



**INDIAN INSTITUTE OF TECHNOLOGY BOMBAY**  
**MATERIALS MANAGEMENT DIVISION**  
Powai, Mumbai 400076

**Technical specification of Gas Chromatograph – Triple quadrupole Mass Spectrometer  
(GC MS/MS)**

**MS/MS specifications:** Brand new triple quadrupole mass spectrometer with noncoated inner source conforming to international safety standards, designed and manufactured under a quality system registered to ISO 9001 with appropriate computer and printer to support the system from original manufacturer. Should include a turbo molecular pump with Inert CI and EI ion source.

The system should have -

1. Mass range: Quadrupole 10 to 1000 amu or better.
2. Mass resolution: minimum 0.7 (width at half height).
3. Mass axis stability:  $\pm 0.1$  amu over 24 hours or more
4. Linear Dynamic range: minimum 6th order of magnitude.
5. Scan rate (electronic): 20000 amu/sec or better
6. Ionization modes: EI (Electron ionization) with self-cleaning ion source.
7. Ionization potential from 5 eV to 250 eV or more for better dissociation of Ions
8. Collision cell gas pressure must be electronically/Software controllable.
9. Collision energy must be variable; nitrogen as a collision gas is required.
10. Should be able to do Scan, SIM, MRM/SRM, Parent ion scan, Product ion Scan, and Neutral loss scan-time segment based.
11. Simultaneous Full Scan -SIM or Full Scan/MRM or SRM whenever required.
12. SRM/MRM Speed: minimum of 800 MRM/sec
13. Minimum MRM dwell time of 0.5 milliseconds or better.



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14. A rotary-vane foreline pump supporting the turbo molecular pump should be quoted.
15. Installation checkout sensitivity must be better than –Instrument detection limit. EI MRM IDL: 0.5 fg OFN, statistically derived at 99% confidence level from the area precision of eight sequential splitless injections of 1  $\mu$ l, 2 fg/  $\mu$ l OFN standard. MS/MS transition of  $m/z$  272 and 222 using 30m x 0.25 mm ID x 0.25  $\mu$ m column. The required sensitivity of the system should be demonstrated at the site after installation of the facility.
16. CI: must be capable to operate with different reagent gases & electronic flow control for reagent gases. Collision cell gas pressure must be electronically/software controllable. Collision energy must be variable
17. EI MRM Sensitivity: 1  $\mu$ L of 100 fg/ $\mu$ L Octafluoronaphthalene (OFN) should produce the following minimum signal - to -noise for the transition from  $m/z$  272 to  $m/z$  222: 30,000:1 or better on 30m x 0.25 mm ID x 0.25  $\mu$ m column.

## **2. Gas Chromatograph (GC)**

A brand new GC system with two injectors should have the capability of:

- i) Solvent bypass- eliminate early peaks. Lower detector maintenance costs
- ii) split/splitless capillary column injection unit
- iii) Split send all peaks to multiple detectors obtain more information during each run. Find peaks of interest in unknowns Quick Swap (GC/MS) inlet maintenance, change GC column, without venting MS Shorten/eliminate GC/MS downtime.
- iv) Operating temp range from near ambient to 400°C
- v) Maximum temp rate 115°C
- vi) Possible to programme 20 ramps (21 plateaus)
- vii) Possible to adjust pressure in increments of 0.001 psi, pressure setting range of 0-95 psi



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- ix) Flow sensor for control & storage of split ratio
- x) Inlet should be capable of taking total flow of upto 200 mL/min with N<sub>2</sub> and 1000 mL/min with H<sub>2</sub> or He.
- xi) Possible to use capillary columns of 50, 100, 250, 320 microns and above
- xii) Should have an auto injector of atleast 100 vials
- xiii) Electronic motor actuated automatic injection system
- xiv) Two injectors; one injector may be quoted as programmable injector.
- xv) Vendors must supply imported GC syringes of 1, 5, 10, 25, 100ul 2 nos. each with GC.
- xvi) All carrier & detector gases must be electronically controlled.
- xviii) should have a customized display unit.
- xix) Capability to inject: Inlet cryocooling capabilities using liquid N<sub>2</sub>/CO<sub>2</sub>.
- xviii) The system should have pre and post column backflush or mid column back flush to remove unwanted components/contaminants/high boilers.

## **6. Tuning**

- i) System should include a variety of auto tune algorithms to tune the instruments for maximum sensitivity or for specific target compounds

## **7. Essential Accessories require to operate GC-MS/MS**

- i) Dimensions: 30m x 0.250mm x 0.25µm, HP-1MS/ DB-1MS or equivalent) (03 no.) and DB-5 MS/ HP-5 MS or equivalent (03 No)



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ii) Should quote deconvolution programme software to deconvolute spectra in a single step for the entire TIC for complex and dirty matrix

iii) EI Filaments (5 No.)

iv) Sample injector:

- For liquid injection (5 no. syringe)
- For HS syringe (5 no. each)
- Air tight syringe (for manual injection) (2 no.)

v) Auto sampler vials: 500 vials (2 ml capacity) with screw cap.

vi) Column Ferrules- injector end and interface end (20 No. each).

vii) Septa for injector (100 No.)

vii) Appropriate nuts to fit capillary columns to the injector and MS interface

viii) PTV (with glass/quartz wool at optimum position) (10 No. each)

ix) O-ring for injector liner (20 No.)

x) Split vent trap (2 No.)

xii) Column cutter (2 No.)

xiii) Gas tube cutter.

xiv) Oil mist trap for pump (2 No.).

xv) Tool kit

**8. NIST Library:** Original licenced version of NIST 2017 or latest version should be quoted

**9. Installation and Training:**

Free of cost installation and training of staff/students of the laboratory. Atleast five working days of training should be given by installation and applicable engineers.



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**10. Warranty**

GC-MS instrument should have four years product warranty (comprehensive) including preventive maintenance and AMC after expiry of standard Guarantee/Warranty should be quoted (from 2<sup>nd</sup> to 5<sup>th</sup> year).

**11. Other Accessories which can be supplied from local market**

- i) Gas purification panel with moisture trap for GC-MS
- ii) Gas regulators for He, H<sub>2</sub>, Zero air
- iii) Cylinder filled with Helium gas 1
- iv) Cylinder filled with Hydrogen gas 1
- v) Cylinder filled with Zero Air 1
- vi) Minimum 10 KVA UPS system. The system should have UPS of suitable rating with voltage regulation, and minimum 60 minutes back up for the supplied equipment. UPS should be slim so that it does not occupy much space.
- vii) Warranty (comprehensive) for UPS system for four years including AMC from 2<sup>nd</sup> to 5<sup>th</sup> year.