

# EXPEC Product Series



EXPEC 3500 Series GC-MS



SUPEC 7000 Series ICP-MS



EXPEC 5210 Series LC-MS/MS



Full-automatic heavy metal analysis system



XPEC 6500 Series ICP-OES



EXPEC 1370/1330 Series NIR



SUPEC 5000 Series permanganate index



## SUPEC 7000 ICP-MS

New starting point with inorganic mass spectrometry

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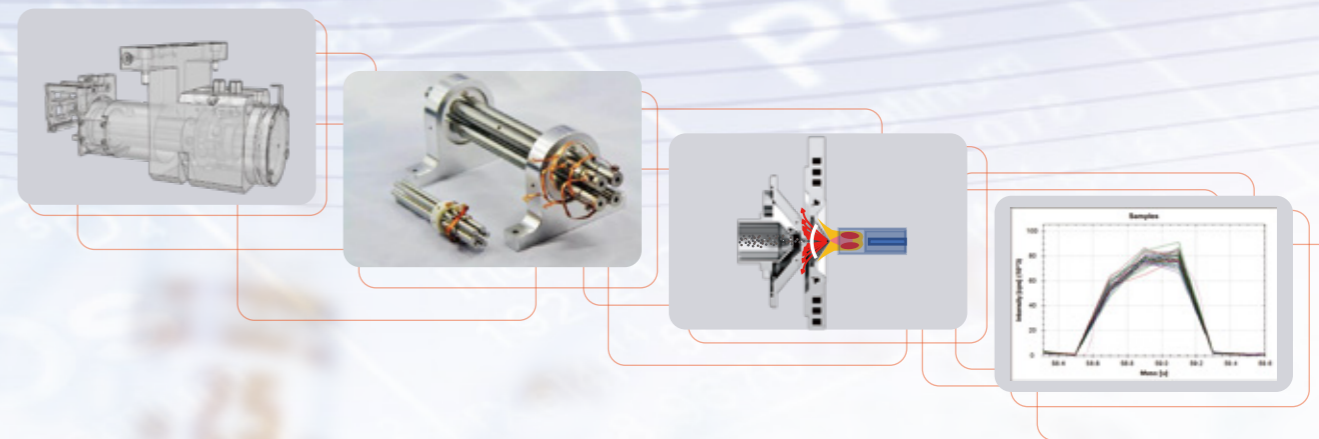
## Third generation ICP-MS with continuous innovation and progress

High sensitivity and reliability SUPEC 7000 inductively coupled plasma mass spectrometer.

SUPEC 7000 ICP-MS was created after core technical difficulties were overcome in mass spectrometry such as flow field control of high temperature gas, multistage gradient vacuum, high sensitivity ion interfaces, distributed collision reaction cells, quadrupole mass analyzer with temperature and humidity resistance, and etc., which is combined with liquid chromatography, online gas dilution system, automatic rapid injection, oxy-combustion, laser ablation, direct injection in atmosphere, organic injection, and other specialized technologies, and meets the needs of various professional applications; at the same time, the combination of Element V, a professional mass spectrometry software system, with standard methodology library, automatic tuning, guided operation mode and visualized status monitoring at any time, greatly reduces the difficulty of the operation of the mass spectrometry software system, and meets the extensive needs of laboratory applications.



Third generation high sensitivity and reliability SUPER 7000 Series ICP-MS



## SUPEC 7000 typical features

Through continuous product innovation, the SUPER 7000 series offers faster analysis speed, higher sensitivity, better interference elimination effect, as well as specialized design that makes the application easier!

### Excellent sensitivity

On the basis of the aerodynamic simulation design at the junction of thermal plasma and vacuum, the ion interface is optimized, and the sensitivity of ICP-MS is increased by 3 to 5 times; and the detection limit as low as ppt is more suitable for the detection of high-purity materials and high-purity reagents.

### Excellent matrix resistance

The matrix resistance of the SUPEC 7000 is so excellent that high-salt samples of up to 10% can be injected directly, which is ensured through the fluid simulation of ion interfaces, design of two off-axes in the front and at the back, patented collision reaction cells, powerful self-excited all-solid-state ICP ion source, argon online dilution, and other key technologies.

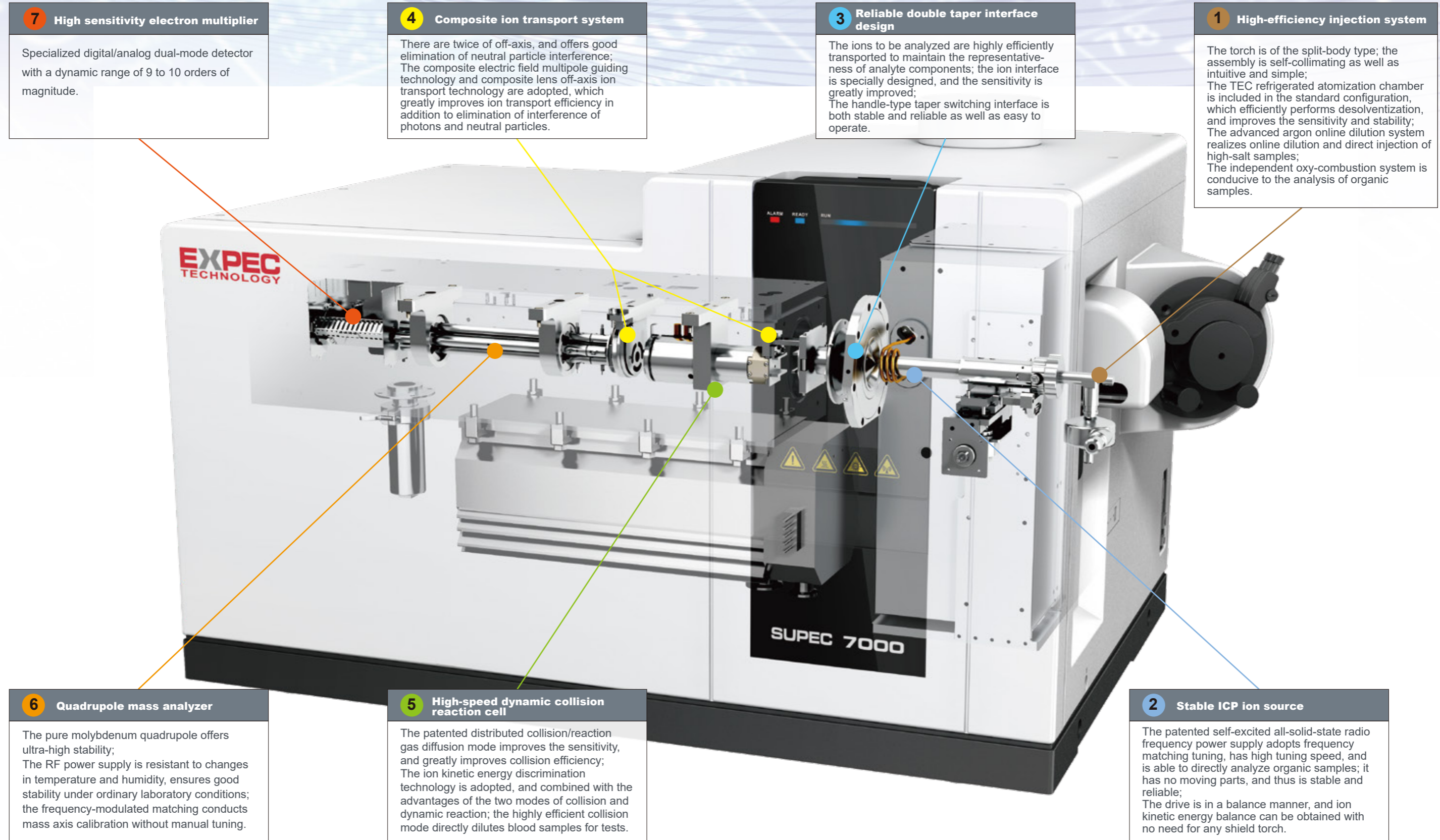
### Unique design for reliability which improves stability

SUPEC 7000 is currently the only ICP-MS that can operate on-board. The product has been specially designed for shock absorption and all-solid-state, has passed comprehensive tests for road load data regarding road conditions when on board of vehicles, as well as practical application tests of tens of thousands of kilometers, and has demonstrated excellent reliability.

### Specialized ICP-MS to solve special problems in applications

- Fully automatic heavy metal analysis system for laboratory filter membranes, soil, and etc.
- On-line monitoring system for heavy metals in surface water
- On-line monitoring system for heavy metals in atmospheric particles
- Heavy metal speciation analysis system based on LC-ICPMS
- Solid direct injection ICP-MS solves difficulties in the analysis of solid refractory samples
- On-line monitoring system on hydrometallurgical processes
- On-line monitoring system for impurity metal elements in high purity reagents for semiconductors
- On-line monitoring system for radionuclides at hazardous locations

# New starting point of inorganic mass spectrometry



## 7 High sensitivity electron multiplier

Specialized digital/analog dual-mode detector with a dynamic range of 9 to 10 orders of magnitude.

## 4 Composite ion transport system

There are twice of off-axis, and offers good elimination of neutral particle interference; The composite electric field multipole guiding technology and composite lens off-axis ion transport technology are adopted, which greatly improves ion transport efficiency in addition to elimination of interference of photons and neutral particles.

## 3 Reliable double taper interface design

The ions to be analyzed are highly efficiently transported to maintain the representativeness of analyte components; the ion interface is specially designed, and the sensitivity is greatly improved; The handle-type taper switching interface is both stable and reliable as well as easy to operate.

## 1 High-efficiency injection system

The torch is of the split-body type; the assembly is self-collimating as well as intuitive and simple; The TEC refrigerated atomization chamber is included in the standard configuration, which efficiently performs desolvation, and improves the sensitivity and stability; The advanced argon online dilution system realizes online dilution and direct injection of high-salt samples; The independent oxy-combustion system is conducive to the analysis of organic samples.

## 6 Quadrupole mass analyzer

The pure molybdenum quadrupole offers ultra-high stability; The RF power supply is resistant to changes in temperature and humidity, ensures good stability under ordinary laboratory conditions; the frequency-modulated matching conducts mass axis calibration without manual tuning.

## 5 High-speed dynamic collision reaction cell

The patented distributed collision/reaction gas diffusion mode improves the sensitivity, and greatly improves collision efficiency; The ion kinetic energy discrimination technology is adopted, and combined with the advantages of the two modes of collision and dynamic reaction; the highly efficient collision mode directly dilutes blood samples for tests.

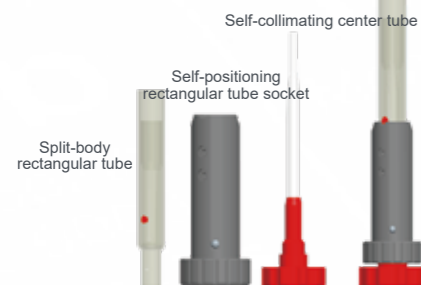
## 2 Stable ICP ion source

The patented self-excited all-solid-state radio frequency power supply adopts frequency matching tuning, has high tuning speed, and is able to directly analyze organic samples; it has no moving parts, and thus is stable and reliable; The drive is in a balance manner, and ion kinetic energy balance can be obtained with no need for any shield torch.

## 1 High-efficiency injection system

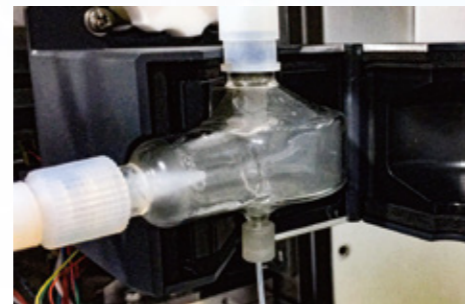
### Split-body torch

Full split-body torch design, self-collimation installation, and simplified torch design greatly reduce the use cost of the torch. Only the central tube needs to be replaced for different applications to meet their different injection requirements such as organic, high salt, high sensitivity, HF acid resistance, and etc.



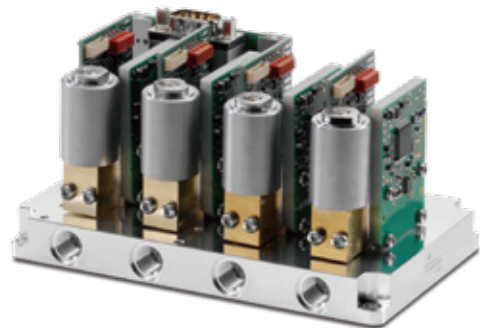
### TEC refrigerated injection included in standard configuration

The injection system is equipped with a TEC refrigeration module in the standard configuration, which greatly improves the continuous working stability of the instrument and its ability to analyze organic solvents, and effectively reduces oxide productivity.



### Full MFC gas control system

A highly integrated high-precision digital MFC gas circuit controller with a control accuracy of <math><0.5\%</math> is adopted. Up to seven channels of MFC can be deployed. Additional dilution gases, auxiliary oxygen, two-way collision gases, and etc. can be deployed in addition to the atomizing gases, auxiliary gases, and cooling gases.



### Online argon dilution system (AGOD)

The system is suitable for complex sample injection analysis under high salt matrix, and is capable of high salt resistant injection analysis and online dilution working mode. The AGOD uses a conventional sampling system, and combines with stable plasma conditions; its sampling depth is deeper and its carrier gas flow is lower. There is a second argon gas flow added between the atomization chamber and the rectangular tube to dilute the sample aerosol before it enters rectangular tube to reduce the total amount of sample that enters the plasma, so that direct analysis can be conducted without adding any reagent or diluting solution.



### Injection by 12-rotor high-precision peristaltic pump

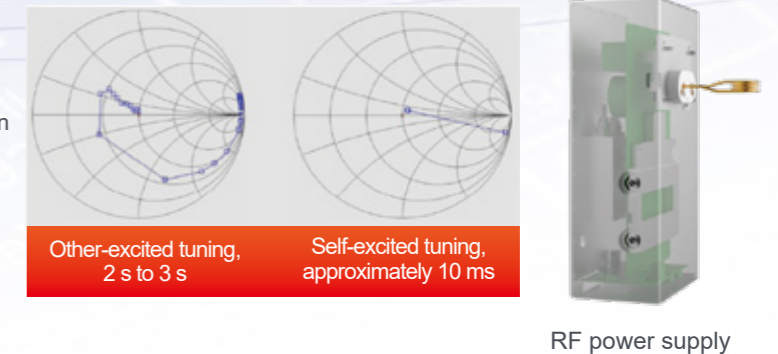
The twelve-rotor high-precision peristaltic pump is equipped in the standard configuration, with optional pump tubes of various materials such as PVC, Solva, Tygon, Viton, and etc., to meet the various needs for the conventional, organic solutions, and long service lives; the optional flared pump tubes greatly reduce the difficulty to use.



## 2 Stable ICP ion source

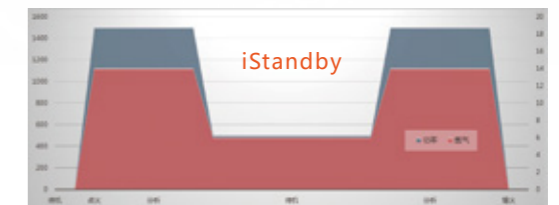
### Patented self-excited all-solid-state ICP ion source

- No matching box needed, millisecond-level fast frequency conversion to match with plasma load changes, and no easy flameout;
- Improved matrix resistance, such as direct injection of buffer salt in arsenic speciation analysis;
- Able to analyze volatile organic solvents, such as: 100% acetonitrile, 100% methanol;
- Balanced drive to reduce ion kinetic energy dispersion and secondary ion generation, without the need for shielding;
- Water cooling to ensure long-term stability.



### iStandby mode

The mode includes automatic low-power standby between analysis intervals, which greatly reduces consumption of argon gas and power, and automatically returns to normal working conditions along with sample injections.



## 3 Reliable double taper ion interface

### Optimized ion interface design

The improved double taper interface perfectly realizes the transition from atmospheric pressure to high vacuum, realizes the effective extraction of representative ions during the transition from ultra-high temperature to normal temperature, and effectively reduces the vacuum load.

### Through aerodynamic simulation

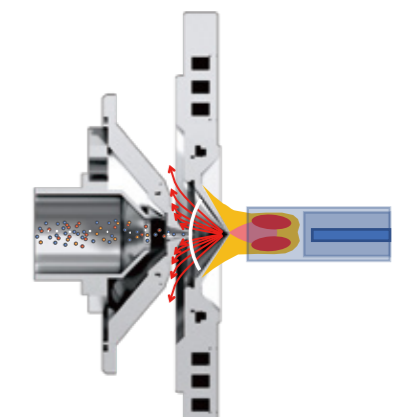
- The double cone design is optimized, and the performance of the instrument is greatly improved.
- The salt deposition is reduced, and the matrix resistance is improved.

### Extraction lens

- Any voltage from -200 to +5V can be applied on the lens, and the extraction voltage can be adjusted arbitrarily for different ions and sample matrices;
- The positive voltage can completely isolate the ions, prevent the ions from entering the ion optical system, and cause unnecessary pollution during standby.

### Minimalist handle type taper switching system

- Innovative handle-type taper switching system with interlock protection to prevent abnormal operations;
- Maintenance through the switching of tapers is easy and convenient which needs no vacuum venting.

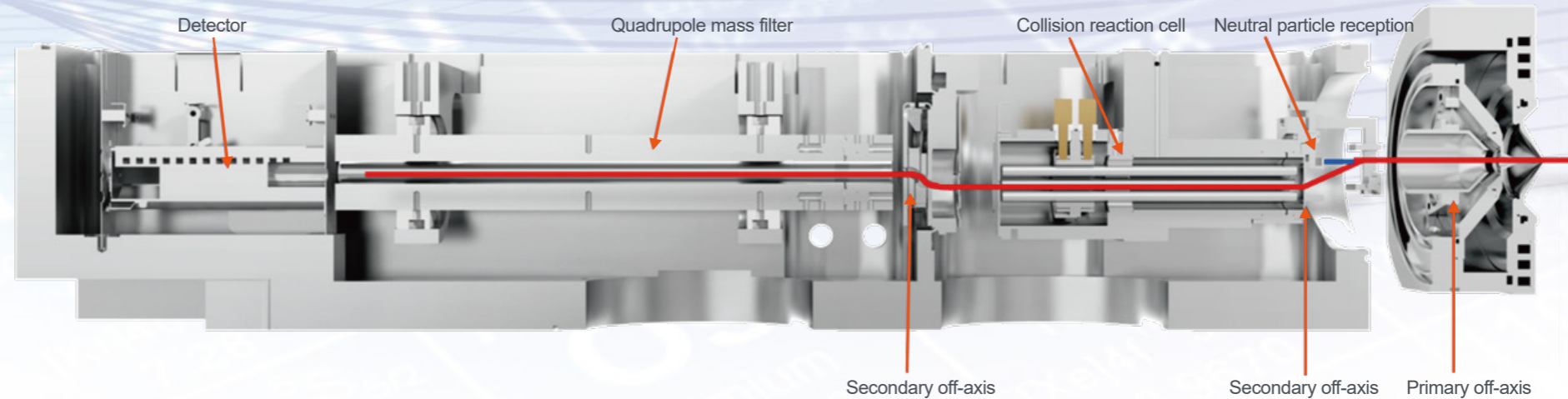


Handle type taper switching system

## High-efficiency ion optical system

- The double taper interface realizes efficient transport of ions under analysis.
- The two off-axes in the front and at the back can effectively eliminate the interfering particles (neutral particles, electrons, photons).
- The patented collision reaction cell technology and distributed intake system minimize the interference.
- The pure molybdenum quadrupole mass analyzer is the most stable choice for high resolution mass spectrometry.
- The dynamic range of the dual mode discrete dynode is up to 9 ~ 10 orders of magnitude

## 4 Composite ion transport system



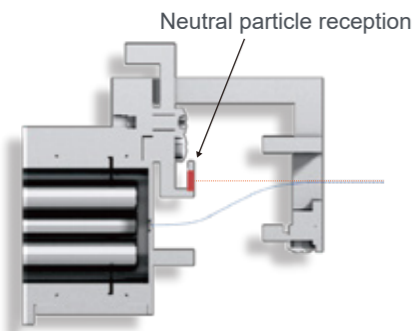
### Unique ion channel

The channel can be flexibly deployed under high sensitivity mode or salt resistant mode with the help of such interface technologies. The taper material is either nickel or platinum.

- The high salt resistance mode ensures the stability of long-term analysis of high salt samples.
- The high sensitivity mode can meet the application requirements of high-throughput analysis of different types of samples

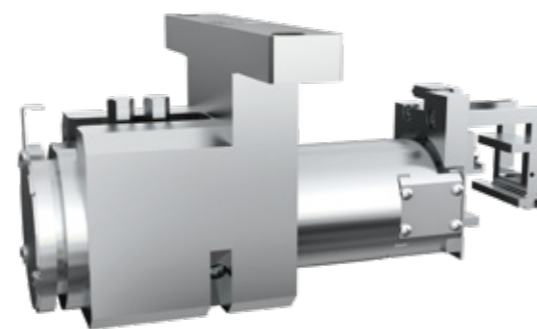
### Open ion deflection lens

- The big opening primary deflecting lens can improve the ion transmittance and hence the sensitivity.
- The special neutral particle reception system cleans the ion lens with no need for replacement.



## 5 High speed dynamic collision reaction cell

- The collision reaction cell with compound electric field has the advantages of small cell volume and high ion transfer efficiency.
- The patented distributed collision / reaction gas diffusion results in a good gas distribution in the cell, and thus greatly improves the collision efficiency and sensitivity.
- The Kinetic Energy Discrimination (KED) provides excellent interference elimination capability.
- Direct dilution injection of blood / serum sample can be achieved, which provides good interference resistance.



## 6 High precision quadrupole mass analyzer

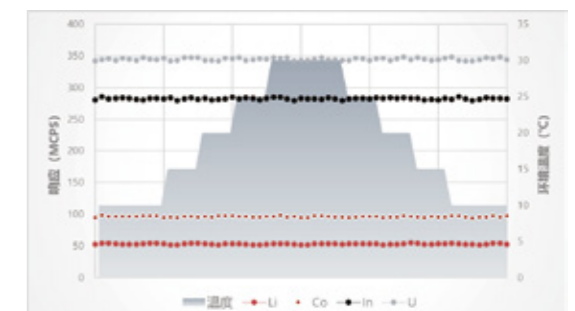
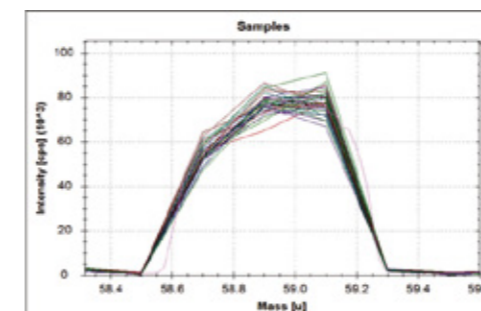
### Unique pure molybdenum quadrupole

- Molybdenum is the best known metal with the best thermal stability, and the performance of Mathew equation stable region of pure molybdenum quadrupoles is the best.
- High precision pure Mo quadrupole ensures the best quality and stability of axes.



### Temperature and humidity sudden changes resistant RF power supply for mass spectrometry

- The patented closed-loop adaptive adjustment technology for double channel RF power supplies to improve the stability of the power supply.
- The patented alternating temperature and humidity changes resistant technology provides adaptation to working environment of (15 ~ 35) °C and (20 ~ 80) % R. H.



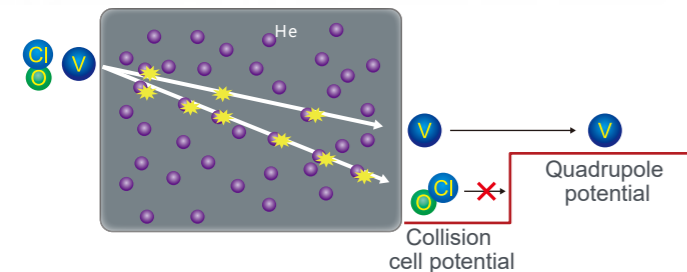
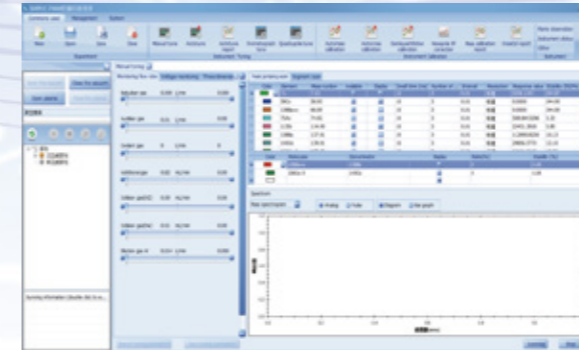
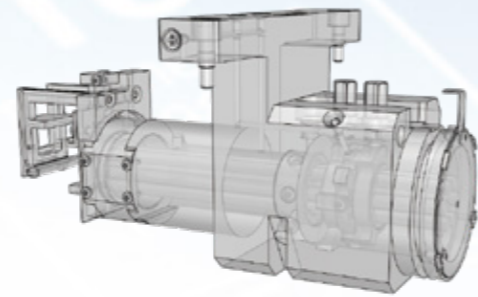
# Outstanding interference elimination capability

# Morphology analysis & direct analysis of solids

## Collision mode + KED to eliminate interference on mass spectrometry.

In the ICP, the polyatomic ions introduced by the solvent and sample matrix may result in serious interference in some target analytes. Therefore, the collision reaction cell (CRC) technology is used to eliminate this interference in quadrupole ICP-MS instruments. SUPEC 7000 is equipped with a new hexapole collision reaction cell system, which greatly enhances the interference elimination efficiency through collision, while maintaining the high-efficiency ion transmission capability. Combined with the ked working mode, SUPEC 7000 provides unparalleled performance in the simultaneous analysis of multiple elements in complex matrix samples.

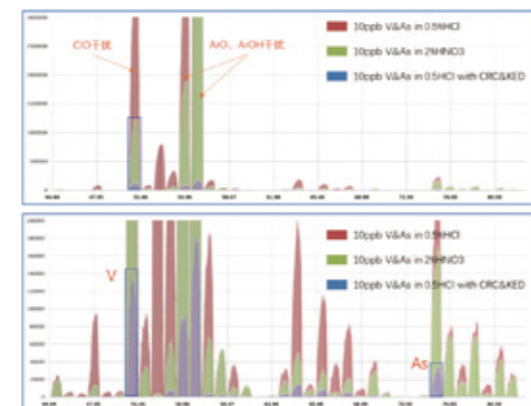
The patented waterfall flow type distributed gas injection system can achieve gas replacement in the cell most efficiently and quickly. The system can, while improving the collision effect, greatly improve the gas replacement speed, and reduce the analysis waiting time.



Kinetic energy discrimination (KED) working mode: The energy loss of each collision between the ion to be measured and the He atom is the same as that between the polyatomic ion and the He atom; yet since the polyatomic ion is larger than the ion under analysis, its chance of collision is therefore greater. At the outlet of the cell, the kinetic energy of the ion to be measured and the interfering ion is no longer the same due to the different times of collisions, and the polyatomic interfering ion will be blocked by potential well voltage blocking of at the quadrupole entrance due to the large kinetic energy loss, and won't be able to enter the mass analyzer.



The detection of trace V in blood samples is easily interfered by ClO ions. It is difficult to detect the level of V of < 0.1 ppb in the conventional collision cell. The SUPEC 7000's patented hexapole collision cell, in combination with KED, can be used to detect trace V in the blood perfectly.



- Visualized operation monitoring
- Real-time display of key operation parameters
- Interlock protection is adopted for plasma in operation (argon, cooling water, ventilation, torch chamber, waste liquid, and temperature)

