

LCMSMS - 3500i

Liquid Chromatography triple quadrupole mass spectrometer



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Analytical Technologies Limited

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►► Product Overview

LCMSMS 3500i is the new-generation liquid chromatograph - triple quadrupole tandem mass spectrometer of ATL Technology. It has the stronger ion source, more excellent ion transmission system, higher scanning speed, and lower detection capability. LCMSMS 3500i is applicable for wide application fields, including the environment detection, medical detection, and food safety. The workstation software, which was independently developed based on users' demand, includes the software for professional mass spectrometry control and quantitative analysis. In combination with the functions of standard method library, automatic tuning, intelligent MRM, intelligent batch processing and customized report output, the software greatly reduces the operation difficulty of the mass spectrometry system. Additionally, Mass Expert has thousands of compound standard libraries and rich application method libraries. It can meet the application demands of more mass spectrometry users.

►► LCMSMS 3500i triple quadrupole tandem mass spectrometer

- Excellent performance and easy operation make it possible for LC-MS/MS testing laboratories.

►► Unique biorthogonal ESI and APCI dual ion sources

- LCMSMS 3500i adopts the E-Spray biorthogonal electrospray (ESI) ion source and APCI ion source, and has an excellent ionic yield and organism resistance.

►► Excellent sensitivity

- The product adopts the Step Scan, a kind of newly designed ion transmission technology, which effectively improves the ion transmission efficiency.
- Brand-new 3rd-generation axial accelerating collision cell technology greatly improves collision efficiency.
- The patented technology of pulse counting detection can detect ion signals without loss and filter noise interference effectively

►► **Mass Expert Mass Spectrometry Work Station**

- The control software and analysis software of completely new Mass Expert mass spectrometry are simple to operate. The function of one-click automatic tuning and mass calibration reduces the complexity of instrument control and the threshold of instrument use. Mass spectrometry analysis software and report template can be customized according to different application fields and different users to meet the use needs of various application fields.

►► **Ion interface**

- High-purity nitrogen blow-back for improving desolvation effects and matrix tolerance
- The temperature of the heating gas circuit can be controlled precisely.

►► **ESI/APCI dual ion sources**

- Biorthogonal electrospray (ESI) ion source and APCI ion source, supporting seamless switch
- Orthogonal ion path with 90 degree deflection to reduce neutral particles entering the mass spectrum and reduce noise
- Orthogonal symmetrical two-way desolvation gas based on flow field simulation to maximize solvent removal.

►► **Reliable multi-level vacuum system**

- Multi-level vacuum system based on the molecular pump + backing pump
- Step transition of vacuum to reduce sudden change of air pressure and ion loss

►► **Complete instrument control system**

- All gas circuits, voltages and heating have interlocking control to ensure equipment safety.
- The vacuum system is independently controlled and has perfect self-protection. It can ensure the normal operation of the system without software.
- All gas circuits are controlled by MFC to control all parameters accurately.

►► New-generation step scan ion transmission

- Three Q quadrupole transmission system design is adopted to maximize the transmission efficiency
- Axially accelerated Q-funnel ion acquisition to improve ion transmission efficiency
- Unique Q-lens, connected with ion interface perfectly Q-guide, improved quadrupole transmission channel to ensure all ions efficient transmission.

►► TQ mass analyzer

- Pure molybdenum quadrupole mass analyzer with gold plating for best thermal stability
- Ultrastable frequency-modulation quadrupole RF power supply, optimal resistance to the changes in temperature and humidity, ensuring excellent stability even under common laboratory conditions

►► High-speed dynamic collision reaction cell

- The patented 2nd-generation hexapole collision reaction tank
- The design of axial acceleration enables the ions to pass through the collision cell quickly, ensuring both collision efficiency and transmission efficiency and reducing cross contamination
- The patented distributed diffusion mode of collision gases significantly improves collision efficiency and enhances sensitivity

►► Pulse-counting detector

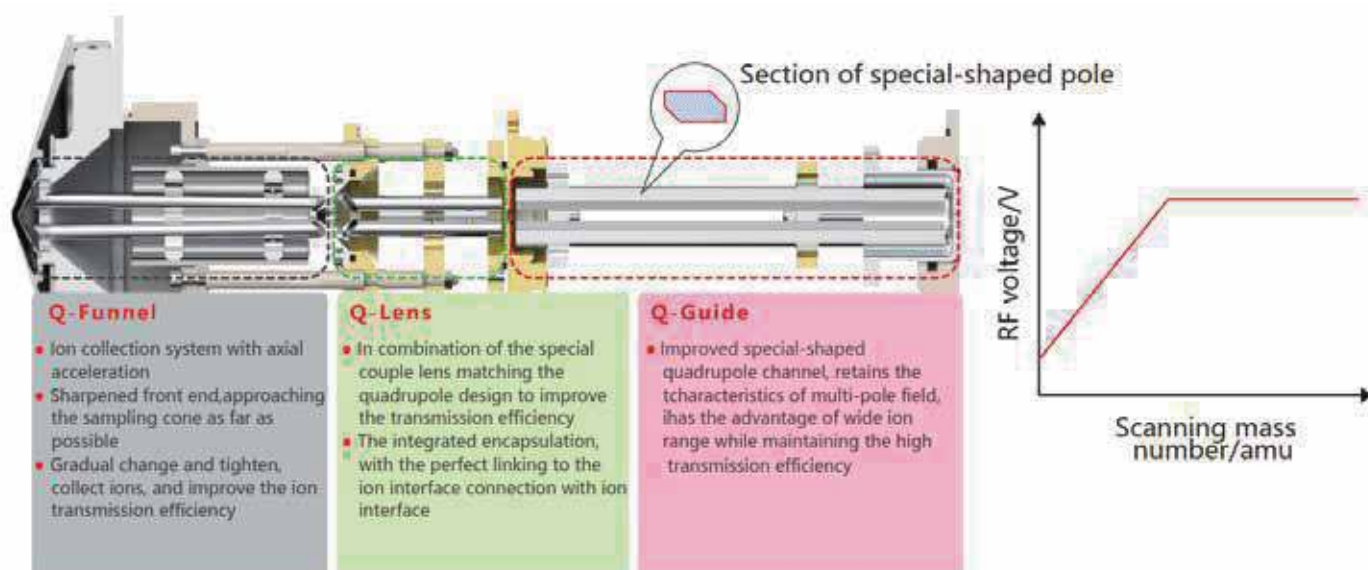
- Special deflecting-channel electron multiplier
- The patented pulse-counting detection provides higher signal response, and generates lower noise



The new-generation dual-3Q ion optical system provides high ion transmission efficiency, excellent matrix tolerance, good balancing sensitivity and stability, and thus superb application effects.

►► Step Scan 3Q ion transmission system

- Integrated packaging, easy to disassemble and cleaning
- Three groups of quadrupoles form a unique TQ ion transmission channel with large ion path and high ion transmission efficiency
- Quadrupole design and step scanning can reduce the interference of low mass ions
- Scanning voltage can be loaded, and special scanning can be realized for specific ions to improve ion selectivity



►► Tandem QQQ mass analyzer

- The design of tandem quadrupole mass analyzer and hexapole collision cell is adopted
- The stable dual-mass analyzer can be used to carry out various mass analysis, and is applicable for the study on different types of mass spectrometry
- Efficient collision cell can transmit various ions to the highest extent
- Including the full scan, selected ion monitor (SIM), single reaction monitoring (SRM), product ion scan, precursor ion scan, neutral loss scan, multiple reaction monitoring (MRM).



►► Self-developed pure molybdenum quadrupole mass analyzer

- Pure molybdenum quadrupole with the best material stability to ensure the stability of the mass axis
- The surface of quadrupole is plated with gold and completely inert to eliminate organic deposits
- The patented closed-loop adaptive adjustment technology of dual RF power supply to improve the stability of quadrupole RF
- The patented temperature and humidity alternating resistance technology can adapt to the working environment of (15 ~ 30) °C, (20 ~ 80)% R.H



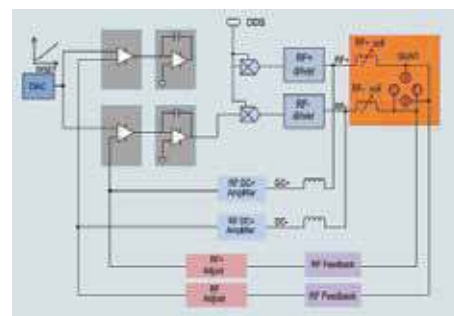
►► Brand-new 3rd-generation axial acceleration collision cell

- Eliminate crosstalk between ion pairs and no memory effect
- Matching ultra-fast liquid chromatography for high-throughput analysis of nearly 100 compounds at the same time



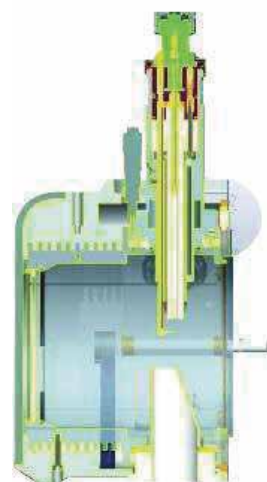
►► Advanced quadrupole RF power technology

- The patented dual-channel RF power closed-loop adaptive adjustment technology is adopted to enhance the stability of quadrupole RF power, ensure the RF power symmetry, and significantly improve the ion screening and the accuracy of ion transmission.
- Completely new temperature and humidity resistance technology is adopted to improve the environmental adaptability of quadrupole driving power supply, and the mass spectrum peaks are very stable in the full temperature and humidity range



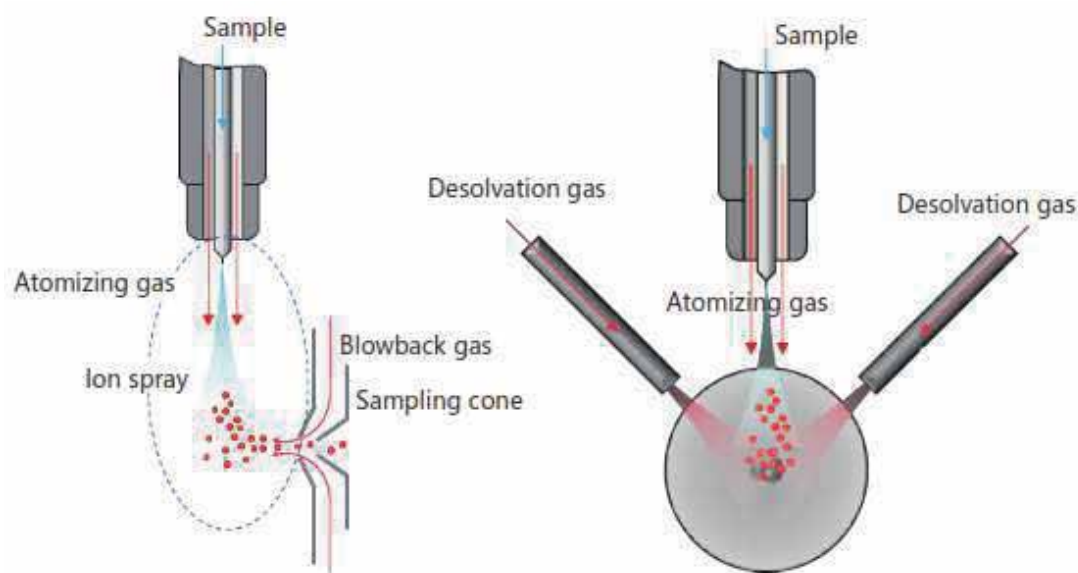
►► ESI/APCI dual ion source

- The orthographic vertical spray ESI ion source and APCI ion source, with 90° deflection for reducing directly sprayed neutral particle pollution, reducing noise while significantly extending the maintenance cycle
- The coaxial atomizing gas forms powerful, stable ion sources, which is applicable for the stable sampling under different flow rates, i.e. 5ul/min - 2ml/min.
- The ion source can be adjusted in a two-dimensional mode, and is suitable for users to optimize the ion collection position based on actual conditions.



►► Orthogonal desolvation gas, aerodynamic and efficient desolvation

- Based on the distribution of aerodynamics and thermodynamics, the spatial position of desolvation gas is optimized, and the orthogonal and symmetrical arrangement has the best desolvation effect.
- Independent temperature control of two-way desolvation gas, and the maximum desolvation gas temperature can reach 700 °C.
- The temperature and flow of desolvation gas can be automatically optimized and switched, and can be flexibly adjusted according to the application to achieve the best effect of desolvation



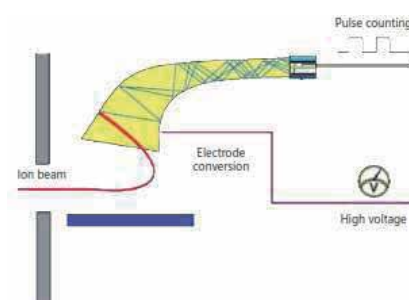
►► Anti-contamination vacuum interface

- The air curtain is formed by the high-temperature nitrogen flow back-blow
- Effectively remove neutral particle
- Prevent large droplet entering the vacuum area
- Negative pressure in atomization chamber to discharge solvent droplets



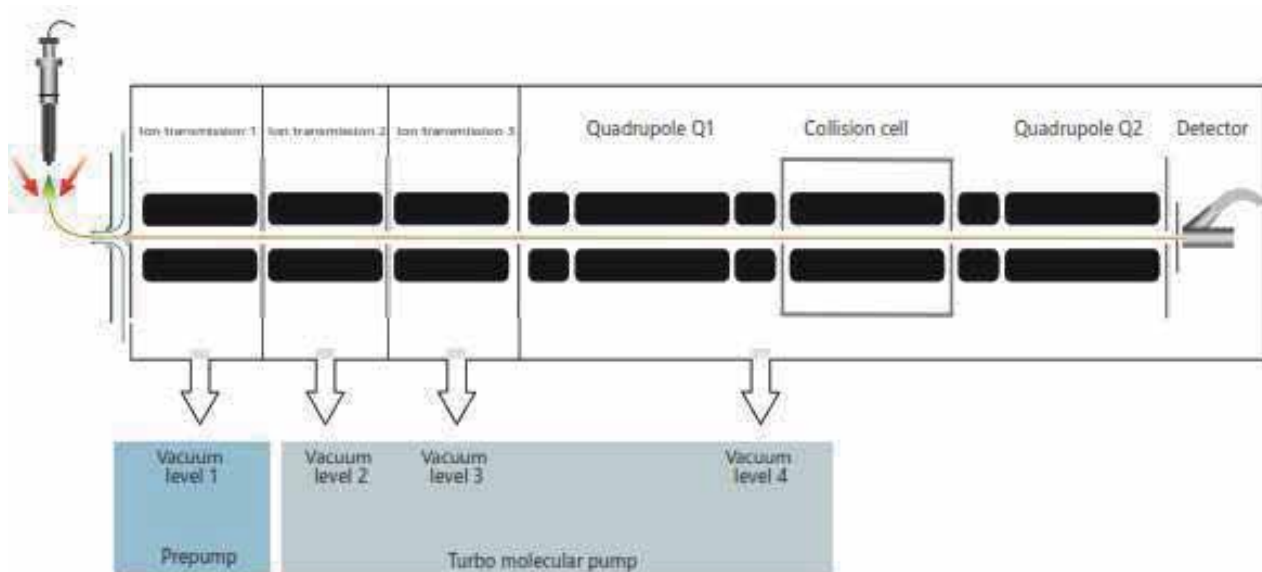
►► Ultra trace single detection

- Channel-type electron multiplier
- Off-axis design, filtering the noise of neutral particles
- Innovative pulse-detection technology can effectively improve the signal-noise ratio and obtain better analysis results



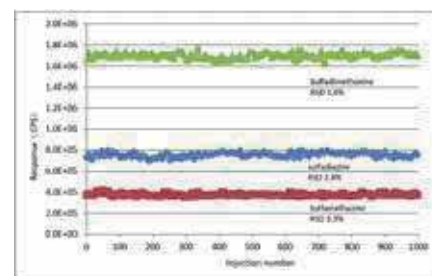
►► Vacuum system

- Differentiation vacuum design is adopted to reduce the ion transmission loss
- Additionally, it reduces the load of the molecular pump, and enhanced the service life of the turbo molecular pump



►► Excellent stability

- 1000 needles of continuous injection over 168 hours, peak area of 3 sulfonamides CV < 4%



►► Powerful and friendly Mass Expert analysis workstation

- Mass Expert work station, providing brand-new user experience and no-barrier learning
- With rich intelligent kits to meet the application needs of different levels from experts to experimenters
- Powerful high-throughput data batch analysis software makes analysts no longer stay at the side of the instrument
- The built-in standard spectrum library contains thousands of compounds, and supports self-built spectrum library, which is convenient for users to build their own methods.
- Provide special solutions for industrial applications, and provide customized method packages for environmental monitoring, online analysis, etc.

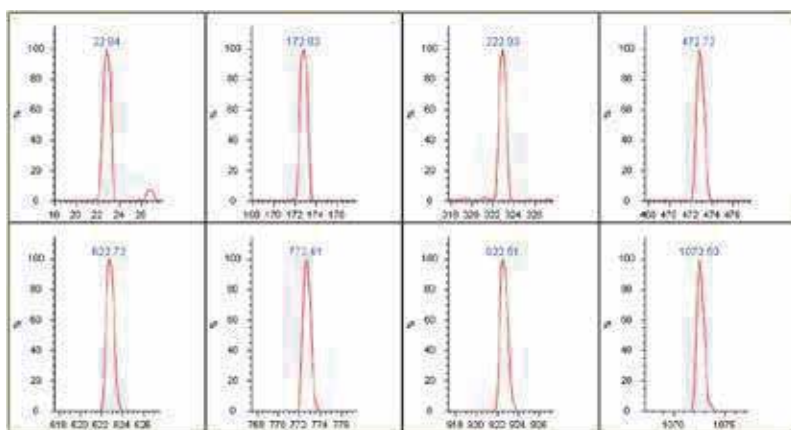
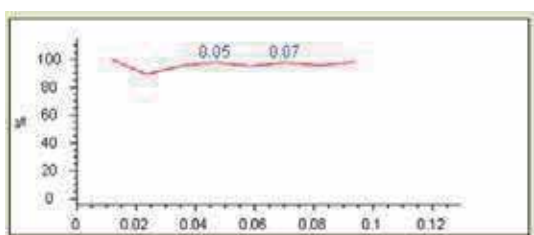
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►► Simple, easy-to-use control software

- The automatic optimization of methods, accelerating the method development procedures
- Monitor instrument status in a real-time manner, reducing the diagnosis and maintenance difficulties

►► Intelligent parameter optimization

- The "one-click" automatic tuning and mass calibration reduce the application difficulty encountered by the user.
- Parameter adjustment tool tailored for advanced users to meet personalized experimental needs



►► Customizable application analysis software

- Customize special software for the applications of environmental protection, medical diagnosis, food safety, on-line analysis, etc.
- With the built-in compound library and analysis method library, it provides analysis method supporting for compounds
- Mark outliers automatically to speed up analysis
- The setting of no parameter automatic integrator to reduce the tedious operation of manual integration
- Analysis data statistics and trend displayed by chart are convenient and intuitive

►► Application scope

The 3500i liquid chromatography - triple quadrupole mass spectrometer, integrating the high separation efficiency of liquid chromatography and the strong identification capability of mass spectrometry, has sufficient sensitivity and selectivity, good stability, and strong anti-interference. Therefore, it is applicable to the high-sensitivity qualitative and quantitative analysis of trace pesticides and veterinary drugs in a complex matrix.

►► Work environment

- 1) Work environment temperature: 18-25°C
- 2) Humidity in the work environment: (20 - 60)% RH
- 3) Power supply: five sets of single-phase (220 ± 20) V AC, 10A, 50 Hz power supply

►► System technical specifications

Configuration and performance indicators of liquid chromatography

- Ultra-high pressure gradient pump
- Two solutions in A and B, or C and D, can be selected as the flowing phase of the system by switching the solvent selection valve.
- A vacuum degasser is equipped, with each pump degassing separately (A/B).
- Flow range: 1-4,000 μ L/min
- Maximum pressure: $\geq 18,850$ psi
- Accuracy of flow rate: $\leq 1\%$
- Precision of flow rate: $\leq 0.075\%$ RSD
- Automatic sample injector
- Three injection modes: full loop injection, partial loop injection and microliter pickup.
- Injection repeatability: full loop injection $< 0.3\%$ RSD; partial loop injection $< 0.3\%$ RSD; microliter pickup $< 1.0\%$ RSD
- Cross contamination: $< 0.05\%$
- Maximum sample capacity: 384 bits, and 96 bits for standard liquid injection.
- Column oven
- Temperature control range: Room temperature +5°C - 90°C
- Temperature control mode: preheating of flowing phase + forced air circulation
- Maximum column capacity: Six 250mm-long chromatographic columns can be installed at the same time.

►► Requirements for configuration and performance indicators of mass spectrometry system

- Ion source (dual-source, i.e. ESI electrospray ion source and APCI ion source, for standard configuration)
- Orthogonal vertical spray design is adopted, so that the system has strong anti-pollution capacity and low background noise.
- Ion source gas supply: 1 loop of nitrogen for atomizing and 2 loops of nitrogen for desolvation. Specifically, the flow rate of nitrogen for atomizing is 0-2 L/min, and that for desolvation is 0-15 L/min. The maximum spray voltage is 6 kV. The flow rate, voltage and temperature can be set up and run under the software interface, to ensure the maximum ionization efficiency and resistance to matrix interference.
- A special exhaust device is set in the ion source to prevent the backflow of gas in the closed ion source cavity, further reduce the memory effect and pollution of the ion source, decrease the load of the mechanical pump, prolong the service time of the mechanical pump oil, maintain the test environment and ensure the health of the staff.
- Vacuum interface and ion transmission system
- High-temperature blowback gas design: Nitrogen is used as the blowback gas, with a flow rate of 0 to 5 L/min to further remove the solvent and reduce the introduction of neutral molecules.
- Heating design of vacuum interface: the cone hole is used for sampling to prevent capillary clogging; it can be heated to 110°C at most to improve the anti-pollution
- Vacuum interface maintenance: simple cleaning and maintenance, without vacuum unloading. The whole process of daily maintenance and installation can be easily completed in a few minutes.
- Ion transmission system: 4-stage differential vacuum design is adopted, and multiple quadrupole transmission is used for accurate focusing of ions.
- Mass analysis system
- Mass analyzer: Gold-plated quadrupole made of high precision pure Mo material is used, and the material can realize the best stability through deactivation; cleanable pre- and post- quadrupoles are set to eliminate the organic deposits; and the best mass axis stability can be ensured without heating.
- Quadrupole: Made of high-precision pure Mo material, capable of ensuring the best mass axis stability.

- Collision cell: Hexapole axial acceleration design is adopted, capable of effectively eliminating the interference of ion-pair and ensuring the high-throughput analysis capability. High-purity nitrogen is adopted as the collision gas (with the purity $\geq 99.999\%$), supplied in cylinders.
- Resolution: unit resolution (full width at half maxima: 0.5 amu)
- Mass stability: better than 0.1 amu/24 hours.
- Scanning speed: $\geq 12,000$ amu/s
- Number of MRM channels: 100 channels/s
- Mass number m/z scope: 5 - 2,000 amu.
- Dynamic range: 6 orders of magnitude.
- Sensitivity: ESI+, MRM mode: 1pg reserpine, injected on the column, with $S/N \geq 200,000:1$; ESI-, MRM mode: 1pg chloramphenicol, injected on the column, with $S/N \geq 200,000:1$;
- Scanning functions: Full scan, selected ion monitoring (SIM), selected ion recording (SIR), production scan, precursor ion scan, neutral loss scan, multiple reaction monitoring (MRM), positive/negative ion switching scan, etc.
- Detector
- Multiplier technology, without any positive and negative ion discrimination effect, which has a long service life, capable of ensuring the long-term data stability.
- Pulse-counting detector, to ensure the data reproducibility of low limit of detection.
- Positive/negative polarity switching time: ≤ 50 ms
- Vacuum system: composed of a mechanical pump and a turbo molecular pump, with a differential pumping system formed between the ion transmission area and mass analysis area, functioning for automatic power-off protection.
- Workstation software:
 - Basic features of software system: Windows XP or later operation platforms. The software can control the liquid chromatography and mass spectrometry, with built-in data processing and report editing functions; besides, the software can realize the function configuration and condition optimization of the instrument automatically, the automatic quantification, the mass spectrometry data analysis, and the establishment and retrieval of the spectral database.
 - The system has the functions of automatic correction and instrument condition monitoring.
 - The LC-MS operation software can be installed on the personal computer, and used for the offline processing of sample analysis data and report generation.
 - In later stages, LCMSMS can be upgraded to be the gas phase-liquid phase-triple quadrupole mass spectrometer.

Accessory system

- Computer system

Brand computer with mainstream configuration, 4GB memory, 1TB hard disk.

- AC stabilized power supply

15 KVA, input voltage of 140 V-300 V, output voltage of 220 V \pm 1%.

- Laser printer

6018L, black and white laser printer.

- Nitrogen generator

The maximum flow is 24 L/min and the maximum pressure is 116 psi.

- Mechanical pump

Pumping speed: 65 m³/h, 220 V power supply, 800 W.

- One cylinder of High-purity nitrogen (including the gas pressure reducing valve).

		S/N	Scan Range/Mass Range(amu)	Scan Speed (amu/s)
3500i	ESI	200000:1	5-2000	12000
	APCI	50000:1		

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HPLC Servicing :HPLC Servicing : We have team of service engineers who can attend to any make of HPLC promptly @the most affordable cost.

Trainings :We also take up preventive Maintenance to reduce downtime of HPLC's Trainings.

AMC's/CMC :AMC's/CMC :We offer user training both in-House and at customer sites on HPLC principles, operations, trouble-shooting.

Validations :Validations :We have protocols for carrying out periodic Validations as per GLP/GMP/USFDA norms.

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3007



Optima Gas
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2979 Plus



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Atomic Absorption
Spectrophotometer



Liquid Particle
Counter



Optical Emission
Spectrophotometer



DSC/TGA



Semi Auto Bio
Chemistry Analyzer



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Reader/Washer



URINOVA 2800
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Regulatory compliances



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