



# Specifications

## Agilent 7500 Series ICP-MS

Simpler. Faster. More accurate.  
Step up to a new level in ICP-MS





## A Range of Systems – Tailored to Your Needs

The new 7500 Series comprises two different models – the 7500cx and 7500cs – to precisely meet your application requirements. For total flexibility, each model can be configured or upgraded with optional features as required.

### Common features of both systems

- Compact Benchtop design permits easy integration into existing laboratory space
- All stainless steel chassis for superior corrosion resistance
- Open architecture sample introduction area simplifies interfacing to alternate sampling accessories
- Peltier-cooled spray chamber for optimum stability and lowest oxide interferences
- Fully automatic, computer controlled torch position in all three axes
- ShieldTorch System (STS) for highest sensitivity, best ion energy control
- Agilent Active Mass Flow Controllers (AMFC) for accurate and precise control of all plasma and collision/reaction cell gases
- High efficiency digital drive 27 MHz ICP RF generator is all solid state and maintenance free
- True hyperbolic profile quadrupole rods for excellent ion transmission and superior abundance sensitivity
- Highest frequency, digitally synthesized 3 MHz RF Quadrupole Driver for enhanced mass spectrometer performance
- Simultaneous dual mode detector with exclusive high-speed amplifier provides true nine orders of linear dynamic range



Guaranteed expandability and on-site upgradeability means that your investment is protected no matter how your application needs change.

# Specifications

## Sample Introduction

### Nebulizers

7500cx – MicroMist glass concentric nebulizer  
7500cs – PFA micro flow nebulizer  
Other nebulizers are available.

### Spray Chambers

7500cx and 7500cs – Quartz Scott-type  
Optional PFA spray chamber available for all instruments

### Peristaltic Pump(s)

Agilent design high precision, 3-channel, 10-roller pump allows precise computer controlled pumping of sample, internal standard and spray chamber drain. A second, optional peristaltic pump is available for applications requiring additional pumping channels or simultaneous multiple pump speeds. Both pumps are located adjacent to the spray chamber for fastest rinse in/out and minimum transfer line volume.

## Plasma

### Plasma Gas Control

Agilent's Active Mass Flow Controllers (AMFC) control plasma, auxiliary, makeup, and carrier gas on the 7500cx, while the 7500cs adds a 5<sup>th</sup> mass flow controller for oxygen addition or other alternative carrier gas (optional on 7500cx).

### Torch

Standard, one-piece quartz torch with wide diameter (2.5 mm) injector for efficient matrix decomposition and sample ionization. Demountable torch with platinum or sapphire injector is optional. Optional taper torch and narrow injector torch(es) available for organics analysis.

### Torch xyz Position

Torch position is fully computer controlled and autotunable in all three axes (xyz), and movement in each axis is independent of the other two. Torch auto-aligns after routine maintenance. Torch position resolution and reproducibility are 0.1 mm in all three axes.

### Plasma RF Generator

Agilent 7500 Series mainframes utilize Agilent's unique all solid state, digitally driven 27 MHz RF generator. 27 MHz is known to promote more efficient ionization than 40 MHz designs, and the all solid state Agilent RF generator requires no regular replacement of RF power tubes.

### ShieldTorch System

The 7500 Series mainframes are fitted with Agilent's unique ShieldTorch System. The ShieldTorch System significantly reduces plasma ion energy spread, which increases sensitivity and permits kinetic energy discrimination of polyatomic interferences in ORS equipped instruments. It also minimizes plasma potential, allowing efficient cool plasma operation.

## Interface

### Cones

Optimized sample cone and skimmer cone design providing both high ion transmission and exceptional matrix tolerance.  
7500cx – Nickel (platinum optional)  
7500cs – Platinum (nickel optional)

## Ion Optic

### Extraction Lenses

Dual extraction lenses permit conventional and soft-extraction modes. The extraction lens configuration provides a "flat" mass response, delivering unmatched low mass transmission, while also minimizing interface backgrounds.

### Omega Lens

Agilent 7500 Series mainframes utilize Agilent's proprietary off-axis Omega lens to eliminate backgrounds due to photons and neutrals. Unlike older photon stop or shadow stop designs, the Omega lens maintains high analyte ion transmission across the mass range by avoiding defocusing and dispersion of the ion beam. The ion lenses are situated outside the high vacuum region, for ease of maintenance.

## Vacuum System

### Expansion Stage

Single, floor mounted rotary pump; can be located remotely to minimize noise, vibration and heat.

### Intermediate and Analyzer Stages

Single, 2-stage turbomolecular pump

## Octopole Reaction System

### Collision/Reaction Cell

The Agilent 7500cx and 7500cs systems utilize Agilent's unique Octopole Reaction System (ORS) to eliminate polyatomic interferences from the spectrum. The ORS employs an octopole cell for higher focusing power than hexapole or quadrupole cells, enabling operation in collision mode, using pure helium (He) cell gas. Helium removes all matrix polyatomics without creating new interferences, so eliminating the need for sample- and analyte-specific cell conditions. Hydrogen (H<sub>2</sub>) reaction mode (standard on the 7500cs, optional on the 7500cx) is used for ultra-trace Se analysis and semiconductor applications. All non-ORS 7500 instruments can be upgraded on-site to ORS configuration if future needs dictate.

### Cell Gas Mass Flow Controllers

AMFC mass flow controllers for 1 ORS cell gas line on 7500cx, and 2 ORS cell gas lines on 7500cs; any ORS mainframe can be upgraded to a maximum of 3 cell gas lines.

## Quadrupole Mass Analyzer

### Quadrupole

Agilent-manufactured quadrupole with true hyperbolic-cross section rods, providing better peak shape and resolution than conventional round rods. The 7500 Series is the only ICP-MS to use a true hyperbolic quadrupole.

### RF Generator

Agilent's unique digitally synthesized RF generator insures better power transfer efficiency than conventional analog generators, and, being solid state, there are no RF tubes to replace. Operating at 3 MHz, the highest frequency of any ICP-MS, the generator helps give the 7500 Series the best abundance sensitivity specification of any ICP-MS.

Mass Range: 2 – 260 AMU  
 RF Frequency: 3 MHz  
 Abundance Sensitivity: Low Mass  $\leq 5 \times 10^{-7}$   
 High Mass  $\leq 1 \times 10^{-7}$

## Dual-Mode Detection System

### Detector

The 7500 Series ICP-MS systems utilize a discrete dynode electron multiplier detector, which operates in a simultaneous dual-mode, giving nine orders linear dynamic range.

### Detector Electronics

Agilent's unique log amplifier circuit features a high speed analog mode for transient signals, and a true nine orders dynamic range.  
 Minimum Dwell Time: 100  $\mu$ s (in both pulse count and analog modes).  
 Working Concentration Range: Detection Limit to 500 ppm.  
 Maximum measurable concentration can be extended to >1000 ppm in He mode (7500cx, 7500cs) – without any adjustment of ion lens settings, analyzer resolution or detector voltage.

## Software That Facilitates Set-Up and Analysis

The Agilent ICP-MS ChemStation software provides a powerful operating environment for both the routine, high volume testing laboratory and the academic research facility. Virtually every instrument function is under full computer control. Routine instrument setup and optimization is fully automated, from total auto-tune capability and automatic torch realignment after maintenance, through automated hardware diagnostics and troubleshooting, to automated method setup via the Method Wizard.

The ChemStation fully supports acquisition in all modes including full spectrum, peak hopping, and time resolved. Data analysis is supported using isotope ratio, isotope dilution, external and standard addition calibrations, with or without the use of internal standards. *Virtual Internal Standards (VIS)* allow the user to base the internal standard correction on a "virtual" mass, by interpolating between existing internal standards. Semiquantitative analysis is fully supported, for rapid screening of unknown samples; semiquantitative analysis is also compatible with helium collision mode for interference-free screening analysis.

Powerful data archival and retrieval functions are built-in, as are tools for bidirectional LIMS connectivity. Batch sample results, including methods, calibrations, and all QA/QC results, can be automatically stored in a date/time stamped file for export. A list of samples, for example those scheduled for analysis by a LIMS, can be imported directly into the analytical sequence. A powerful macro programming language allows additional ChemStation customization for even more flexibility.

Operating System:	Microsoft Windows XP
Autotuning:	Included
Custom Reporting:	Included
Macro Programming Language:	Included
Intelligent Sequencing:	Optional
Data Security Pack:	Optional

## Accessories and Peripherals

A wide range of options and accessories is available for all 7500 Series instruments. These options, including hardware and software, are designed to meet the needs of specialized applications including hyphenated techniques such as LC-, IC- or GC-ICP-MS and laser ablation ICP-MS. Following is an indication of some of the specialized software and hardware options, which insure that the 7500 Series instruments are the most capable and flexible ICP-MS systems available.

### Software

**Intelligent Sequencing** – user configurable QA/QC and sequence automation software, for full regulatory compliance. Meets US EPA and other requirements. Allows ChemStation to automatically make QA/QC decisions and execute appropriate actions during unattended operation. Controls such system operations as automatic autodilution (when ISIS is configured), calibration and interference checking, recalibration, sample reruns, and customized QC reporting.

**Plasma Chromatographic Software** – Real-time chromatographic data analysis package based on Agilent's industry leading GC/MS software. It includes sophisticated chromatographic data analysis tools for analysis of LC- or GC-ICP-MS data. Since it operates in real-time, during data acquisition, it is capable of automatic sequence recalibrations, retention time and ion ratio updates and automated report generation.

**User Access Control Pack** – Designed to meet the needs of laboratories requiring a high level of data security and traceability. The User Access Control Pack monitors and records user access to the system and data.

### Hardware

**Agilent Integrated Autosampler (I-AS)** – A close-coupled, covered autosampler with flowing rinse port, for low volume and ultra trace analyses.

**Integrated Sample Introduction System (ISIS)** – ISIS can be added to any 7500 Series ICP-MS. It consists of two additional high precision peristaltic pumps and two optional 6-port switching valves, all under computer control and closely integrated into the sample introduction area. ISIS can be configured for on-line, real time intelligent autodilution, high sample throughput, discrete sample analysis, low-pressure liquid chromatography, hydride generation, online matrix elimination and more.

**Second Peristaltic Pump** – An optional second peristaltic pump can be added to any 7500 Series instrument not fitted with an ISIS, to increase sample throughput with constant flow nebulization.

**GC-ICP-MS Interface** – Agilent's GC-ICP-MS interface was the first commercially available GC interface and remains the gold standard in difficult GC-ICP-MS applications. Only the Agilent GC interface is heated from the GC oven to the tip of the ICP injector, eliminating cold spots that can interfere with the chromatography of high boiling point compounds. Additionally the Agilent GC interface uses an inert SilcoSteel™ liner to minimize breakdown of labile compounds. The Agilent GC interface is under complete control from any Agilent 6890 gas chromatograph, fully controlled via the GC method, and does not require any external controllers or power sources.

**LC Connection Kit and Arsenic Speciation Kit** – The Agilent LC connection kit allows any 7500 Series ICP-MS to be interfaced to any Agilent or other HPLC or IC system. It includes all necessary tubing, connectors and cables for seamless LC-ICP-MS integration. The Arsenic speciation kit includes the column, pre-column, connectors and instructions for the turn-key analysis of arsenic species in urine.

**Cr Speciation Kit** – The Cr Speciation Kit utilizes a proprietary Agilent IC column for Cr speciation in natural waters.

**Organic Solvent Introduction Kit** – The organic solvent kit allows the direct measurement of organic solvents that would normally not be possible by ICP-MS, or would damage standard sample introduction components.

**Laser Ablation** – The 7500 Series can be integrated with any commercially available laser ablation system for both routine and research applications.



*Integrated Autosampler*

## Environmental Requirements

### Operating Temperature

15-30°C, <2°C/hr (max change: 5°C)

### Operating Humidity

20-80% (non-condensing)

## Utility Requirements

### Electrical Power

Single phase 200-240 V, 30 A, 50/60 Hz

### Cooling Water

Inlet Temperature: 15-40°C  
Minimum Flow Rate: 5 L/min  
Inlet Pressure: 230-350 kPa (33-51 psi)

### Argon Gas Supply

Minimum Purity: 99.99%  
Maximum Flow Rate: 20 L/min  
Supply Pressure: 700 kPa (100 psi) ± 3.5%

### Exhaust Duct

Extraction Flow Rate: 4-6 m<sup>3</sup>/min  
(7-8 m<sup>3</sup>/min with optional duct)

## Dimensions

### Product Dimensions (7500cx, 7500cs)

#### Mainframe\*

Height: 830 mm (32.7 in)  
Width: 1100 mm (43.3 in)  
Depth: 720 mm (28.3 in)  
Weight: 175 kg (386 lbs)

#### Rotary pump

Height: 550 mm (21.7 in)  
Width: 570 mm (22.4 in)  
Depth: 170 mm (6.7 in)  
Weight: 36 kg (79 lbs)

\*PC, printer, options and peripherals are not included.

## Shipping Container Dimensions

### Mainframe\*

Height: 1020 mm (40.2 in)  
Width: 1220 mm (48.0 in)  
Depth: 850 mm (33.5 in)  
Weight: 230 kg (508 lbs)

### Rotary pump

Height: 900 mm (35.4 in)  
Width: 1030 mm (40.6 in)  
Depth: 680 mm (26.8 in)  
Weight: 108 kg (238 lbs)

\*PC, printer, options and peripherals are not included.

## Safety

### Safety

All Agilent 7500 Series ICP-MS Systems meet:  
IEC61010-1: 2001/EN61010-1: 2001  
CSA C22.2 No.1010  
UL61010A-1

### EMC

IEC61326-1: 1997+A1:1998+A2:2000  
EN61326-1: 1997+A1:1998+A2:2001  
ICES-001: 1998  
AS/NZS 2064.1

### ISO

Agilent 7500 Series ICP-MS are manufactured at an ISO 9001 and ISO 14001 certified facility.



## Performance Specifications

Sensitivity	7500cx			7500cs		
	No gas	He mode	H <sub>2</sub> mode (where fitted)	No gas	H <sub>2</sub> mode	He mode
Li(7) <sup>1</sup> MHz/ppm	≥ 30			≥ 50	≥ 20	
Y(89) <sup>1</sup> MHz/ppm	≥ 80	≥ 15	≥ 30	≥ 160	≥ 100	
Tl(205) <sup>1</sup> MHz/ppm	≥ 40			≥ 80	≥ 90	
Co(59) MHz/ppm						≥ 40
<b>Background<sup>1</sup></b>	≤ 5 CPS <sup>2</sup> (9 AMU)			≤ 5 CPS <sup>2</sup> (9 AMU)		
<b>Oxide %(CeO<sup>+</sup>)<sup>1</sup></b>	≤ 1.5	≤ 0.8		≤ 6		
<b>Doubly Charged %(Ce<sup>2+</sup>)<sup>1</sup></b>	≤ 3.0			≤ 6		
<b>Detection Limit ppt (3σ)</b>						
Be(9)	≤ 1.5			≤ 0.5		
In(115)	≤ 0.5			≤ 0.1		
Bi(209)	≤ 0.5			≤ 0.1		
Se(78)			≤ 4 ppt			
Fe(56) (H <sub>2</sub> mode)					≤ 3 ppt	
Fe(56) (cool)				≤ 3 ppt		
<b>Short Term Stability (%RSD)</b>	≤ 3% (20 min)			≤ 3% (20 min)		
<b>Long Term Stability (%RSD)</b>	≤ 4% (2 hrs)			≤ 4% (2 hrs)		

<sup>1</sup> Measured and verified on site at installation under a single set of tuning conditions.

<sup>2</sup> Background measured as mean counts, not standard deviation.



[www.agilent.com/chem](http://www.agilent.com/chem)

#### **Facts at Your Fingertips**

Stay up-to-date on the Agilent 7500 Series ICP-MS, and other Agilent products. Register at [www.agilent.com/chem/registration](http://www.agilent.com/chem/registration) to receive exclusive benefits, such as:

- Personalized email notifications that reflect your specialized interests
- Access to “how-to” videos, chromatogram libraries, application notes, and more
- Free firmware and software updates
- Faster registration for free e-Seminars and other training

#### **The Agilent Promise – 10 Years of Guaranteed Value**

The Agilent 7500 Series ICP-MS is backed by the Agilent Value Promise. This promise guarantees you at least ten years use of your 7500 Series ICP-MS, from the date of purchase, or Agilent will credit you with the residual value of the system when you upgrade to an Agilent replacement system.

#### **For More Information**

To learn more about the Agilent 7500 Series ICP-MS – including how it meets the changing demands of the environmental, semiconductor and research industries – visit [www.agilent.com/chem/icpms](http://www.agilent.com/chem/icpms).

Or call 1-800-227-9770 (in the U.S. and Canada) for a free, no-obligation demonstration.

In other countries, please call your local Agilent Representative or your Agilent Authorized Distributor.

The 7500cx can not be used with hydrogen cell gas or hydrogen cell gas mixtures unless the optional hydrogen cell gas line is installed.

The information and pricing in this guide are subject to change without notice.

© Agilent Technologies, Inc. 2007  
Printed in USA June 21, 2007  
5989-6493EN