



Agilent 710 Series ICP-OES

Accurate. Robust. Reliable.

Specifications



Introduction

Agilent 710 Series ICP-OES spectrometers are manufactured according to a quality management system certified to ISO 9001.

Design overview

The Agilent 710 and 715 ICP-OES systems are compact, bench-mounted simultaneous Inductively Coupled Plasma Optical Emission Spectrometers (ICP-OES) with full PC control of instrument settings and compatible accessories. They feature an innovative megapixel CCD detector designed specifically for ICP-OES and provide complete wavelength coverage from 177–785 nm.

Agilent ICP-OES systems are available in either axially (710) or radially (715) viewed configurations and include a free-running, air-cooled 40 MHz RF generator with solid-state HV power supply, purged echelle polychromator and full PC control of plasma viewing position and plasma gas flows. Fully web-integrated ICP Expert II software uses Agilent's worksheet concept for ease of use, rapid operator training, and commonality with Agilent Atomic Absorption products.



Instrument hardware

Sample introduction

Choice of optimized axial (710) or radial (715) configurations to suit your application needs.

- 715 includes an inert and robust, double-pass cyclone spraychamber and V-groove nebulizer as standard
- 710 includes a high sensitivity glass, single-pass cyclone spraychamber and Conikal nebulizer as standard
- Fully PC-controlled peristaltic pump, variable speed from 0–50 rpm, three channels for sample, drain and internal standard/ionization buffer
- Optional semi and fully-demountable torches with choice of glass or ceramic injector tubes, high solids torch and all-glass sample introduction system.

Gas control

Plasma and auxiliary gas flows are software controlled using switched flow controllers. The system is fully interlocked against gas failure.

- Nebulizer gas: software enabled with choice of flow control using a high precision pressure regulator, or computer controlled using mass flow control. MFC provides flow range 0–1.3 L/min in 0.01 L/min increments
- Plasma gas: 0–22.5 L/min in 1.5 L/min increments
- Auxiliary gas: 0–2.25 L/min in 0.75 L/min increments

RF generator

- 40 MHz free-running, air-cooled RF generator. Power output of 700–1500 W in 50 W increments. Optimum power settings defined and stored within each method for different sample types
- Over 75% RF coupling efficiency
- Automatic ignition and shutdown with user-customizable ignition sequence
- Power output stability is better than 0.1%

Plasma configuration

Radially viewed system (715 ICP-OES)

Vertically oriented, radially viewed plasma is ideal for the most difficult of applications, including the analysis of oils and organic solvents, geological/metal digests and high TDS solutions e.g., brines. Includes full PC control of plasma viewing height from 0–20 mm and horizontal adjustment of ± 3 mm to optimize sensitivity and minimize interferences. Viewing height may be adjusted under PC control for each wavelength of interest.

Axially viewed System (710 ICP-OES)

Horizontally oriented, axially viewed plasma is ideal for high sensitivity analyses. Provides a 2–8 fold improvement in detection limits compared to radial viewing. The axially viewed plasma system features a unique Cooled Cone Interface (CCI) to prevent the cooler plasma tail from being viewed by the optics. This reduces interferences, improves the system's tolerance to high dissolved solids and extends the linear dynamic range compared to conventional axial systems.

The CCI is a superior plasma interface with lower running costs compared to shear gas systems. Includes full X, Y adjustment of plasma viewing position under PC control.

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Instrument hardware

Optical system

- Computer-optimized echelle optical design with no moving optical parts ensures lowest detection limits and maximum stability
- 400 mm focal length polychromator is thermostatted to 35 °C for excellent stability. Features a precision prism cross disperser and echelle grating (94.74 lines/mm) creating an echellogram (of 70 orders) that is projected onto the megapixel CCD detector
- Standard polychromator purge of 0.75 L/min with PC controlled 3 L/min boost purge for operation with emission lines having wavelengths below 185 nm. Can be purged with either argon or nitrogen (requires optional nitrogen purge kit)

Megapixel CCD detector

- Innovative megapixel CCD detector features 1.12 million pixels, each 15 µm x 15 µm in an X-Y grid array for full wavelength coverage from 177 nm to 785 nm. The detector is thinned and back illuminated for enhanced Quantum Efficiency (QE) in the UV. The detector is mounted on a two stage Peltier device and cooled to -30 °C for low dark current and noise
- Auto Integration allows intense and trace signals to be measured simultaneously at the optimum signal-to-noise ratio, providing lowest possible detection limits and preventing over-range signals – more intense peaks are allocated shorter integration times and less intense peaks are allocated longer times
- The megapixel CCD detector features anti-blooming protection on each pixel. This enables the simultaneous measurement of trace level analytes in the presence of nearby intense signals

Instrument software

Features

ICP Expert II is an easy-to-use, web-integrated instrument software package. It features wizards that guide users through method and sequence development and method templates for rapid development of commonly used methods.

- Computer control of plasma gas flows, plasma viewing position, ignition, RF power, safety interlocks and utilities monitoring
- Choice of background correction techniques from traditional off-peak background correction to unique fitted background correction
- Fast Automated Curve-fitting Technique (FACT) for online spectral deconvolution of complex spectra
- MultiCal assists in extending linear dynamic range and automatic validation of results
- Number of replicates measured can be set by solution type (calibration standards, QC solutions, samples)
- Calibration routines for multi-element external calibration and method of standard addition
- Calibration reslopes eliminate the need for full re-calibration
- User-customizable Quality Control Protocols (QCP) designed to meet US EPA and other international compliance standards
- Fully editable sample label list with optional customer and batch label fields
- Weight/volume/dilution correction factors with user-definable concentration units conversion for samples and calibration/QC solutions
- Autosampler rack and tube positions can be edited for true random access sampling
- Sequence options include calibration/reslope/QCP error actions and end of analysis actions

Instrument software

Features

- Calibrations can be programmed at a user-specified rate either inline with sample tubes or from centralized calibration tubes (rate-driven)
- Microsoft's SQL Server 2005 Express for secure storage and fast retrieval of results
- Real-time graphical display of signal spectra, results and calibration graphs
- Post-run retrospective data editing
- Wide variety of reporting and exporting options with user-defineable settings
- Graphical display of system status and comprehensive set of instrument diagnostic tools
- Comprehensive help system, including multimedia and video assistance

Analytical performance

Warm-up time

Warm up time from standby mode <10 mins from plasma ignition.

Stray light

Stray light elimination via baffles and optical design to less than 2.0 mg/L effective As signal at 188.980 nm from 10 000 mg/L Ca.

Signal stability

Typically stable to less than 1% RSD over 8 hours without internal standardization or any form of drift correction.

Typical resolution (FWHM)

Element	Wavelength (nm)	Resolution (pm)
As	188.980	<9
Mo	202.032	<9
Zn	213.857	<10
Cr	267.716	<13
Cu	327.396	<19
Ba	614.172	<45

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Analytical performance

Typical detection limits

3 sigma detection limits (µg/L) using a 30 second integration time

Element	Wavelength (nm)	715 radial (µg/L)	710 axial (µg/L)	Element	Wavelength (nm)	715 radial (µg/L)	710 axial (µg/L)
Ag	328.068	1	0.5	Mg	279.553	0.1	0.02
Al	396.152	4	0.9	Mn	257.610	0.15	0.05
As	188.980	12	2	Mo	202.032	2	0.5
Au	242.794	5	1	Na	589.592	1.5	0.2
B	249.772	1.5	0.3	Ni	231.604	2.1	0.7
Ba	455.403	0.15	0.03	P	177.434	15	3
Be	313.107	0.15	0.03	Pb	220.353	8	1.5
Bi	223.061	10	2.5	S	181.972	13	4
Ca	396.847	0.3	0.01	Sb	206.834	15	3
Cd	214.439	0.5	0.08	Se	196.026	16	4
Ce	418.659	7	2	Si	251.611	5	2
Co	238.892	1.2	0.3	Sn	189.927	10	1.6
Cr	267.716	1	0.2	Sr	407.771	0.1	0.02
Cu	324.754	1.5	0.5	Ti	334.941	0.5	0.15
Fe	238.204	0.9	0.2	Tl	190.794	10	2
Hg	184.887	2.5	0.9	V	292.401	2	0.5
K	766.491	4	0.3	Zn	213.857	0.8	0.2
Li	670.783	1	0.06	Zr	343.823	1.5	0.3

Accessories

Autosampler

- Agilent SPS 3 high throughput autosampler, with fast X, Z, theta arm movement
- Capacity for up to three sample racks and two standard racks. Racks may be exchanged during analysis for unlimited sample capacity
- Fully compatible with optional online diluter
- Compatible with a wide range of commercially available, autoclavable, laboratory racks

Diluter

- Optional precision syringe auto-diluter for Agilent SPS 3, performs automatic online over-range dilution and automatic off-line sample and calibration solution preparation using optional Roboprep software

Automatic online dilution

- Online dilution of over-range elements with user-definable dilution and mixing options
- Serial dilution of samples until analyte results are in-range
- Combine with MultiCal to further extend the linear dynamic range

Accessories

Intelligent off-line solution preparation

- Optional RoboPrep software utility allows off-line dilution and preparation of samples and standards
- Provides customization of rack configurations to allow dilution of samples directly in digestion racks
- Includes capabilities for preparation of multi-element calibration standards, sample spiking and standard addition

Productivity package

- Four port Switching Valve System (SVS 1) immediately rinses the sample introduction system while the next sample is being introduced to the instrument
- Reduces carry-over, increases sample throughput and decreases cost per analysis

Ultrasonic nebulizer

- USN increases nebulization efficiency typically providing an order-of-magnitude improvement in detection limits

Vapor generation

- Modular continuous flow vapor generator for the determination of Hg, As, Se, Sb, Te, Bi, and Sn at $\mu\text{g/L}$ and ng/L levels
- Compatible with the Agilent SPS 3 autosampler

AGM 1

- Controls addition of oxygen to the plasma to prevent carbon deposition and reduce background structure when analyzing organic solvents. Recommended when determining organic solvents using the axially-viewed ICP-OES

Volatile organics kit

- Includes a water-cooled spraychamber and demountable torch with 0.8 mm ID injector for the analysis of volatile organics such as gasoline and naphtha
- Requires, but does not include a suitable water cooler. The AGM 1 for controlled addition of oxygen to the auxiliary gas is also recommended

Torches, nebulizers and spare parts

Agilent offers a range of torches, nebulizers, spraychambers, tubings and other spares parts. Refer to our Web site for details.

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Installation requirements

System installation

For details of ICP-OES installation requirements refer to the Pre-installation manual, publication number 8510233700.

Customer support policies

Warranty

Twelve (12) months, though this may vary according to location.

Hardware support period

Seven (7) years from date of last unit manufacture. After this time, parts and supplies will be provided if available.

Software support

Telediagnostic capability is available for some instrument models. Availability of Telediagnostic support may vary according to location. Software upgrades to fix nonconformances or safety problems will be issued free of charge. Software upgrades to add additional functionality will require an additional fee.

Online user group

All Agilent ICP-OES users can join our free email users group, PlasmaNet, which has access to Agilent ICP-OES users and Agilent support staff worldwide.

Further details

More information

For further information please consult your Agilent office or supplier, or our Web site at www.agilent.com

www.agilent.com/chem

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