



Agilent 7500cs Inductively Coupled Plasma Mass Spectrometer (ICP-MS)

Data Sheet

ICP-MS

The Agilent 7500cs ICP-MS is designed for the ultratrace measurement of trace metals in high purity chemicals used in the semiconductor industry. The 7500cs features Agilent's unique Octopole Reaction System (ORS) to remove even the most problematic polyatomic interferences in the widest range of sample matrices.

The 7500cs is the successor to the Agilent 7500s – the most widely used ICP-MS in the semiconductor industry. The 7500cs features the same solid-state 27.12 MHz ICP digital-drive RF generator as the other instruments in the 7500 Series model range. The sample introduction system comprises a quartz torch and a quartz double-pass spray chamber fitted with a Micro Flow nebulizer. A PFA inert kit is also included for use with HF containing matrices (this can be deleted if not required). The 7500cs features a completely new ion optic starting with an extraction lens that prevents Easily Ionized Elements (EIE) from being extracted from the interface. As a result, Background Equivalent Concentration (BECs) for EIE are reduced close to cool plasma levels, even when the 7500cs is operated at 1600W forward power. This gives the user the option to perform all measurements at a single, high- power setting. Behind the extraction lens, a simplified, high-transmission Omega lens increases sensitivity for ultratrace measurement. Both extraction and Omega lenses are located in the interface region of the spectrometer

for easy removal and maintenance without opening the main vacuum system. This reduces maintenance time and protects the mass analyzer from contamination.

The 7500cs also features the Agilent ShieldTorch System (STS), offering two key benefits. First, the STS minimizes ion energy spread, enabling optimum interference removal efficiency in the cell by energy discrimination. Secondly, the STS enables the 7500cs to be operated in cool-plasma mode, if preferred. In the 7500cs, the ORS cell is positioned on-axis to the quadrupole, increasing ion transmission, and reducing detection limits. For interference removal, the ORS is pressurized with either H_2 (reaction mode) or He (collision mode) gas to eliminate virtually all matrix and argon based interferences. The ORS can remove even the most problematic interferences - such as P-based and S-based interferences in H_3PO_4 and H_2SO_4 . The 7500cs can remove SO_2 and S_2 interferences to determine Zn at ultratrace levels in 10% H_2SO_4 – directly at the analyte mass. Thus, the 7500cs combines the interference removal power of high resolution ICP-MS, with the ease of use of quadrupole ICP-MS.

With a new Active Mass Flow Control (AMFC) for argon and cell gas flows, computer-controlled torch position in all three axes, and multi-mode analysis functionality, the Agilent 7500cs offers an unprecedented level of instrument automation and flexibility.

The 7500cs has unsurpassed detection capability in ultrapure reagents such as deionized water and hydrogen peroxide; it also measures the most challenging semiconductor sample matrices such as sulfuric and phosphoric acids, photoresist, VPD solutions, and organics.

The Agilent 7500cs ICP-MS features:

- ORS technology for interference removal
- On-axis reaction cell for increased sensitivity demanded by semiconductor applications
- High transmission Omega lens (off-axis ion lens) – also contributes to increased sensitivity
- Agilent ShieldTorch for precise control of ion energy – improves interference removal efficiency (by energy discrimination)
- New extraction-lens design allows all applications to be performed at high RF power (1600W)
- Cool-plasma mode also available for complete flexibility in operation
- Sample introduction system optimized for semiconductor use
- AMFC system for precise mass flow control of argon and cell gases
- Mass flow controller for addition of O_2 (for organics analysis) is standard



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Dimensions and Weight

Mainframe (W x D x H)	1100 × 600 × 640 mm (43.3" × 23.6" × 25.2")
Weight	175 kg (386 lb) Not including PC, printer and rotary pump

Hardware

Nebulizer	Micro Flow nebulizer
Spray chamber	Quartz (thermoelectrically controlled)
Torch	Quartz
Interface	Platinum cones
Six mass-flow controllers	Plasma, auxiliary, make-up and carrier gas lines, and two reaction-gas lines
Optional Mass Flow Controller Standard (for example, for additon of O ₂)	
ShieldTorch system	Standard
ICP source	27.12 MHz solid state, digital drive
Vacuum system	Three stage
Ion optics	Extraction/Omega/ORS
Quadrupole	True hyperbolic cross-section rods
Quadrupole radio frequency	3 MHz
Data acquisition	True simultaneous dual mode electron multiplier with nine orders dynamic range
Minimum dwell time	100 μs
Mass range	2–260 amu
Rotary pump	One
PFA inert kit	Included in the accessory kit

Note: A PFA inert kit is included with the mainframe.

Software

Operating system	Microsoft® Windows XP®
Autotuning	Included
Custom reporting	Included
Three offline user license	Optional
Intelligent sequencing	Optional

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
Maximum 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%

Reaction gas supply	
Minimum purity	99.999%
Maximum flow rate	H ₂ : 7mL/min, He: 10 mL/min
Typical pressure	40 kPa (5.6 psi) ±3.5%
Exhaust duct	
Extraction flow rate	7–8 m ³ /min

Environmental Requirements

Operating temperature	15–30 °C <2 °C/h (max. change: <5 °C)
Operating humidity	20%–80% (noncondensing)

Selected Peripherals

G3160A	Integrated Autosampler (I-AS)
G3139A	Micro Flow nebulizer
G1833-65038	Organic Solvent Introduction kit
G3263A	User Access Control Pack

Performance Specifications

Non-gas mode

Sensitivity*	
Li (7)	≥50 Mcps/ppm
Y (89)	≥160 Mcps/ppm
Tl (205)	≥80 Mcps/ppm
Background (9 amu)*	≤5 cps
Oxide (CeO ⁺ /Ce ⁺)*	≤6.0 %
Doubly charged (Ce ²⁺ /Ce ⁺)*	≤6.0 %
Detection limit (3 sigma)	
Be (9)	≤0.5 ppt
In (115)	≤0.1 ppt
Bi (209)	≤0.1 ppt
Short term stability (RSD)*	1 ppb Li, Y, Tl: ≤3% (20 min)
Long term stability (RSD)	1 ppb Li, Y, Tl: ≤4% (2 h)
Abundance sensitivity	
Low mass	≤1 × 10 ⁻⁶
High mass	≤5 × 10 ⁻⁷

Cool plasma mode

Detection limit (3 sigma)	
Fe (56)	≤3 ppt

Hydrogen mode

Sensitivity*	
Co (59)	≥20 Mcps/ppm
Y (89)	≥100 Mcps/ppm
Tl (205)	≥90 Mcps/ppm
Short term stability (RSD)	1 ppb Co, Y, Tl: ≤3% (20 min)
Detection limit (3 sigma)	
Fe (56)	≤3 ppt

Performance Specifications (continued)

Helium mode

Sensitivity*

Co (59): ≥ 40 Mcps/ppm

Short term stability (RSD) 1 ppb Co, Y, Tl: $\leq 3\%$ (20 min)

*All items so marked will be tested on-site.

Note: Above specifications apply to new 7500cs instruments, not existing instruments upgraded with 7500cs-type upgrade kits.

Regulatory Compliance

Safety	IEC61010-1:2001/EN61010-1:2001 CSA C22.2 No.1010.1B: 1992+A2: 1997 UL61010A-1: 2002
Electromagnetic	IEC61326-1: 1997+A1: 1998+A2: 2000 EN61326-1: 1997+A1: 1998+A2: 2001 ICES-001: 1998 AS/NZS 2064.1

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

For More Information

For more information about the Agilent 7500 Series ICP-MS, visit our Web site
<http://www.agilent.com/chem/icpms>

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Printed in the USA
April 21, 2004
5988-8991EN