



# Agilent 5110 ICP-OES

## Specifications



### The fastest, most precise ICP-OES...ever

The Agilent 5110 ICP-OES revolutionizes ICP-OES analysis—designed to run your samples faster, using less gas, without compromising performance on your toughest samples. Innovative and unique technologies, and vertical torch on all configurations, enable uncompromised robustness for axial and radial measurements at the same time. Intelligent hardware and software take the guess work out of method development ensuring stable, accurate, and reproducible performance.

The Synchronous Vertical Dual View (SVDV) configuration is four instruments in one; able to run in axial, radial, vertical dual view and synchronous vertical dual view modes. Unique Dichroic Spectral Combiner (DSC) technology delivers the fastest analyses and the lowest gas usage per sample. The Vertical Dual View (VDV) configuration offers a robust vertical torch and high throughput, and is upgradable onsite to the SVDV configuration if your lab throughput demands increase. The 5110 is also available in a Radial View (RV) only configuration, ideal for labs needing a fast, high performance radial ICP-OES.



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## Instrument hardware

### Sample introduction

One-piece quartz tube, polymer base, plug and play vertical torch on all instrument configurations. The simple and effective torch loader mechanism automatically aligns the torch and connects gases for fast start up and reproducible performance. Once the torch is loaded, no further alignment or adjustment is required. Optional torch configurations are available for other applications (organic solvents, volatile organic solvents, hydrofluoric acid resistant, high solids), along with optional demountable torches.

Glass concentric nebulizer, and glass cyclonic double pass spraychamber with 'ball and socket' connection to the bottom of the torch injector for easy setup and maintenance. Optional configurations for other applications (high sensitivity, hydrofluoric acid resistant) are available.

Fully PC-controlled peristaltic pump with variable speed from 0–80 rpm, and five channels (SVDV) for sample, drain, internal standard/ionization buffer, and MSIS vapor generation solution. A three channel pump is standard for VDV and RV configurations (option for five channel available).

### Gas controls

All plasma related gas flows are computer controlled, using high precision Mass Flow Controllers:

- Plasma gas 8-20 L/min in 0.1 L/min increments, default setting 12 L/min
- Auxiliary gas 0-2.0 L/min in 0.01 L/min increments, default setting 1.0 L/min
- Nebulizer gas 0-1.5 L/min in 0.01 L/min increments, default setting 0.7 L/min
- Make up gas 0-2.0 L/min in 0.01 L/min increments (used for optional accessories)
- Option gas (argon/oxygen blend), added as percent of auxiliary gas (0-2.0 L/min) via software (used for some organic solvent applications)

Three user interchangeable gas control modules for supply of argon, nitrogen, and argon/oxygen blend:

- Single port module for argon only. Supplies plasma gases, and purge gas for optics, cone and snout
- Two port module for argon and option gas. Supplies argon for plasma gases and purge gas for optics, cone and snout. Supplies argon/oxygen blend for option gas
- Three port module for argon, nitrogen, and option gas. Supplies argon for plasma gases, cone and snout purge. Supplies nitrogen for optics purge, and argon/oxygen blend for option gas

The two port and three port modules are supplied with SVDV configuration for ultimate flexibility. The single port module is supplied as standard for VDV and RV configurations (option for two and three port modules are available).

### RF generator

27 MHz Solid State, maintenance free, water cooled RF generator. Power output of 700-1500 W in 10 W increments. Robust free running design rapidly reacts to changes in plasma load, providing stable and consistent power supply into the plasma when switching between samples of high or varying matrix. Coupling efficiency of more than 75%. Power output stability is better than 0.1%.

All configurations feature a vertical torch allowing you to measure the most challenging samples – from high matrix to volatile organic solvents. The vertical torch and solid state RF generator allow uncompromised, robust measurements on tough samples with less cleaning, less downtime and less replacement torches.

### Optical system

Vertical dual view pre-optics allow axial and radial plasma viewing from the vertical torch. Unique Dichroic Spectral Combiner (DSC) technology allows you to run axial and radial view analysis at the same time in SVDV mode, for the fastest analysis and lowest gas usage. Cooled Cone Interface (CCI) prevents the cooler plasma tail from being viewed by the optics when viewing axially, reducing interferences and increasing linear dynamic range. Three configurations, all featuring a vertical torch, and four viewing modes are available:

	Radial Mode	Axial Mode	VDV Mode	SVDV Mode
SVDV configuration	✓	✓	✓	✓
VDV configuration	✓	✓	✓	
RV configuration	✓			

Easy access to pre-optics windows for user serviceability/maintenance. Computer-optimized echelle optical design uses a single entrance slit and focuses the echelle image onto a single CCD detector. No moving optical parts to ensure lowest detection limits and maximum stability. 400 mm focal length polychromator is thermostatted to 35 °C for excellent stability. Features a CaF<sub>2</sub> prism cross disperser and echelle grating (94.74 lines/mm) creating an echellogram of 70 orders projected onto the CCD detector, which is custom-designed to exactly match the image produced by the echelle optics. Mass flow controlled polychromator purge (argon or nitrogen), with easy access user replaceable filter.

### CCD detector

The VistaChip II detector is a high speed, continuous wavelength coverage CCD detector with anti blooming protection on every pixel. It is a zero gas consumption design and enables fast warmup, high throughput, high sensitivity and largest dynamic range.

- Utilizing Image Mapping Technology (I-MAP), the photosensitive pixels are arranged to exactly match the image from the echelle optics. This provides full wavelength coverage from 167–785 nm on a single detector, from a single entrance slit. The detector is mounted on a triple-stage Peltier device and cooled to -40 °C for low dark current and noise
- Adaptive Integration Technology (AIT) allows intense and trace signals to be measured simultaneously at the optimum signal to noise ratio. AIT automatically allocates a pixel read time to each of the selected wavelengths – more intense peaks are allocated shorter integration times and less intense peaks are allocated longer

times. Unlike conventional simultaneous systems which sequence these read steps, AIT can conduct these readings at the same time providing true simultaneous measurement

- The VistaChip II features the fastest available read-out speed of any spectroscopic CCD detector – with a 1 MHz clocking speed to process pixels. Total read-out time for a full illumination of all pixels on the detector is approximately 0.8 seconds. Duplex read-out circuitry is provided on both sides of the detector, halving read-out processing time
- CCD detector features anti-blooming protection on each individual pixel, enabling the simultaneous measurement of trace level analytes in the presence of nearby intense signals
- The VistaChip II is hermetically-sealed which means it requires no argon purge to achieve excellent sensitivity in the UV range of the spectrum. This feature also reduces time from plasma ignition to analysis as there are no delays from waiting to purge air from the detector

### Software

ICP Expert v7 software has a familiar worksheet interface, easy method development and software applets that include pre-set method templates, saving you time.

- Easy-to-use, application-specific software applets automatically load a pre-set method so you can start analysis immediately without method development or alignment, and with minimal training
- Computer control of plasma gas flows, vertical plasma viewing position, plasma ignition, RF power, safety interlocks and utilities monitoring
- Choice of background correction techniques from traditional off-peak background correction to unique Fitted Background Correction (FBC)
- MultiCal assists in extending linear dynamic range and automatic validation of results

- Fast Automated Curve-fitting Technique (FACT) for online spectral deconvolution of complex spectra. Inter Element Correction (IEC) technique also included
  - Calibration routines for multi-element external calibration and method of standard addition
  - Calibration reslopes eliminate the need for full recalibration
  - User-customizable Quality Control Protocols (QCP) designed to meet US EPA and other international compliance standards
  - Perform rapid qualitative screening and semi quantitate all elements in each sample using IntelliQuant
  - Unique IntelliQuant 'heat map' results display paradigm provides rapid and intuitive visualization of results, at a glance, for all elements in each sample
  - Fully editable sample label list with optional customer and batch label fields
  - Full control of all fully integrated Advanced Valve systems (AVS 4, 6 and 7). These switching valves will increase sample throughput, save gas costs and reduce your consumable costs by extending the lifetime of torches, spraychambers, nebulisers and pump tubes
  - Integrated control of the IsoMist temperature controlled spray chamber
  - 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
  - Custom rack editor to support non standard racks on any supported autotsampler
  - Expanded QC to enable user definable QC for all samples.
  - Segregated analysis page display of QC tests including accuracy, repeatability, ruggedness and detectability. Can be used for USP and ICH elemental analysis in pharmaceutical products regulations.
  - Calibrations can be programmed at a user-specified rate either inline with sample tubes or from centralized calibration tubes (rate-driven)
  - Wide variety of reporting and exporting options with user-definable settings
  - Windows 7/Windows 10, 64-bit compatible
  - Software interface available in English, Japanese, Simplified Chinese, French, German, Italian, Spanish, Portuguese, Polish and Russian
  - Simplify diagnosis of instrument and utility supply faults with enhanced diagnostic software. Actionable error messages, a simple graphic display dashboard and automated instrument self checks on all sub modules assist to maximize instrument uptime
  - Optional software available to assist in achieving compliance to the US FDA's 21 CFR Part 11 requirements for audit trails, electronic signatures and access privileges
- Optional Pro software pack:**
- Select 3<sup>rd</sup> party autosampler support
  - Automatic standards preparation and overrange sample dilution from integrated control of ESI prepFAST AutoDiluter.
  - Tracking of nebulizer back pressure and argon emission intensity for monitoring and trouble shooting sample introduction system
  - Control of the AVS 6 and 7 accessories
  - Automatically monitor sample washout using Intelligent Rinse to improve sample throughput and reduce ownership costs

- User definable replicates for all different solution types including blank, standards, samples and QC.
- Rate generated QCP
- Live export of data to spreadsheet
- Oxygen addition

## Performance

### Warm up time

Warm up time from standby mode of <20 minutes from plasma ignition.

### Stray light

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

### Signal stability

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

### Typical resolution

Element	Wavelength (nm)	Resolution (pm)
As	188.980	<7
Mo	202.032	<7
Zn	213.857	<7.5
Pb	220.353	<8
Cr	267.716	<9.5
Cu	327.396	<13
Ba	614.172	<34

## Accessories and peripherals

Agilent offers a full range of configurable accessories and peripherals for the 5110 ICP-OES, including:

### AVS Advanced Valve System

The fully integrated AVS (optional) simplifies setup and use while delivering ultra-high sample throughput without compromise to analytical performance. Available in 4 port, 6 port and 7 port options

### SPS 4 Autosampler

Designed to meet the needs of high-throughput laboratories requiring a fast, compact, high capacity (360 samples) reliable autosampler.

### Multimode Sample Introduction System (MSIS)

Provides simultaneous measurement of hydride and non-hydride elements including As, Se, and Hg to sub ppb levels. This eliminates changeover and allows routine and hydride elements to be determined simultaneously using the same setup.

### Application-specific sample introduction options

A range of optimized torches and sample introduction kits is available for:

- aqueous samples
- organic solvents
- high salt/matrix samples
- samples containing hydrofluoric acid (HF)

You can minimize costs with demountable torches, designed for easy maintenance, fast changeover, and economical operation.

## Installation requirements

### System installation

For details of ICP-OES installation requirements refer to the Agilent 5110 ICP-OES Site Preparation Guide.

### Dimensions

Width	Depth	Height	Weight
800 mm	740 mm	940 mm	106 kg
31.5 in	29 in	37 in	233 lb

## Exhaust requirements

The 5110 ICP-OES incorporates corrosion-resistant materials, and an on-board fan maintains internal positive pressure to keep acid vapors out. Exhaust flow minimum requirements are 2.5 m<sup>3</sup>/min (88 ft<sup>3</sup>/min). User serviceable coarse dust/particulate filter included on air supply inlet.

## Air supply inlet options:

- High capacity, high efficiency 'fine' dust filter for additional protection against ingress of dust from the lab environment.
- External inlet duct adapter to enable connection of ducting to the air supply inlet of the instrument, to duct clean dust/acid-vapor free air into the instrument from outside the lab.

## Access and serviceability

All connections for power, gas, water and communications are accessed from the side rather than the rear of the instrument. Self-diagnosing electronics constantly monitor instrument status, allowing rapid identification of component health issues.

## Power requirement

2.9 kVA, single phase mains input voltage of between 200-240 VAC (50-60 Hz), drawing a maximum of 15 amps.

## Instrument qualification services

Instrument qualification services (IQ/OQ) provide initial and ongoing verification that your system meets regulatory requirements.

## Instrument communication

Communication with the instrument uses Ethernet via an IEEE 802.3, Ethernet LAN cable.

## Customer support policy

### Warranty

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

### Agilent service guarantee

If your Agilent instrument requires service while covered by an Agilent service agreement, we guarantee repair or we will replace your instrument for free. No other manufacturer or service provider offers this level of commitment to keeping your lab running at maximum productivity.

### Agilent value promise

We guarantee you at least 10 years of instrument use from your date of purchase, or we will credit you with the residual value of the system toward an equivalent model.

### Further details

For further information please consult your Agilent office or supplier, or our website at [www.agilent.com](http://www.agilent.com)

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

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