Supply, Delivery, Installation, Commissioning and Training of a Gas chromatograph with flame ionization detector GC- FID - SUP/SD/25/07

Items	Specifications Required
Make	Please Specify
Model	Please Specify
Country of Origin	Please Specify
Country of Manufacture	Please Specify
Application	Analysis of fats in foods including fatty acid profile, triglycerides, trans fat and cholesterol
System Requirements	The System shall comprise a gas chromatograph equipped with flame ionisation (FID) detector that shall produce analytical data to determine fatty acid profile, triglycerides, trans fat and cholesterol in extracts including food, animal, plant tissues. System shall have the following major components: 1. GC Mainframe with flame ionisation detector (FID) 2. Automated sampler 3. Data management and acquisition Software system 4. Suitable columns and other accessories 5. Computer 6. UPS (6kVA) 7. Required gas supply with accessories 8. Black and white printer Electricity requirement should be 230 V, 50 Hz.
GC Mainframe	1. Must be able to support at least 2 inlets, 2 detectors and 2 signal acquisitions. • (Gas chromatograph should be upgradable to accommodate a MS (mass spectrometric) detector • GC should be upgradable to accommodate a multimode injector 2. Must have advanced intelligent self-diagnosis feature. Electrical system, flow control systems and sensors must be fully supported by the operating software. 3. Must provide software that monitors GC counters and provides graphic display. 4. Upgradability for Detector Splitting System (multiple detection capability), Detector Switching System, and/or Backflush System. 5. Retention time performance: Retention time repeatability - < 0.008% or < 0.0008 min Area repeatability - < 1% RSD, using 2ng tetradecane 6. Self-diagnostic feature with safety features to help prevent unexpected instrument malfunctions. 7. Must support LAN communications 8. Leak tests Must provide programmed leak tests available from keyboard or monitoring software
GC Oven	1. Operating temperature range: 25 °C to minimum of 400 °C 2. Oven temperature set point resolution must be 0.1°C. 3. Oven must support at least 20 ramps/21 plateaus and negative ramps must be allowed. 4. Maximum achievable temperature ramp rate must be 100°C/min or high. 5. Oven temperature program set point resolution for the temperature ramp rate must be 0.01°C. 6. Maximum run time of at least 999 minutes 7. Oven cools down from 400°C to 25°C must be less than 4 mins (under non-specific conditions), with faster cooling speed is preferred 8. Temperature stability for < 0.01°C for a 1°C ambient change, ensuring the maintenance of oven internal temperature with respect to external fluctuations. 9. Volume: approximately 10 Litres or more for easy fixing and removing different types/dimensions of columns without compromising the rate of heating or cooling of the oven. 10. Oven power must turn-off automatically when the lid/door is opened. All temperature and time functions should be microprocessor controlled and displayed on the screen.

Gas Flow control	1.Must come standard with programmable pneumatic control 2.Digital Pneumatic Control for setting column flow with pressure, flow, and linear velocity. 3.Inlet must have Electronic pneumatic control of carrier, split and septum purge gases, including electronic ON/OFF 4.Minimum Three - ramp pressure program should be available 5. Pressure set points must be able to be adjusted by increments of 0.001 psi, with typical control ± 0.001 for the range 0.000 to 99.999 psi; 0.01 psi for the range 100.00 psi to 150.00 psi
Gas Valve	1.System should have full Pneumatic Controlled Gas Sampling Valve. 3.No. of Ports/Inlets: 2 Ports 4.Gas Sampling Valve should be controllable through GC System Interface without PC Control. 5.Valve should be with Standard 1 mL Sampling Loop. 6.Valve should have provision to connect packed as well capillary Injector.
Inlet (Injector)	**Split/Split less** 1. Must be able to install at least two independent temperature-controlled injector units 2. Must be suitable for all capillary columns of 50um to 530um internal diameter. 3. Must be able to select carrier and makeup gas types: Helium, Hydrogen, Nitrogen. 4. Split ratio range: 0 to 7500 must be available to avoid column overload. 5. Maximum operating temperature up to 400 °C. 6. Efficient gas saver mode built-in to reduce gas consumption during standby without affecting performance. 7. Must have electronic septum purge flow control to eliminate carry-over.
Autosampler	A robotic, fast, high precision and unattended automated sampler capable for liquid injection. 1. Allowing approximately 1.8 mL, liquid sample vials 2. Sample vial Capacity – Min 100 vial positions for 1.8 mL 3. Syringe size: 0.1 µL – 10 µL
Detectors	**FID** 1. FID detector with auto ignition facility 2.Flame out detection facility/automatic re ignition 3.Overheat protection system 4. Minimum detectable level (for tridecane): < 1.8 pg C/s 5.Linear dynamic range: $>10^7$ (± 10%). 6.Linear Dynamic Range Full-range digital data path enables peaks to be quantified over the entire 10^7 concentration range in a single run, without the need to set a switch or software setting to obtain this full range of data.
Data management and Instrument Software system (System Control)	1. Compatible with Latest Windows operating system with seamless integration & control of all the GC parameters. 2.The software of GC should integrate the control of the entire system, the auto-sampler, the operating parameters of the GC from a single interface. 3.The system controller should be able to real-time monitor and diagnose the system status, gas supplies, instrument temperatures, electrical systems, etc and for real time notification via advisories and indicators. 4.The raw data and peak lists can be exported in standard formats to possibly access software packages from third parties. 5.Calibration modes must include external calibration and method of standard additions. Correction options must include background subtraction, blank subtraction and internal standard correction. 6.It must have a mechanism to lock retention time to keep an anchor to integrated retention times for the analysis of established compounds in complex matrices assuring reproducibility of same retention time such that no method development is required for the instrument over time.
Accessories and other items	The System shall be supplied with a general consumable kit including standard solutions for system tuning; It should include following essential accessories kit containing: Consumables required for 1 year of operations 1.GC capillary columns (02 Nos each for)- suitable for analysis of a) fatty acid methyl esters (FAMEs) with the capability to resolve cis-trans isomers of unsaturated fatty acid methyl esters (0.25 µm x 100 m x 0.25 mm) b) cholesterol (0.25 µm x 30 m x 0.25 mm) and c) lipid profile (0.25 µm x 30 m x 0.25 mm) including suitable guard columns – 03 Nos)

	2.Compatible ferrules and column nuts for above columns – 10 Nos each 3.Compatible Glass Liners (Split -05 and spliless -05) with compatible o-rings (10 Nos) 4.GC septa - 50 Nos 5.GC vent trap - 01 Nos 6.Seals for the injection port - 05 Nos 7.Syringe (10 µL) for liquid injection for robotic sampler – 3 Nos 8.Autosampler vials – 200 Nos 9.Tool kit for GC (all sizes numbered spanners, pliers, Allen key set (inch & metric series), screwdriver set, column cutter) 10.Required gases to run the system with tubing 11.High purity (99.999%) nitrogen, Hydrogen and dry air – filled 1 cylinder each 12.Moisture trap 1 each including Oxygen scrubber, Hydrocarbon trap 13.Regulators – 03 Nos
Data Systems/Computer	Branded Intel at least Core i7 Processor with a minimum of 3.2 GHz Processor speed, 8 GB RAM, 1TB HDD, CD/DVD RW with a separate graphics card that can support multiple displays with preloaded latest possible version of Windows OS. Monitor with 23.5" for Instrument operation and Data Acquisition.
System Installation and Commissioning	1.The installation protocol should send with the quotation and details of manufacturer assigned installation/application engineer with his/her qualification. This protocol must include at least full installation, qualification/performance verification and on-site familiarization. 2.During commissioning the supplier should demonstrate the system performance by analysing the samples such as spices and butter. Summary report should be submitted to laboratory with relevant data immediately after commissioning the system and including repeatability, reproducibility and spike recovery as part of the Certificate of Acceptance (CoA) 3.Chemicals, reagents and other accessories (including standards, certified reference materials and columns) required for commissioning of the system and analysis above samples should be provided by the supplier.
Performance specifications	1.Performance specifications (should be tested and demonstrated on-site during installation) Selectivity, Sensitivity, Repeatability and Reproducibility should be proven with data generated by the system installed at the time of commissioning of the equipment. Prove and method detection limit (MDL) of Instrument Detection Limits (IDL) should be provided with real analytical data generated. 2.The report for the performance specification should be provided as part of the Certificate of Acceptance. 3.Chemicals and reagents (including standards, kits and certified reference materials) required to prove performance specifications of the system should be provided by the supplier.
Operation and application Training, Service Support implementation	The supplier should provide 1. Training should be provided to laboratory staff at the beneficiaries sites on the software, operation of the system and application of the equipment immediately after commissioning of the system. Manufacturer assigned technical expert should be assigned for this training program. 2. Complete technical support for the equipment for at least a period of 2 years during warranty period of 2 years. This shall include the following at no extra cost: • Vendor to provide service guarantee: should the system require service during the warranty period, vendor must guarantee or replacement of instrument for free. • Vendor to have logistic support to ensure that over at least 95% of the service parts are readily available and upkeep delivery within 24 hours. • The warranty shall commence only upon successful completion of installation /commissioning and issuing the acceptance of the system by ITI. • Support will be available on working days • Operator/ software training should be provided at the beneficiaries' premises immediately after commissioning the GC system. Trained application and operation specialist/consultants must be available for customized on-site training.
Warranty	System should have minimum 2 years comprehensive manufacturer warranty with maintenance package to be included. The supplier must specify the equipment parts covered under the warranty and consumables which are not covered under the warranty with reasons. If in case, the instrument is in out of order during the warranty period, the supplier should provide an extended warranty considering this time period or replacement of

	similar system for uninterrupted testing services of the laboratory.
Service agreement (quote separately)	An annual service agreement for 5 years after the warranty period of 2 years. Please fill the details for the yearly breakdown of service charges, terms and conditions in the following format.

Year from the date of Purchase	**Terms and Conditions**	**Service Charges**
3rd Year	Specify (labour cost)	
4th Year	If different from the previous year, specify	
5th Year		
6th Year		
7th Year		

Quote separately

1 GC capillary columns (02 Nos each for)- suitable for analysis of

d) fatty acid methyl esters (FAMEs) with the capability to resolve cis-trans isomers of unsaturated fatty acid methyl esters (0.25 µm x 100 m x 0.25 mm)
e) cholesterol (0.25 µm x 30 m x 0.25 mm) and
f) lipid profile (0.25 µm x 30 m x 0.25 mm) including suitable guard columns – 03 Nos)

2.Compatible ferrules and column nuts for above columns – 10 Nos each
3.Compatible Glass Liners (Split -05 and spliless -05) with compatible o-rings (10 Nos)
4.GC septa - 50 Nos
5.GC vent trap - 01 Nos
6.Seals for the injection port - 05 Nos
7.Syringe (10 µL) for liquid injection for robotic sampler – 3 Nos
8.Autosampler vials – 200 Nos
9.CRM and RMs for calibration of the equipment and for QC with CoA from competent manufacturer (ISO 17034 certified as CRMP)

10 **Multimode**

- Hot/Cold
- split/splitless modes (compatible with merlin microseal septa)
- Large volumes at least upto 250 µL
- Temperature Range (Cryogenic) : at least (-150 ° C) with Liquid nitrogen
- Temperature Range: ambient + 5 to 450 ° C
- Ability to program Temperature upto 3 ramps at rate of at least 700 ° C/min

The system should have a mechanism to prevent substances and highly retained substances from dirty sample matrices to foul the column and the system

11.MS detector

11 a) Ion source/ Mass Analyzer

1. The quadrupoles should be cleanable.

The mass spectrometer must have Electron Ionization (EI) modes supplied as standard. The system should have provision to be upgraded to house Positive Chemical Ionization (PCI) and Negative Chemical Ionization (NCI) modes and be able to switch between EI / CI mode without changing ion source when both ionizations are required.

2. It should have a mass range of 1.5 to 1090 amu with unit mass resolution over the entire mass range.

3. It should be able to perform calibration manually as well as auto-tune at m/z below 500, molecular weight below 500 Da to obtain accurate mass spectrum and for high molecular weight compounds such as halogenated and derivatized compounds. (mass tuning solutions should be provided)

4. The scanning speed capability should be 20,000 amu/sec (single scan). Higher scan rates are preferred

5. It should have a fast scan cycles in order to obtain highly precise data for fast GCMS

6. The mass spectrometer should have a stability of +0.1u / 48 hours.

7. The ion source and transfer line must be independently heated over a user-selectable temperature range:
   Ion Source: 150 to 350°C
   Transfer Line: 100 to 350°C

8. The mass spectrometer must have a dynamic range of 5 x 10^6.

9. It should have high performance synchronous SIM/Scan with automated SIM set up that can convert a full scan method to a SIM or SIM/Scan method. The software must automatically configure the number of SIM group, SIM cycles across the peak and the ions added to each group.

10. It should have a SIM capability of up to 60 groups of masses with 120 masses per group may be time programmed.

11. The mass spectrometer should employ a mechanism to minimize random noise enhancing the Signal-to-Noise.

12. EI scan sensitivity: Signal-to-noise (S/N) > 2000 at m/z 272 amu for 1 pg octafluoronapthalene (OFN) in EI scan

13. Mass resolution – Unit mass resolution

14. Evacuation speeds and increases allowable column flow rates.

The mass spectrometer should have capability to install two narrow-bore/ wide-bore capillary columns into the MS simultaneously in order to eliminate the need to swap columns.

11b Vacuum system

- Vacuum system should be operated on air cooled turbo-molecular pumps with back up mechanically by rotary pump
- Should be able to accommodate GC carrier gas flow upto 6 mL/min
- High capacity (> 250 L/s)
- Noise reduction cover should be included

Vacuum level indicator should be included in the scope.

11c Data management and Instrument Software system (System Control)

a. The workstation of GC-MS should integrate the control of the entire system, the auto-sampler, the operating parameters of the GC and MS from a single interface.
b. The system controller should be able to monitor the system status, RF power, gas supplies, instrument temperatures, electrical systems, vacuum system etc.
c. The raw data and peak lists can be exported in standard formats to possibly access software packages from third parties.
d. Calibration modes must include external calibration and method of standard additions. Correction options must include background subtraction, blank subtraction and internal standard correction.
e. It must have a mechanism to lock retention time to keep an anchor to integrated retention times for the analysis of established compounds in complex matrices assuring reproducibility of same retention time such that no method development is required for the instrument over time.
f. It should have a mechanism to scan given fragment ion/ ions in the TIC chromatogram even in ppt level (Facility should be available in the software after running a sample); Displaying mass chromatograms from fragment table in the TIC chromatogram.
g. Standard, latest MS spectral libraries: NIST, Wiley (or compatible) which contains spectra with structural information, should be provided as reference libraries
h. The software must have the ability to automatically search significant compounds against NIST, etc. and many other public and private databases.
i. Library should come with open-source architecture