectors and other necessities with no leaking;		
10.9 During instrument commissioning, the technical specialist/engineer must validate the LC-IMS-MS/MS instrument based on the contractor's installation specifications on-site. A copy of the validation report must be submitted to HSA – Pharmaceutical Laboratory after validation has been carried out on the LC-IMS-MS/MS instrument;		
10.10 The contractor must supply the calibration standards with their certificate of analysis attached, and all other accessories necessary to carry out validation checks and maintenance of the instrument. These accessories shall include syringes of appropriate sizes, as well as cleaning tissue and cleaning buds at no additional cost;		
10.11 For the statement of coverage of each type of preventive maintenance plan (PMP), the service availability, materials, parts and services provided, telephone technical support, and coverage exclusions should be clearly defined and stated;		
10.12 The LC-IMS-MS/MS instrument power supply rating must be compatible with Singapore power supply to enable successful on-site installation and full commissioning. Power supply requirements can be obtained post tender award via on-site inspection;		
10.13 The LC-IMS-MS/MS instrument must be fully commissioned within 1 month upon delivery;		
10.14 Lead time for instrument delivery post tender award must be shorter than 4 weeks;		
11. Training		Yes/ No
11.1 On-site training for all end-users in the Pharmaceutical Division that is approximately 30 pax shall be provided by trained personnel(s), and shall cover topics including simple MS theory, instrument overview, MS method optimization, data acquisition, and general maintenance. In addition, a proposed training schedule must be supplied together with the submission of tender document;		
11.2 Advanced training for minimum 12 end-users must be provided including theory for adducts-formation mechanisms under ESI and APCI ionization modes, ion mobility spectrometer parameter optimization, information dependent analysis for triggered MS/MS functions, compound library building using MS/MS scan function, and trouble-shooting.		
12. Technical Support		Yes/ No
12.1 Tenderer must have application and maintenance support through the provision of local technical specialist to assist in method developments, on-site training that stated in Clause 11 Training , as well as readily available parts and consumables on demand.		
12.2 The service engineers and product specialists must be trained to provide training, technical and maintenance support for the model propose. Please		

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submit the relevant certificates together with the tender submission for evaluation. 12.3 Tenderer must be able to send its application specialist(s) to HSA Pharmaceutical Laboratory to complete at least 1 workflow development after the instrument is successfully commissioned.	
13. Post-Warranty Comprehensive Maintenance Contract 13.1 The Comprehensive Maintenance contract for the LC-IMS-MS/MS instrument shall minimally include the following: 13.1.1 The Contractor is required to perform preventive maintenance once a year; 13.1.2 All necessary kits, consumables (inclusive of all related tuning solutions with certified validity for the entire duration of the maintenance contract) and parts must be included; 13.1.3 Unlimited breakdown calls and on-site services must be provided; 13.1.4 Contractor must supply all replacement parts (either electronic or mechanical in nature) and provide labour within the contract period at no additional costs. 13.2 Tenderer is required to provide detailed information for the price proposed in a separate form, if necessary; 13.3 The Contractor shall bill the Authority after the preventive maintenance is completed, together with relevant detailed signed service reports as supporting documents.	Yes/ No
14. Submission of Supporting Documents 14.1 The Tenderer is required to provide the following for evaluation: 14.1.1 Certification or authorised letter to perform servicing for the instrument by Original Equipment Manufacturer (OEM); 14.1.2 Company's track records for the past 2 years in providing local sales and service support for LC-MS/MS equipment.	

I hereby confirm that I can meet all the Requirement Specifications as stated above.

Tenderer's (as *Principal/Agent)
Company or Business Registration No: Tenderer's official
Stamp:

Authorized Signature

Name:

Designation:

(*Delete whichever is not applicable)

Please indicate any non-compliance here should there be any.

Reference To	Remarks