Agilent 5100 ICP-OES

DUAL VIEW ICP-OES
MINUS THE WAIT

The Measure of Confidence

Agilent Technologies

THE FASTEST ICP-OES... EVER.

The Agilent 5100 Synchronous Vertical Dual View (SVDV) ICP-OES revolutionizes ICP-OES analysis. With its unique Dichroic Spectral Combiner (DSC) technology, you can now run axial and radial view analysis at the same time.

Save time and money

- Run the fastest ICP-OES analysis, using less gas.
- Measure all wavelengths in one measurement, for higher precision without delays.
- Start work sooner with the zero gas consumption VistaChip II detector that shortens warm-up time.

Uncompromised performance

- Measure your toughest samples with a vertical torch – from high matrix to volatile organic solvents.
- Minimize interferences with our Cooled Cone Interface (CCI).
- Achieve long term analytical stability with a solid-state RF system that delivers a robust plasma.

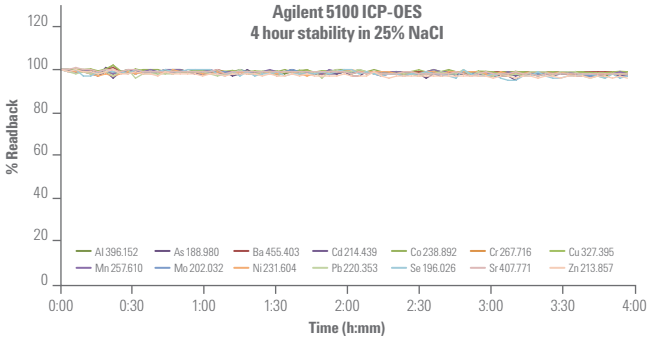
Simplify your analysis

- Take the guess work out of method development with intuitive ICP Expert software and DSC technology.
- Ensure fast startup with minimal training using application-specific software applets and a plug-and-play torch.
- Powerful software algorithms simplify method development, improve accuracy, and extend your measurement range.

Flexible configurations

The Agilent 5100 is available in three configurations, all featuring a robust vertical torch:

- Synchronous Vertical Dual View – delivers the fastest analyses and the lowest gas usage.
- Vertical Dual View – offers high throughput, and is upgradable on-site to the SVDV configuration if your lab throughput demands increase.
- Radial View – ideal for labs needing a fast, high performance radial ICP-OES.



Robust and stable

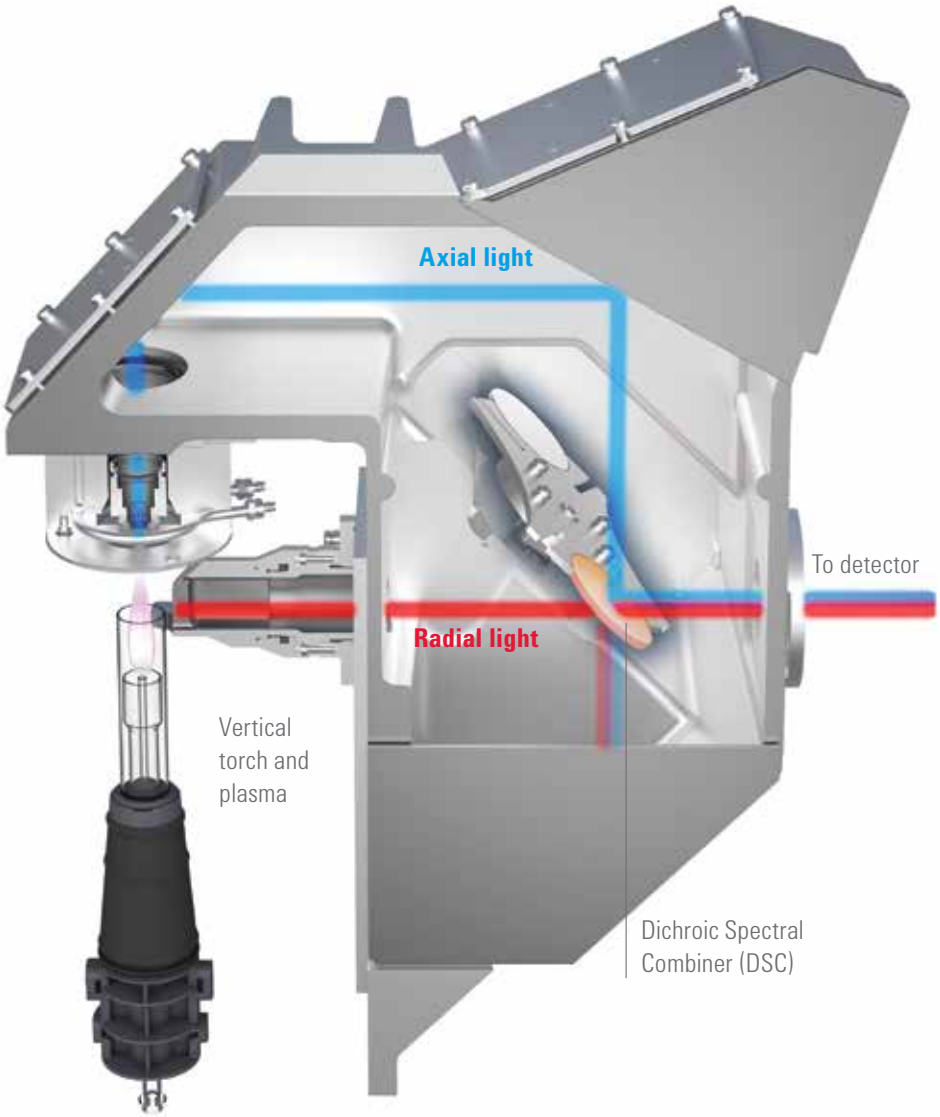
With a vertical torch and robust solid state RF in every configuration, the 5100 ICP-OES handles your toughest samples with ease. Shown is the percentage readback on a range of elements in a 25% NaCl solution. Readback stability for all elements over 4 hours was < 1.3% RSD, without internal standardization.

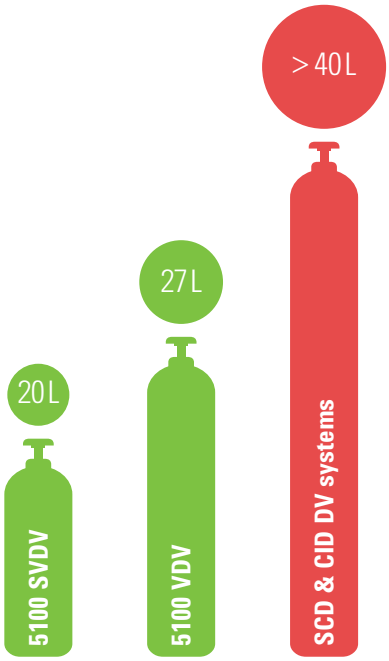
The Agilent 5100 ICP-OES has the industry's smallest footprint, saving valuable bench space.

55% FASTER. 50% LESS ARGON.

How does Synchronous Vertical Dual View work?

The 5100 SVDV ICP-OES needs only a single measurement per sample. The Dichroic Spectral Combiner allows both the axial and radial views of the plasma to be captured in one reading. This delivers accurate results in the quickest possible time[1].





Dramatically reduce your argon consumption[1]

The 5100 ICP-OES has the lowest argon consumption per sample of any ICP-OES instrument.

DID YOU KNOW?

Conventional dual view ICP-OES systems require you to set up a series of sequential measurements by selecting which elements are measured in axial mode, and which are measured in radial mode.

Some systems also use two slits to measure low and high wavelengths in each mode, resulting in up to four sequential measurements on each sample, making sample throughput slow.

AGILENT 5100 ICP-OES

FAST, ACCURATE RESULTS, EVEN FOR YOUR TOUGHEST SAMPLES.

MINIMIZE INTERFERENCES

The CCI removes the cool plasma tail from the axial optical path. This minimizes self-absorption and recombination interferences to provide a wide linear dynamic range and low background for the most accurate results.

ACHIEVE LONG TERM ANALYTICAL STABILITY

A solid state RF system delivers a reliable, robust and maintenance-free plasma for even the toughest samples.

CONQUER EVEN THE MOST DIFFICULT SAMPLES

A vertical torch allows you to measure the most challenging samples – from high matrix to volatile organic solvents. The vertical orientation means uncompromised, robust measurements on tough samples with less cleaning, less downtime and less replacement torches.

PLUG-AND-PLAY TORCH

The simple torch loader mechanism automatically aligns the torch and connects gases for fast start up and reproducible performance.

REDUCE SERVICE COSTS AND INSTRUMENT DOWNTIME

Self-diagnosing electronics constantly monitor instrument status, allowing rapid identification of component health issues. This reduces instrument downtime.

DELIVER FAST, ACCURATE RESULTS IN A SINGLE MEASUREMENT

The DSC enables the light from both the radial and the axial views of the plasma to be measured at the same time. Only one reading is needed per sample.

CHOOSE HIGH THROUGHPUT AND DYNAMIC RANGE

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 warm-up, high throughput, high sensitivity, and the largest dynamic range.

SAVE BENCH SPACE WITH COMPACT DESIGN

The world's smallest ICP-OES saves valuable bench space while ensuring easy access for servicing and maintenance. All connections for power, gas, cooling, water and communications are accessed from the side rather than the rear of the instrument.

ENSURE RELIABILITY WITH CORROSION-RESISTANCE

The 5100 ICP-OES incorporates corrosion-resistant materials, and internal positive pressures keep acid vapors out. This increases instrument robustness – even in harsh environments.

www.agilent.com/chem/5100icpoes

GET THE RIGHT RESULTS THE FIRST TIME, EVERY TIME.

Simplify your analysis

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

Take the guess work out of method development

The 5100 ICP-OES with DSC eliminates the need to select the correct plasma mode in which to run each element. Just choose your elements and wavelengths, and the instrument does the rest in a single synchronous measurement.

Click and Go methods

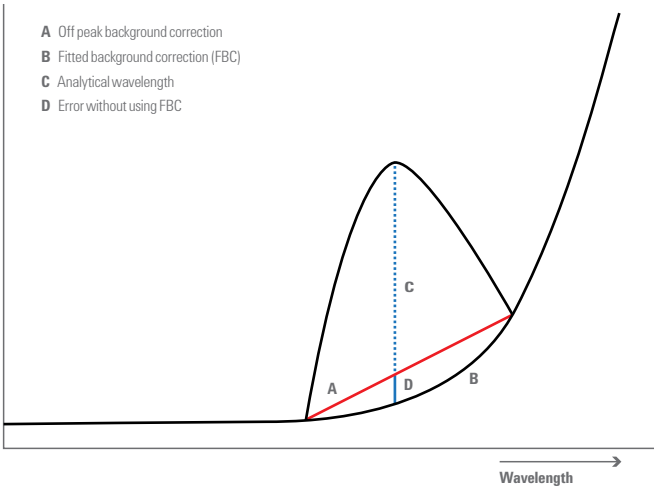
Easy-to-use, application-specific software applets automatically load a pre-set method so you can start analysis immediately without method development or alignment, and with minimal training.

Software algorithms that deliver accurate, reliable results

- Fitted Background Correction (FBC) simplifies method development and ensures fast, accurate background correction.
- Spectral interferences are easily corrected using either the powerful spectral deconvolution Fast Automated Curve-fitting Technique (FACT) or the well characterized Inter Element Correction (IEC) technique, ensuring greater accuracy in difficult matrices.
- MultiCal allows you to monitor two or more wavelengths for each element, giving you confidence in the accuracy of your results and extending your measurement range.

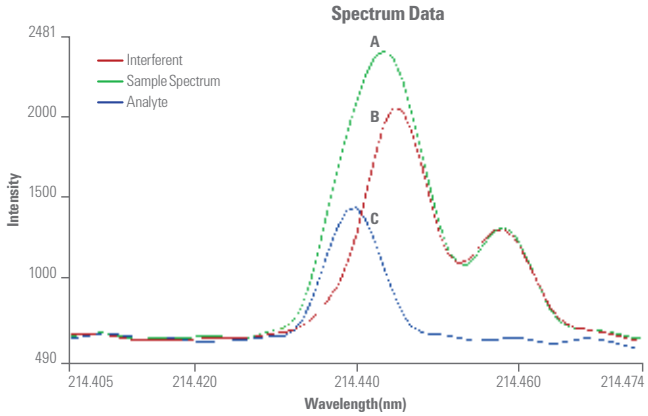
Dependable compliance support

- Optional Spectroscopy Configuration Manager (SCM) software helps you achieve compliance with the US FDA 21 CFR Part 11 electronic records regulations.
- Instrument qualification services (IQ/OQ) provide initial and ongoing verification that your system meets regulatory requirements.



Accurate, automatic background correction with FBC

FBC calculates the true background signal, improving accuracy and saving time during method development.



Resolve spectral interference with FACT

Resolution of the difficult Fe interference at Cd 214.438 nm. Shown are:
A. Appearance of the peaks in a soil sample,
B. FACT model of the interference,
C. Corrected signal for the Cd analyte.

PRODUCTIVITY & PERFORMANCE ENHANCEMENTS.

Plug-and-play torch

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.

Torch installation in three easy steps

1 **Open the torch loader**

2 **Insert the torch**

3 **Close the torch loader**

Accessories

SVS 2+ Switching Valve System

Reduces cost per analysis and more than doubles the productivity of your 5100 ICP-OES by reducing sample uptake, stabilization times, and rinse delays.

SPS 4 Autosampler

Ideal for high-throughput laboratories requiring a fast, high-capacity (up to 360 samples), reliable autosampler, that is also small, rugged and easy-to-use.

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:

- 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.

For more information

Learn more
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- Familiarization disk including over 20 tutorial videos.
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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.

1. The analysis speed and gas consumption figures are compared to competitive systems, based on published application data. Refer to Agilent application note 5991-4821EN (Ultra-fast determination of trace elements in water, conforming to US EPA 200.7)

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Agilent ICP-QQQ

Printed in the USA July 1, 2015
5991-4734EN

Agilent Technologies

Agilent 5100 ICP-OES

Specifications

The fastest ICP-OES... ever.

The Agilent 5100 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 5100 is also available in a Radial View (RV) only configuration, ideal for labs needing a fast, high performance radial ICP-OES.

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 and RV configurations) for sample, drain, internal standard/ ionization buffer, and MSIS vapor generation solution. A three channel pump is standard for VDV configuration (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 and RV configurations for ultimate flexibility. The single port module is supplied as standard for VDV configuration (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%.

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 ºC for excellent stability. Features a CaF_2 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 ºC 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)

- Fast Automated Curve-fitting Technique (FACT) for online spectral deconvolution of complex spectra. Inter Element Correction (IEC) technique also included.
- MultiCal assists in extending linear dynamic range and automatic validation of results
- 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
- 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
- Calibrations can be programmed at a user-specified rate either inline with sample tubes or from centralized calibration tubes (rate-driven)
- Post-run retrospective data editing
- Wide variety of reporting and exporting options with user-definable settings
- Windows 7, 64-bit compatible
- Software interface available in English, Japanese, Simplified Chinese, French, German, Italian, Spanish, Portuguese and Russian
- 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 3rd party autosampler support
- Tracking of nebulizer back pressure and argon emission intensity for monitoring and trouble shooting sample introduction system
- 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 5100 ICP-OES, including:

SVS 2+ Switching Valve System

Simultaneously rinses the sample introduction while the next sample is being introduced to the instrument. Reduces cost per analysis and more than doubles the productivity of your 5100 ICP-OES by reducing sample uptake, stabilization times, and rinse delays.

SPS 3 Autosampler

High throughput autosampler, with fast X, Z, and theta arm movement. Capacity for up to three racks and two standard racks. Automates and simplifies analysis, with extended sample capacity via rack changes, and a flexible choice of racks. Simply load, set, and go.

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 5100 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 5100 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 m3/min (88 ft^3/min). User serviceable course 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 is 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

www.agilent.com/chem

Published July 1, 2014
Publication number: 5991-4852EN

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