

Gas Chromatograph

Purpose

- Quantitative and qualitative analysis of trace concentrations of pesticides, phenols, polynuclear aromatic hydrocarbons and polychlorinated biphenyls in water and sediment samples.
- Fully automated PC controlled with following features:

Conditions & Requirements

- Installation, commissioning and training in operational use shall be by supplier.
- At least 5 years of after sales service shall be guaranteed

Specifications

General Features	<ul style="list-style-type: none"> • Fully automated with programmable pneumatic control (PPC) • The oven should give temperature control and fast cool-down • The oven should provide high heat-up rates in defined temperature ranges to a maximum of 140 °C/min • Instrument should be compatible to computer and software should be Window based • Basic system with PPC/EPC control for carrier/detector zone gases • All parameters should be stored as a part of method for better analysis reproducibility
Functional Display	<ul style="list-style-type: none"> • Functional keyboard with four line alphanumeric display, which should include temperature and pressure, flow parameters, type of carrier gas, carrier gas column pressure flow rates, split flow parameters
Memory protection	<ul style="list-style-type: none"> • Power fail memory protection storage of at least 20 methods, memory storage of at least 20 methods or higher
Injection port	<ul style="list-style-type: none"> • OCI/PTV with auto-injector
Oven and column characteristics	<ul style="list-style-type: none"> • Heated zones: three inlets, three detectors in addition to oven • Volume: approximately 13 Litres or more for easy fixing and removing different types/dimension of columns without compromising rate of heating or cooling of oven • All temperature and time functions should be micro-processor controlled and displayed on the screen, column over-heat protection, should be settable upto 450 °C, temperature ramp rate

	<p>should be programmable from 0.1 °C to 50 °C in steps of 0.1 °C, cool down time 400 °C to 50 °C within 4-5 minutes</p> <ul style="list-style-type: none"> • Columns capacity: 2 or more, accommodate both capillary and mega-bore columns with respective mounting supports • Columns: Approx. 30 m, 3 mm inner diameter and 0.25 mm film thickness, stainless steel, 6 mm outer diameter glass, packed or capillary columns, approx. 15-16 cm diameter coil, provision for interface adapter for packed column • Maximum Packed column length: two approx. 30 cm x 3.5 cm outer diameter, stainless steel or two 3 m x 6 mm outer diameter, glass nominal approx 15 cm column length diameter coil with uniform shape and contact between successive turns and co-overlapping turns • The oven should have excellent temperature control and fast cool down system
<p>Oven temperature</p>	<ul style="list-style-type: none"> • Range: 4 °C above ambient (with zones at 250 °C) to 450 °C • Settings: multi ramp programme from 0 to 49.9°C/min, increment 0.1°C/min, at least 22 different programmable ramp setting, heating rate 0.1 °C/min up to 50 °C/min throughout the operating temperature range • Temperature should be directly selectable in 1 °C steps throughout the temperature range • Average ambient: It should be not more than 0.05 °C change over a 5 °C change in ambient temperature, within the 10 to 35 °C • Sensitivity: It should be within allowable ranges • It should be provided with high-temp protection
<p>Oven temperature programming</p>	<ul style="list-style-type: none"> • At least 22 programmable temperature ramp or higher • Temperature settings: Initial and final temperature should be selectable within 1 °C increments • Time settings: It should be 1 min increments for values 0 to 999 minutes • Programming rate: It should be settable from 0.0 °C/min to 160.0 °C/min in 0.1 °C increments

Pneumatics	<ul style="list-style-type: none"> • Flow system should have provision for dual flow, electro pneumatic and manual control • PPC should provide optimum performance with all types of columns and detectors • Electronic Pneumatic Control (EPC) for setting column flow with pressure gauge and digital display of flow (total flow should not be less than 50 mL/min • Electronic septum purges flow control
Autosampler	<ul style="list-style-type: none"> • There should be a built-in syringe autosampler for maximum sampling capabilities. All control should be accomplished through the keyboard. It should have following features: • Turret Assembly: approximately 25-30 samples • Injection speed: Three speeds i.e. normal, fast, slow • Program modes: at least two methods should be programmable • Sample positions: Approx 5-100 • Vial size: 2-mL (0.25 mL with insert) crimp-top caps 2-mL screw-top caps • Syringe size: At least three options i.e. 0.5 μL, 5.0 μL or 50.0 μL • Sampling volume: 0.1 μL to 0.5 μL from the 0.5-μL syringe in 0.1-μL increments or 0.5 μL to 5.0 μL from the 5.0-μL syringe in 0.5-μL increments or 5.0 μL to 50.0 μL from the 50.0-μL syringe in 5.0-μL increments • Viscosity settings: Provision for 0-15 • Maximum injections per vial: Approx 15 • Maximum solvent postwashes: Approx 15 times • Maximum sample pumps: Approx 15 • Maximum sample prewashes: Approx. 15 • Minimum sample: 5 μL when used with the 0.25-mL vial insert; 350 μL when used with the 2-mL vial • Sample pre-rinse facility to prepares the autosampler syringe in

	advance of the GC becoming ready
Injectors	<ul style="list-style-type: none"> • It should have three port injection systems, one for packed column and two for capillary column • Split/splitless capillary injector with septum purge facility (2 Nos), split range 1:10,000 depending on column • These three injectors should be able to operate simultaneously with independent temperature control • Adapter for on-column injection to wide bore capillary columns • Removable glass liner for trapping non-volatile residues • It should support a comprehensive array of injectors that provides accuracy and precision to all sampling applications. • It should have provision of installation of two injectors which can be operated simultaneously with independent temperature. Every injector should be controlled by PPC • System should be compatible for 3 injectors and 3 detectors • Simultaneous
Detectors	<ul style="list-style-type: none"> • Three detectors i.e. Electron Capture Detector (ECD), Flame Ionization Detector (FID), Pulsed Flame Phosphorus Detector (PFPD)
Electron Capture Detector (ECD)	<ul style="list-style-type: none"> • It should have high sensitivity and good selectivity • Frequency controlling constant current type • It should be PPC pneumatics – software flow control of makeup gas • Source: 15 mCi ⁶³Ni • Temperature protect 470 °C by software • Carrier gas either He/Ar/CH₄ or N₂ • Operating temperature 100 °C to 450 °C in 1 °C increments • Minimum detectable quantity < 0.05 pg perchloroethylene with argon/methane or nitrogen • Linearity > 10⁴

	<ul style="list-style-type: none"> • Signal filtration 200, 800 msec • Makeup gas Standard • Detection limit: better than 1.0×10^{-13} g/sec lindane • Dynamic range: 10^4 • Features: constant current and constant frequency mode for high sensitivity and wide linearity range.
Flame Ionisation Detector (FID)	<ul style="list-style-type: none"> • Operating temperature: It should be within 100 °C to 450 °C in 1 °C increments • EPC pneumatics – software flow control of hydrogen and air • Sensitivity: it should be > 0.015 coulombs/g C • Minimum detectable quantity should be $< 3 \cdot 10^{-12}$ g C/sec nonane at a S/N = 2 to 1 • Linearity should be $> 10^7$ • Signal filtration should be 50, 200, 800 msec • Input range should be 1, 20 • Jet material: fused quartz/ceramic/non-corrosive material
Pulsed Flame Phosphorus Detector or equivalent	<ul style="list-style-type: none"> • Maximum temperature: 450 °C • Detector: photomultiplier tube S/P/N • Minimum detectable quantity: S: 1 pg S/sec (S/P tube), P: 100 fg P/sec (S/P tube), N: 20 pg N/sec (S/P/N tube)
Software	<ul style="list-style-type: none"> • Software performing data analyses at least as per DIN/ISO/US-EPA, calibration, blank correction, data import, export, handling and reporting, quality control protocols, computer based training • Software package for reference library for pesticides preferably NIST
Power supply	<ul style="list-style-type: none"> • 220 VAC $\pm 10\%$, 47 to 53 Hz.
Accessories	<ul style="list-style-type: none"> • Columns for analysis of pesticides, aromatics and petroleum derivatives • Standards for pesticides, aromatics and petroleum derivatives

	<ul style="list-style-type: none">• Septa: Teflon septa suitable for the temperature range up to 400 °C to be provided (Pack of 100): 10 nos• GC installation kit with tools – one• Ferrules: Ferrules for the column of ID 0.25 mm, 0.3 mm and 0.5 mm to be provided in sufficient numbers, the ferrules should be of graphite, polyamide and in combination of both• Syringes 1-10 10-100 micro-litre• Two stage regulators for the gases with oil free tubing for connections and gas purifiers as required• Hydrogen, nitrogen, helium, argon and air gas bottles (cylinders)• Accessories for sample concentration), 250 ml flask and 5 ml volumetric receiver• Manuals for service, operation and maintenance• Application notes for analysis of trace organics in environmental samples• Dust covers• Additional spares and consumables (considering their expiry dates) for two year operation as recommended (e.g. column nut, washers, ferrules, septa, FID jet and connection assembly, soap, bubble gas flow meter, etc.)
--	---