



INDIAN INSTITUTE OF TECHNOLOGY BOMBAY

MATERIALS MANAGEMENT DIVISION

Powai, Mumbai - 400076

PR No. 1000038600

Rfx No. 6100001670

Technical Specifications for Gas Chromatography System (Qty-1)

| Sr. No. | Specifications | Compliance (Yes/No) | | | | | | |
|---------|--|--|------|--|--|------|--|--|
| A | <p>Automatic, computer-controlled Gas Chromatograph Analyser with TCD and Dual FID is required for the analysis of gaseous mixtures generated during the below reactions: We would be performing various experiments such as –Carbon dioxide reduction, water splitting, and other types of chemical reactions. Both gaseous and liquid compounds are generated during the reactions that need to be analyzed with this gas chromatograph based on their volatility.</p> <ol style="list-style-type: none"> 1. The gaseous compounds that need to be analyzed are – H₂ (≤ 100 ppm) and for all gases CO, CH₄, CO₂, C₂H₆, C₂H₄, C₂H₂, C₃H₈, O₂ + N₂(≤250 to 300 ppm). TCD, suitable columns along with automatic gas sampling valves, loop, pressure balance valves, etc to be offered as channel 1. 2. The liquid compounds are typically solvents like methanol, ethanol, propanol, and higher hydrocarbons, and typical small organic molecules. Suitable dimensions Polar, Mid-polar, and non-polar capillary columns to be offered along with SPL injector and FID as channel 2. <p>The scope of supply consists of installation, commissioning, and training of the system at IIT Mumbai laboratory. The system is to be supplied with the method set-up parameters, plumbing diagram, and schematics from the factory. Below are the minimum specifications required for the Gas chromatograph system.</p> | | | | | | | |
| 1. | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; text-align: center; vertical-align: top;">GC</td> <td style="width: 5%; text-align: center; vertical-align: top;">1.1)</td> <td style="width: 80%; vertical-align: top;">Large Graphical LCD-based display to view real-time Chromatogram and their Parameters such as temperature sensors and carrier gas supply pressure.</td> </tr> <tr> <td></td> <td style="text-align: center; vertical-align: top;">1.2)</td> <td style="vertical-align: top;">An automatic computer-controlled dual channel gas chromatographic system, capillary/ packed columns, oven, flow control systems, FID, TCD, gas sampling valves with appropriate loops&fittings, pressure balance valves for automatic sampling and powerful and versatile software capable of analyzing gases/liquid is required. The Valves must be factory-fitted only in the dedicated option box.</td> </tr> </table> | GC | 1.1) | Large Graphical LCD-based display to view real-time Chromatogram and their Parameters such as temperature sensors and carrier gas supply pressure. | | 1.2) | An automatic computer-controlled dual channel gas chromatographic system, capillary/ packed columns, oven, flow control systems, FID, TCD, gas sampling valves with appropriate loops&fittings, pressure balance valves for automatic sampling and powerful and versatile software capable of analyzing gases/liquid is required. The Valves must be factory-fitted only in the dedicated option box. | |
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| | | 1.3) Should be capable of mounting 3 injectors and 4 Detectors. | |
| | | 1.4) Should be equipped with Intelligent self-diagnostic functions for detailed diagnosis of the septum, glass insert usage status, temperature sensor error, gas supply pressure, status of each gas ignition function etc. | |
| | | 1.5) Should be manufactured as per ISO 9001 and in full compliance with international regulatory, safety, and electromagnetic compatibility requirements | |
| | | 1.6) The GC with an autosampler provision | |
| 2 | Column Oven | 2.1) Capacity :- Minimum 15L or above | |
| | | 2.2) Display screen :- All temperature and time functions should be microprocessor-controlled and displayed on the screen | |
| | | 2.3) Column overheat protection :- MUST be provided | |
| | | 2.4) Temperature Range;- Ambient + 10°C to 400°C | |
| | | 2.5) Temperature Program ramps :- Minimum 20 or more | |
| | | 2.6) Max temperature program rate:- Minimum 60°C/min or more | |
| | | 2.7) Temperature set point resolution :- Must be at least 1 °C or better | |
| | | 2.8) Cooling time :- 300 °C to 50 °C within 6 min (at 25 °C ambient temperature) or faster | |
| | | 2.9) Maximum run time:- At least 9999 min or more | |
| 3 | Automatic Gas Sampling Valves | Factory fitted, pneumatic 6and10 port gas sampling valve (Valco makeonly) – 2nos each in combination for both gas samples analysis. Vendor to submit the Plumbing diagram with technical bid. 1 mL sample loop with gas sampling valve. | |
| 4 | Thermal Conductivity Detector (TCD) | 4.1) One | |
| | | 4.2) Max Operating temperature :- 400°C or more | |
| | | 4.3) Sensitivity :- 200 pgtri-decane/mL or <10 microvolt per ppm or >40000mV x mL/mg (Decane) | |
| | | 4.4) Dynamic range :- 10 ⁵ or better | |
| | | 4.5) Minimum detectable quantity -MDQ :- < 1ppmNonane or better | |
| | | 4.6) Data Acquisition rate :- 800 Hz or better | |
| 5 | Flame Ionization | 5.1) Dual FID | |
| | | 5.2) Max Operating temperature :- 400°C or more | |



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| | Detector (FID) | 5.3) Minimum detectable quantity -MDQ :- 3 pg C/s (Dodecane) or better | |
| | | 5.4) Dynamic range :- 10^7 or better | |
| | | 5.5) Data acquisition rate :- 800 Hz or better | |
| 6 | Sample Injector port | Channel 1- suitable injector port connected in series with GSV for manual injection of gas samples through gas tight syringe. Channel 2 – suitable Split/splitless injector port for injecting liquid samples. SPL injector should be with max pressure of 140psi with temperature range up to 450°C and split ratio 1:5000 or better. Removable glass liner for trapping Non-volatile residues. | |
| 7 | Automatic Gas Flow / Pressure Controller | 7.1) Automatically compensates for variations in atmospheric pressure and temperature 7.2) Pressure range :- 0 to 140 psi 7.3) Pressure program ramps :-Minimum 7 or more | |
| 8 | Software | 64-/32-bit Windows 10 compatible workstation software with minimum 4 Channel to be quoted of same make. - Multi channel real time chromatographic data acquisition and post-run analysis should be possible. - Software should be with high-speed data acquisition and bulk analysis compatibility - Full qualitative & quantitative processing functions, multi-function compatibility, GLP/GMP functions, Audit Trail, Validation Assistant, Column Performance function, System Suitability, QA/QC functions - All in-one file configuration for easy data, transfer, customized report generator, networking capability, data management etc. | |
| 9 | Columns | Suitable columns for channel 1 – gaseous compounds analysis and for Channel 2 – Suitable dimensions Polar, Mid-polar and non-polar capillary columns to be offered. | |
| 10 | GC Plumbing | Suitable sample loop, gas supply pipes & OEM make filter kit should be included. | |
| 11 | Calibration gas blend | Suitable calibration gas blend containing known certified concentrations of mentioned gaseous compounds should be provided in 10L capacity cylinder with suitable regulator. | |



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| 12 | Pre-installation requirements | Suitable branded PC system (HP or Lenovo or Dell only, NOT assembled system) including a printer for GC software should be included. Other PC requirement: minimum of 1 TB SSD-Hard drive, Minimum of 16 GB RAM, Monitor (HP or Lenovo or Dell) size: Minimum of 23 inch. Branded 5KVA online UPS with 30min backup should be included. Pre-filled 47L capacity Gas cylinders for Ar, H ₂ and Zero Air with suitable dual stage regulators and tubing should be included. Gas Purification panels for Ar, H ₂ and Zero Air with tubing and installation parts should be provided. Tools, 100 Septa, Teflon tape, Glass bubble flow meter and leak checking solution with Brush. | |
| 13 | Power supply | 220 V AC \pm 10 %, 47 to 53 Hz | |
| 14 | Consumables | i. Injector ferrules – 20 nos ii. Injector liners of capillary injector – 5 nos iii. Injector nuts – 5 nos iv. Injector septa – 50 nos v. Detector ferrules – 20 nos vi. Injector O-ring vii. Gas tight syringe from Vici with side bore needle – 0.5 ml, 1.0 ml, and 2.0 ml (one each) for headspace gas sample injection viii. GC sample vials: 200 nos | |
| 15 | Warranty | 12 months from the date of installation. | |
| 16 | Installation & training | Installation of the instrument is to be done at the IIT Bombay campus, at free of cost. Operational training to be provided to respective groups of research fellows. | |
| 17 | Future upgrades | Provision to upgrade the current GC with i. In line connection with Autoclave reactors | |