GC-Single Quadrupole Mass Spectrometer Specifications

Ion Source: Must be able to remove all source parts that require periodic cleaning, including the repeller, ion volume and lens stack, without venting mass spectrometer The source should be made of solid, non-coated, inert material. The Source block heater control should have with user-selectable temperature set **points up to 350 °C and better**. The source should have additional lens heater independent of source heater to heat the lenses and ion guide It should have ability to interchange dedicated EI, PCI and NCI sources without venting mass spectrometer. It should have combination EI/CI ion volume for conducting EI & CI experiments within the same chromatographic analysis. It should have electron beam collimating magnets for greater ionization efficiency It should have accurate regulation of emission current **up to 250 µA and above**. It should have Integrated, dual filament assembly with improved filament lifetime and effective regulation of emission current across the available emission current range. Both the filaments should be used in either EI or CI mode. The User definable electron energy should be adjustable from 0-150 eV. It should have constant calibration gas pressure for optimum system tuning. The GC transferline temperature should be programmable up to 400 °C

Quadrupole Mass Analyzer

Mass Range: 1.2 –1100 u, Resolution: Unit mass resolution maintained over the entire mass range. Scan Rate: Ability to scan within entire available mass range (1.2 –1100 u) up to 11,111 u/sec. The Main quadrupole rods should be non-coated, homogeneous, and cleanable.

Detection System: It should utilize new generation discrete dynode electron multiplier integrated with linear-log electrometer with maximum linear output

Vacuum System: It should have high-capacity (>230 L/s) turbomolecular pump with air-cooled high vacuum pump, with control and safety interlocks integrated into the system. It should have ability to perform automated leak check using a metered amount of air as reference. It should have Standard 3.0 m^3/min rotary-vane pump

Instrument Control: It should have ability to acquire data in centroid or profile mode. It should have scan modes like full scan, SIM, and alternating full scan/SIM. It should have ability to alternate between full scan MS and SIM target analysis on successive scans. In full scan/SIM mode, the data should be acquired into a single file with the ability to be parsed into separate views by the data system.

Chemical Ionization (optional): It should have ability to perform Positive Chemical Ionization (PCI) and Negative Chemical Ionization (NCI).It should have dual CI gas flow module, capable of automatically switching between two CI gases on a sample by sample basis through software control.

Installation Specifications

Using helium as carrier gas: EI full scan specs 1 µL injection of 1 pg/µL OFN while scanning from 50-300 u gives for mass 272 an **RMS S/N ≥300:1. PCI** full scan specs 1 µL injection of 100 pg/µL benzophenone while scanning from 80 – 230 u gives for mass

183 an RMS S/N ≥ 300:1, NCI full scan specs 2 µL injection of 100 fg/µL OFN while scanning from 50 – 300 u gives for mass 272 an RMS S/N ≥ 600:1

Library: Latest NIST(Licensed Copy) to be quoted.

GC System

The GC should be having minimal local interface of two interactive buttons (Start/Stop and Maintenance), and 4 status LEDs.

Oven: The column oven should have an operating **range of ambient + 5°C to 450°C**. Heat-up time from 50°C to 450°C within 4 minutes (230 VAC version) Cool-down time from 450°C to 50°C in less than 4 minutes The oven temperature stability is within 0.01 °C/ every °C of actual temperature The oven should support a fast start-up to quickly start operations and for power savings: From power off conditions, programming the oven to 50 °C and with one injector and one detector installed and set to 250 °C, the GC reaches a ready condition in 3.5 minutes.

Pneumatic controls: Electronic pneumatic controls should not be integral part of injector and detector modules and should not install into the oven mainframe. No extra tubing and wires required to operate electrical valves, and deliver carrier, detector and make-up gases to injectors and detectors. The digital carrier gas controller should allow operating in constant and programmed flow and pressure modes. Split/splitless injector with backflush: The dedicated Split/Splitless with backflush injector should be user-installable within a few minutes, and without any special tool. The T-connector between pre-column and the analytical column should be integral part of the injector module. The injector can allow the operator to reverse flow during the GC run, saving time to get rid of the heavier sample and matrix components without changing the GC method until the last component of interest is eluted. The injector can able to operate with capillary, wide bore and packed columns The injector can feature an optimized, modular thermal profile for split and splitless injection with a cold head. The injector can permit large volume splitless injection (up to 50 microliters) without requiring pressure pulse to quantitatively recover the whole sample, and without any further hardware requirement. The injector can allow timed closure/opening of the purge line. Maximum Temperature: 400 °C **Split Ratio: up to 7500:1 or better** Pressure Range: **0-650 kPa (0-100 Psi) or better** Total Flow Setting: Control of split flow in 1 mL/min from 0 to 1250 mL/min Purge flow from 0 to 50 mL/min

HEADSPACSE AUTOSAMPLER

The autosampler must feature an X-Y-Z axis design without the use of transfer lines. The autosampler must be able of performing alternate sampling and injection of: Liquid samples, Gas samples, both Liquid and Gas, samples by SPME technique.

Each configuration (Liquid, Headspace, Liquid + Headspace together) must be expandable to the most complex including Liquid+Headspace+SPME. For configurations capable of multiple injection modes, swapping from one configuration to the other must be unattended, without human intervention to replace syringes or turret. The autosampler must feature a single turret specifically engineered to handle multiple volume liquid syringes, multiple volume gastight syringes and SPME fibers, so to avoid multiple injections turrets and human interventions when swapping injection techniques. The same turret must be able to access both the injectors on the same GC unit, with no limitation as to injector type. During stand-by operations syringes must be positioned away from any

GC hot source. The autosampler, in any configuration, must be installable on two adjacent GCs, and must be able to serve up to four injectors sequentially.The autosampler, in any configuration, must be installable on two adjacent GCs-MS, and must be able to serve up to four injectors sequentially. The autosampler, in any configuration, must feature a pre-load function allowing the sampling system to anticipate syringe preparation phase of sample n+1 during the analytical run of sample n. Teaching of the unit and installed devices' positions must be performed by hand without using any tool. The autosampler must feature or be upgradable to the use of Cooled/Heated trays (+4 / +70°C) through Peltier cells, in order to allow handling of very volatile solvents and of samples that are very viscous at ambient temperature.
CONTROL: The autosampler must be controlled through LAN in remote. The autosampler control (method, sequences etc.) must be possible within the Chromatography Data System in use, without any external software needed. A virtual software terminal must be available as part of the Chromatography Data System in use allowing full control of the autosampler.
VERSION FOR LIQUIDS: Must be able to house up to **294-2-mL sample vials or 600 - 1-mL** vials with the extended X-arm. Must allow installation of two needle length syringes, so to be able to address any injection mode or injector type. Must allow installation and automation of syringes featuring volumes from 0.5 to 10000 µl. Must be able to accurately withdrawn 3ul of sample from a conical type vials containing as low as 5ul of sample Must be able to perform sequential injection in four inlets using different methods and injection modes, regardless the type of injector. Must handle any Large Volume injection techniques. (PTV-LV, LV Splitless, LV- On column).
VERSION FOR HEADSPACE: Must allow housing of up to four (six with the extended length X arm) 60-positions sample trays for a maximum loadability of 240 (360 with the extended length X arm) 10- or 20-mL vials. Must allow headspace injection without using any transfer line or loop valve. Must include an incubation/agitation oven, to be heated up to 150°C, and featuring 6 positions for 10/20 ml vials. .

Software: 1. NIST Library with update
2. All software should be 21CFR compliance

All prerequisites required for installation of instrument to be quoted like: Columns, Gas cylinder, gas Regulators, Gas Purification systems, Tubing, fitting, UPS(10KV)