

**GAS CHROMATOGRAPH MASS SPECTROMETER (GC-MS)-1No.**

**Doc. No: ST/12/GCMS/2016-17/01**

**Specifications and features:**

**Proposed applications:** Quantification of fatty acids, phytosterols, essential oils and flavours in different food matrices.

**GC-MS system should have following capabilities:**

1. Must be able to support any combination of 2 injectors and 2 detectors and able to monitor through software simultaneously.
2. Should have advanced software to support automatic diagnosis, flow EPC and temperature control system.
3. Should have carrier gas controller for all gases with temperature and pressure compensation.
4. Gas controller should have automatic leak check facility.
5. Should have keyboard/user interface which controls all instrument functions including injector/detector temperature, carrier and detector gases pressures/flows and oven temperatures and detector signals.

**Split/Split less Injector**

1. Must be suitable for all capillary columns from 50 to 530µm diameter.
2. Split ratio range : 1500:1 or better.
3. Maximum operating temperature : 400°C or better.
4. Set flow range : 0-500 ml/min for N<sub>2</sub> ; 0-1250 ml/min for H<sub>2</sub>/He
5. Pressure/programmable ramps should be at least 3 or more.

**Column Oven :**

1. Temperature Range: Ambient +4°C to 400°C
2. Oven should support at least 5 or more ramps/holds.
3. Maximum achievable oven ramp temperature should be 120°C or better.
4. Oven Temperature set point resolution should be at least 1°C.
5. Oven cool down (at 22°C ambient) from 450 to 50°C in 4.0 mins or better.
6. Oven should have temperature and gas (H<sub>2</sub>) safety shutdown capability.

**Mass Detector**

**Ion Source**

Ionization Source : EI and CI  
 Mode of ionization : Positive and Negative (or) dual mode  
 Ionization voltage : up to 100 eV and must be user defined  
 Transferline Temperature : Programmable up to 350°C.

**Mass analyzer:**

Mass analyzer : Single stage quadrupole analyzer  
 Mass range : up to 1000 amu (or) better  
 Mass resolution : unit mass resolution over entire mass range (or) better  
 Scan rate : 10000 amu/sec (or) better  
 Spectral Library : NIST and Wiley should be traceable and certified.

Mass stability :  $\pm 0.1$  Da /48 hours

### **Detector**

1. It should utilize photomultiplier/electron multiplier and good positive and negative ion sensitivity.
2. Dynamic range should be  $10^6$  or better.
3. It should have both manual and auto tuning facility in all ionisation modes.

### **Vacuum system**

1. Powerful turbo molecular pump working under a mechanical vane pump.
2. It should have the ability to perform automated leak check using a metered amount of air.

### **Detector Performance specifications**

Mode	Test	Specification
EI (with Helium)	1 pg/ $\mu$ l Octafluoronaphthalene Scanning from 50- 300 m/z for mass 272 m/z	$\geq 600:1$ or better
PCI (with Helium)	100 pg/ $\mu$ l benzophenone Scanning from 80-230 m/z for mass 183 m/z	$\geq 300:1$ or better
NCI (with Helium)	200 fg/ $\mu$ l Octafluoronaphthalene Scanning from 200-300 m/z for m/z 272	$\geq 600:1$ or better

### **Flame Ionisation Detector:**

Minimum detectable level :  $\leq 2$  pg C/s or better  
 Data acquisition rate : 300 Hz or better.  
 Linear Dynamic Range :  $10^6$  or better  
 Maximum operating Temperature : 400°C or better  
 Electronic Pneumatic control : Air, H<sub>2</sub>, Make up (N<sub>2</sub> or He)  
 Flameout detection and automatic recognition should be available.

### **Auto sampler**

1. Auto-sampler should have automatic installation and alignment over injector and sample vials.
2. Auto-sampler should have at least 96 positions of 2ml vial capacity.
3. Auto-sampler should have at least 4 wash vial positions. Auto sampler should have liquid and SPME injection modes.
4. Auto-sampler should support 10 $\mu$ l standard syringe and 5 $\mu$ l syringe for optional micro volume sampling.
5. Auto-sampler should have software control of viscosity delay, sample withdrawal speed, injection speed and dwell time.

### **SPECIFICATIONS FOR CONTROL SOFTWARE AND SYSTEM**

#### **1. Control software**

The software should be able to provide single platform for controlling gas chromatography and mass spectrometer and auto sampler simultaneously as well as independent of each other.

## 2. Computer and accessories

Branded latest Pentium PC and 20" LCD monitor with suitable powerful processor, 2T Hard disk, 4GB RAM and original operating system (with original CDs), duplex laser printer and licensed anti-virus to operate GCMS equipment through control software.

## 3. Installation

All accessories required for installation such as required installation kits, starter kits, columns, reagents, standards, tubing, fittings, seals, cables, vent and vanes for exhaust, non-vibration table, etc. should be included in the quote. The bidder should provide the pre-requisites required for the installation and safe operation of the equipment.

## 4. Essential items

- GC start up kit, International brand gas generators (H<sub>2</sub>, N<sub>2</sub> and Air), suitable gas regulators for He and methane respectively. The supplier should be responsible to fix up all the accessories and gas station (suitable filters & gas pipes) required for installation.
- Calibration and validation standards such as Octafluoronaphthalene, benzophenone, dodecane and tridecane etc., should be included in the quote. Instrument qualification (IQ), Operational qualification (OQ) and performance qualification (PQ) should be included in the quote.
- Suitable GCMS grade low bleed capillary columns for the analysis of fatty acids, phytosterols, essential oils and flavours should be provided two numbers each. Guard columns for each type of column should also be provided.

## 5. List of GCMS columns:

Bonded and highly crosslinked silphenylene polymer capillary MS column (30m X 0.25mm X 0.2µm), (5%-Phenyl)-methylpolysiloxane capillary MS column (30m X 0.25mm X 0.25µm), highly polar non-bonded; poly(biscyanopropyl siloxane) column was specifically designed for detailed separation of geometricpositional (cis/trans) isomers of fatty acid methyl esters (FAMES). (75m X 0.18mm X 0.14µm); DB-XLB or equivalent (30m X 0.25mm X 0.25 µm) (2 columns each should be provided).

## 6. Essential Items to be quoted separately.

- Gas purification panels, gas pipes, ferrules, fittings, gauges etc., Cylinders with test certificate from manufacturer and no objection certificate from the explosive department, Nagpur.
- **Essential spares:**  
Spares for GCMS operation including septa (200Nos.), ferrules (50Nos.), Inert glass liners (10 Nos.), pre assembled sample vials (2ml,2000 Nos.) and wash vials (10Nos.), micro inserts (250µl, 5000Nos.), spare vial caps (5000Nos.) and Syringes 10µl for Auto sampler (6Nos.) to be quoted separately.
- **GC-MS Analytical Standards**

The following GCMS grade analytical standards should be quoted separately:

i. FAMES (FAMES 37 Mixture)

ii. Phytosterols standards (5-alpha cholestane, cholesterol, dihydrocholesterol, desmosterol, campesterol, lathosterol, lanosterol, stigmasterol, delta 7-avenasterol, delta 5-avenasterol, delta 7 stigmaterol, ergosterol, dihydrobrassicasterol, b-sitosterol, tigmastanol, campestanol and b-sitostanol ) lavours (benzaldehyde, decane, decanal, (E)-2-decenal, guaiacol, heptanal, heptanes, 2-heptanone, nonane, nonanol, octane, pentadecane, 1-pentanol, tridecane, tetradecane, undecane, (E,E) 2,4 decadienal, hexanal, (E)-2-hexenal, 2-nonanone, (E)-2-Octenal, 1-Octen-3-ol, p-methan-3-one, naphthalene, octanal,, p-xylene, dodecane, (E,E) 2,4 nonadienal, (E)-2-nonenal and 2-pentylfuran, 3-Octen-2-one, 2,4,6 Trimethylpyridine, (E)-2-heptenal, 1-hexanol, nonanal, (E)-2-nonenal, (E,E) 2,4-decadienal (with (E,Z)-2,4-decadienal as an isomer in it), gamma-nonalactone, 2-pentadecanone, 2-methoxy-4-vinylphenol and 4-vinylphenol.

7. **Electrical specification:** All modules of GC/MS, vacuum pump, gas generators should work at power ratings of 220 Volts and 50 Hz frequency.

8. **Warranty:** 3 years comprehensive warranty and 2 years non-comprehensive warranty for the GC-MS system, vacuum pump, all the gas generators, computer and printer. **Tenders without this offer will not be considered.**