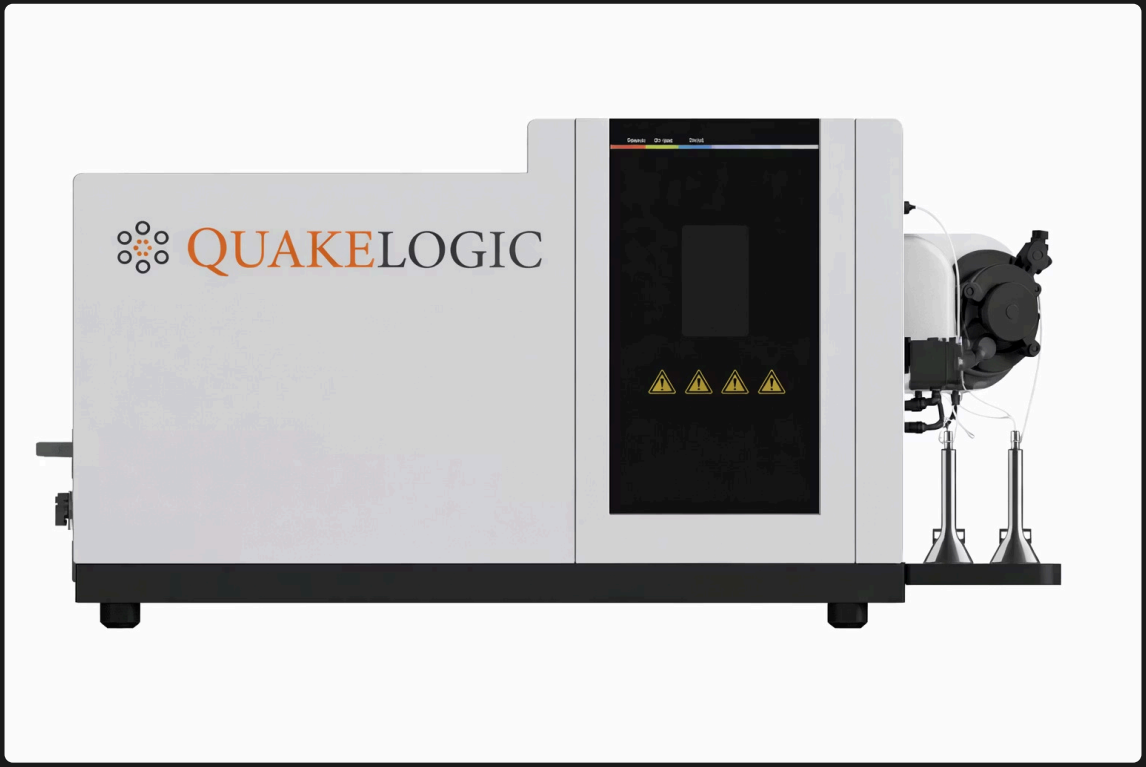
QUAKELOGIC

QL-ICPMS-7000 Inductively Coupled Plasma Mass Spectrometer



Detection Limit
≤ 3 ppt ultra-trace sensitivity

Dynamic Range
>9 orders of magnitude

Low Interference
CeO+/Ce+ ≤ 2%

High Stability
RSD ≤ 2% short-term

System Overview

The **QL-ICPMS-7000** is a heavy metal analysis system based on inductively coupled plasma mass spectrometry technology. The system supports integration with liquid chromatography, autosamplers, graphite digestion systems, and is suitable for trace and ultra-trace elemental analysis.

Technical Design

The QL-ICPMS-7000 employs a balanced drive ion source design, low-background dual off-axis ion optics, six-pole collision/reaction cell, and four-level bar mass analyzer with pure molybdenum quadrupole. The system operates with a pulse/analog dual-mode detector and includes real-time plasma visual monitoring capabilities.

Application Areas

Environmental Analysis

Water and soil sample analysis for trace metal contamination and regulatory compliance

Food Safety

Elemental analysis in food products and agricultural materials

Industrial Materials

Quality control for semiconductors, high-purity materials, minerals, and petrochemical products

Product Testing

Cosmetics, textiles, and related analytical fields requiring trace element detection

Ion Source

The system adopts a balanced drive ion source design to effectively reduce ion kinetic energy dispersion and suppress secondary ion generation.

Design Features

- Eliminates the need for a shielding ring
- Avoids secondary arc discharge
- Ultra-low power standby operation at 500 W
- Reduced argon consumption to 5 L/min during standby

Interface System

The interface system provides critical coupling between the atmospheric pressure ion source and high vacuum mass analyzer.

Cone Configuration

- Nickel and platinum cones supported
- Handle-type cone replacement design
- External maintenance without vacuum leakage
- Interlock protection mechanism included
- Total of 10 sets of cones provided

Ion Optics System

The ion transmission system adopts a low-background dual off-axis structure to effectively remove neutral particles, electrons, and photons, eliminating the need for ion lens replacement.

Extraction Lens

Zero Voltage Mode

Standard ion extraction configuration for general analytical applications

Negative Voltage Mode

Enhanced ion extraction for specific sample matrices

Positive Voltage Mode

Optimized ion transmission for challenging analytical conditions

Maintenance-Free Operation

The design allows maintenance-free operation without frequent cleaning. The low-background dual off-axis structure effectively removes interfering species while maintaining high ion transmission efficiency.

Ion Transmission

The dual off-axis ion optics design provides:

- Effective removal of neutral particles from the ion beam
- Elimination of electron interference
- Photon background reduction
- Extended operational lifetime without lens replacement
- Consistent analytical performance over extended periods

Collision / Reaction Cell

The system uses a six-pole collision/reaction cell with a distributed gas intake structure. This design improves collision efficiency, reduces interference, and enhances sensitivity.

Cell Configuration

Six-Pole Design

The hexapole configuration provides superior ion confinement compared to quadrupole reaction cells. The geometry enables efficient collision and reaction processes while maintaining high ion transmission.

Distributed Gas Intake

The distributed gas introduction system ensures uniform gas distribution throughout the cell volume, optimizing collision and reaction efficiency for interference removal.

Mass Analyzer

A four-level bar mass analyzer with a pure molybdenum quadrupole is used. The quadrupole operates with a low-frequency drive of 2.0 MHz to improve mass axis stability and expand the usable mass spectrum range.

Quadrupole Specifications

Pure Molybdenum Construction

High-purity molybdenum rods provide superior dimensional stability and thermal characteristics for long-term analytical precision

Low-Frequency Drive

2.0 MHz operating frequency improves mass axis stability and reduces electronic noise contributions

Extended Mass Range

Expanded usable mass spectrum range supports analysis across the full elemental spectrum from lithium to uranium

Detector System

A pulse/analog dual-mode detector is employed with automatic switching between modes to support both qualitative and quantitative analysis.

Dual-Mode Operation

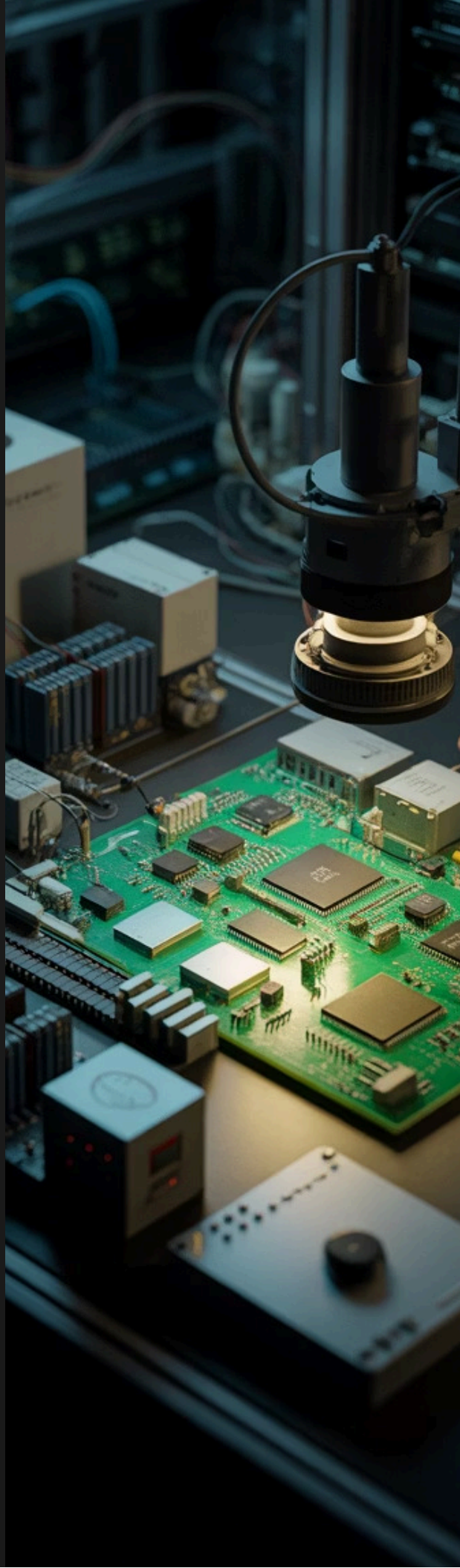
- Pulse counting mode for trace level detection
- Analog mode for high concentration measurements
- Automatic mode switching for extended dynamic range
- Seamless transition across concentration levels
- Single detector design eliminates cross-calibration requirements

Plasma Visual System

The plasma visual monitoring system enables real-time observation of plasma conditions. Electromagnetic shielding is included to reduce interference.

Monitoring Capabilities

- Real-time plasma state observation
- Cone orifice condition monitoring
- Central tube visual inspection
- Electromagnetic shielding for interference reduction
- Diagnostic support for method development and troubleshooting



Sample Introduction System

The sample introduction system is designed for efficient sample delivery, acid resistance, and reduced oxide formation.

Nebulizer Configuration

Quartz Concentric Nebulizer

Standard nebulizer configuration for general sample introduction applications

PFA Micro-Injection

Improved acid resistance including HF compatibility for challenging sample matrices

Spray Chamber

Cyclone atomization chamber with a thermoelectric refrigeration module operating below -15°C is used to reduce oxide yield and memory effects.

Torch Configuration

Torch Design

- Detachable quartz torch tube
- Multiple central tube options supported
- High-precision mass flow controllers for gas control

Optional Enhancements

- Online gas dilution system
- Improved salt tolerance
- Extended dilution capability

Sample Delivery Features

- Thermoelectric spray chamber cooling below -15°C
- Reduced oxide formation (CeO+/Ce+ ≤ 2%)
- Minimized memory effects between samples
- HF-compatible sample introduction pathway
- Precision gas flow control for reproducible plasma conditions

Software and Automation

The system operates on Windows 10 and provides comprehensive instrument control and data processing capabilities.

Software Functions

Instrument Control

- Automatic tuning
- Automatic diagnostics
- Real-time instrument visualization
- Real-time data display

Data Processing

- Report generation
- QC functions supporting EPA methods
- Offline data processing
- Quantitative and qualitative analysis tools

System Integration

- Interfaces for HPLC-ICP-MS
- Microwave digestion system integration
- Autosampler control
- One-key automated analysis

Quality Control

The software includes quality control functions that support EPA analytical methods, ensuring regulatory compliance for environmental and industrial testing applications.

Automation Capabilities

One-key automated analysis functionality streamlines routine analytical workflows. The system supports integration with liquid chromatography systems for speciation analysis and interfaces with microwave digestion systems for complete sample preparation and analysis automation.

Technical Specifications

Parameter	Specification
Mass Range	2–260 amu
Linear Dynamic Range	Greater than 9 orders of magnitude
Sensitivity - Li	≥ 30 Mcps/ppm
Sensitivity - In	≥ 300 Mcps/ppm
Sensitivity - U	≥ 350 Mcps/ppm
Detection Limit	≤ 3 ppt
Short-term Stability (RSD)	≤ 2%
Long-term Stability (RSD)	≤ 3%
Oxide Ion Ratio (CeO+/Ce+)	≤ 2%
Double Charge Ratio (Ce2+/Ce+)	≤ 3%
Abundance Sensitivity	≤ 1×10^{-6}

Standard Configuration

Core Instrumentation

- ICP-MS host system
- RF generator
- Quadrupole mass analyzer
- Collision/reaction cell
- Vacuum system
- Detector system

Sample Introduction

- Sample introduction system
- Cooling circulating water system
- Standard accessories required for operation

QuakeLogic QL-ICPMS-7000: Advancing Analytical Precision

QuakeLogic, an industry leader in analytical instrumentation, provides laboratories with the **QuakeLogic QL-ICPMS-7000**, designed for superior elemental analysis, robustness, and unparalleled data quality.

Connect with QuakeLogic for QL-ICPMS-7000

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For technical specifications, application support, and product inquiries regarding the **QuakeLogic QL-ICPMS-7000**.

Available Monday - Friday, 8 AM - 5 PM PST

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Contact us for detailed product demonstrations, purchasing information, and tailored solutions for your analytical needs.

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