



Flexible. Productive. Robust.

AGILENT 720/730 SERIES ICP-OES

The Measure of Confidence



**Agilent Technologies**

# flexible



## AGILENT 720/730 SERIES ICP-OES

Agilent Technologies is now your premier resource and partner for atomic spectroscopy. With the 2010 addition of Varian's world-renowned AA and ICP-OES products, together with our market-leading 7700 Series ICP-MS, Agilent offers you a comprehensive range of inorganic analytical instrumentation.

### The world's best ICP-OES

The Agilent 720/730 Series ICP-OES offers the finest performance, speed and flexibility. At the heart of these instruments is a custom-designed and patented CCD detector, giving you unrivalled productivity. With a range of performance enhancing options, the series will meet your most demanding needs — now and in the future.

The Agilent 720/730 Series ICP-OES are the world's most productive high-performance simultaneous ICP-OES.

- Continuous wavelength coverage provides extended dynamic range and reduced interferences, giving you maximum confidence in your results
- Robust plasma ensures reliable and reproducible results — even with the most complex matrices
- One view, one step measurement of major, minor, and trace elements, plus the fastest warm-up, increases throughput and productivity
- Choice of optimized axial (720/730) or radial (725/735) configurations to suit your application needs
- Superior software features providing enhanced productivity and outstanding ease-of-use

Agilent is committed to continued product development across our entire range of atomic spectroscopy product lines. We are dedicated to delivering to you innovative technology, best-in-class quality and reliability, and unmatched support.



*The Agilent 720/730 Series ICP-OES features a custom-designed and patented CCD detector, delivering the world's most flexible, highest performing and fastest ICP-OES platform.*

## Agilent

**1938**

HP is formed

**1965**

HP enters the gas chromatography market

**1976**

HP 5992A introduced as the world's first benchtop GC/MS

**1983**

HP redefines 'reliability' in GC with the introduction of the HP 5890A

**1994**

Launch of the 4500 Series, the world's first benchtop ICP-MS

**2009**

Launch of the Agilent 7700 Series ICP-MS featuring Agilent's HMI & ORS<sup>3</sup> Cell

**2010**

Varian becomes a part of Agilent

## Varian

**1948**

Varian Associates is formed

**1957**

Built components for world's first AA (as Techtron)

**1991**

Releases first sequential ICP-OES

**1994**

Axial ICP-OES with cooled cone interface released

**1997**

Patented Vista chip CCD detector with full wavelength coverage

**2006**

Launch of the 700 Series ICP-OES — world's fastest ICP-OES

# FOR YOUR APPLICATION

Agilent is committed to providing solutions for your application. We have the technology, platforms, and expert guidance you need to be successful.



**INDUSTRIAL**



**CHEMICAL & PETROCHEMICAL**



**ENVIRONMENTAL**



**FOOD & AGRICULTURE**



**METALS/MINING**

**Axial ICP**  
720/730

Pb and Cd in consumer goods e.g. toys, jewelry and clothing  
N/P/K, S/Ca/Mg and micronutrients in Fertilizers

S, P, Ca, Mg, Na, and K in biodiesel (ASTM D6751 & EN 14214)

Toxic elements in waters, soils and sediments (US EPA Method ILM05.3)  
Metals and trace elements in waters and wastes (US EPA Method 200.5)  
Heavy metals in soils

Major, minor and toxic elements in foods, beverages and agricultural samples  
Elemental impurities in pharmaceuticals (USP 232)

Trace impurities in high purity Cu

**Radial ICP**  
725/735

Major, minor and trace elements in brines  
Metal impurities in pure hydroxides and salts

S, P and Cu in ethanol for blending with fuel (EN 15837)  
Additive elements, wear metals and contaminants in used lubricating oils (ASTM D5185)  
Major elements in polymers

Pb, Cd and Cr in electronics and plastics (WEEE/RoHs)  
Metals in aqueous wastes containing oils, greases or waxes (US EPA Method 3040A)

Extractable cations and nutrients in soils

Au, Ag and Pt group elements in ore grade material  
Major and minor components in iron, steel and alloys  
Trace elements in geological samples

## Customize your ICP-OES

The Agilent 720 Series ICP-OES is completely customizable, allowing you to match the instrument to your application. Alternatively, choose Agilent's fully optioned 730 Series ICP-OES, which is configured for maximum productivity.

Feature	720 series	730 series
3 channel pump	●	—
4 channel pump	●	■
Pressure regulated nebulizer gas control	●	—
Mass flow nebulizer gas control	●	■
Switching Valve System (SVS)	●	■
Validation (IQ/OQ)	●	●
21 CFR 11 software	●	●

■ Standard feature ● Optional feature — Not available

# productive



## SETTING THE BENCHMARK IN PERFORMANCE

With over 6,000 ICP-OES systems worldwide, Agilent's plasma generation is field-proven, robust, and consistently provides stable and accurate results, even with the most challenging samples.

### Superb design

- Superior plasma performance allows direct analysis of samples ranging from organic solvents to industrial waste and brines.
- Agilent's innovative cooled cone interface eliminates the use of expensive shear gases, saving you money.
- Advanced optical design with no moving parts and robust plasma generation ensure superb long term stability.

### Designed for speed

The patented CCD detector provides full wavelength coverage and fast read-out for maximum flexibility and productivity.

- Adaptive Integration Technology (AIT) prevents overrange signals by adjusting the measurement time simultaneously for each wavelength to achieve the optimum signal-to-noise ratio.
- Image Mapping Technology (I-MAP) ensures complete coverage of all wavelengths by arranging 70,000 pixels in an uninterrupted array that exactly matches the two-dimensional optical image. This ensures complete wavelength coverage from 167-785 nm and eliminates the need for multiple measurements.
- Temperature controlled optics provides excellent stability, and an exceptionally fast warm up time allows you to start analyzing your samples quickly.

### Maximize productivity

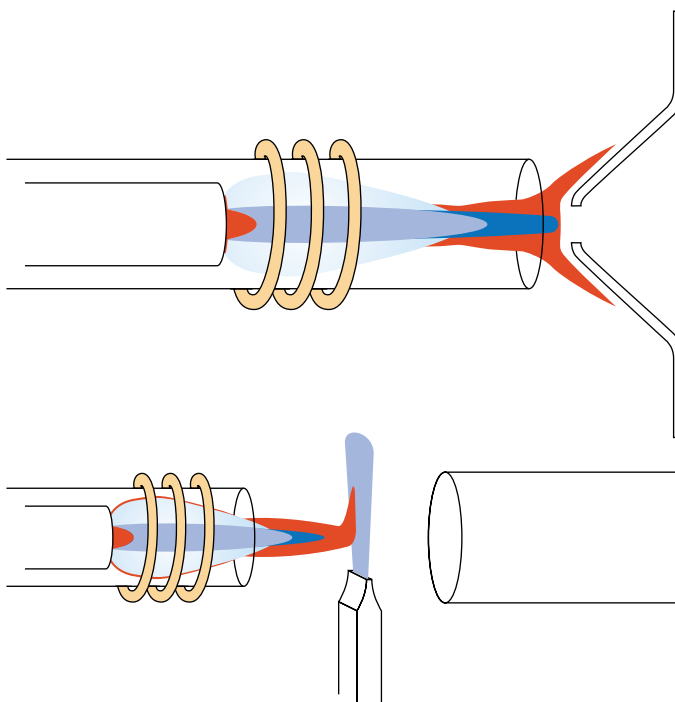
The 730 Series includes a full suite of productivity enhancements giving you the throughput you need.

- Fully automated switching valve system (SVS) reduces carry-over, providing up to 33% improvement in productivity and 25% reduction in argon usage.
- 4-channel pump provides instant rinse solution to the switching valve system for fast washout, increasing sample throughput.
- Mass flow controlled nebulizer gas flow gives enhanced long-term stability and reduces the need for re-calibration, allowing you to run more samples per day.

### Minimize interferences

#### The Cooled Cone Interface (CCI)

efficiently removes the cool plasma tail (the red zone, top) away from the optical path. This minimizes self-absorption and recombination interferences to provide a wide linear dynamic range and low background for the best detection limits. Dual view plasmas (bottom), do not fully remove the cool plasma tail, degrading performance and linear dynamic range.



# ONE-STEP ANALYSIS FROM ONE PLASMA VIEW

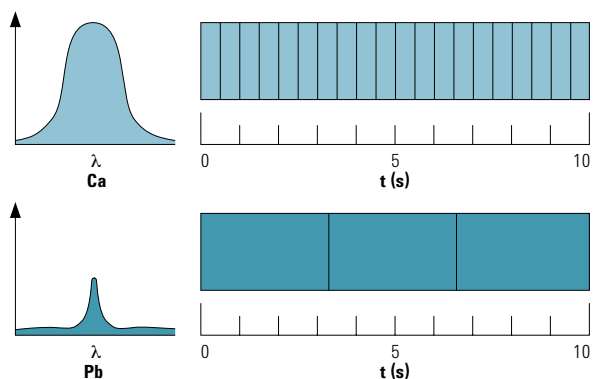
## Productivity with extended dynamic range

The determination of major, trace and toxic elements in soils, waters, food, and agricultural samples is fast and easy using a single plasma view. Agilent's 720/730 horizontal, axially-viewed plasma provides excellent sensitivity for trace-level determinations and the flexibility to handle major levels. The robust plasma is able to handle a wide variety of sample matrices while still delivering the best detection limits. Agilent's unique Multi-Cal feature extends the linear range of analysis from parts-per-billion to percentage levels. Unlike dual view systems, the Agilent 720/730 Series ICP-OES provides this linear dynamic range without having to analyze the sample twice.

This extended linear dynamic range, coupled with the freedom from interferences offered by the CCD detector, makes the 720/730 ICP-OES ideal for environmental applications. The Agilent 720/730 axial meets all US EPA Contract Required Detection Limits (CRDL) for waters and waste waters and is capable of routinely handling up to 5% dissolved salts. The stability, wide linear dynamic range and reduced chemical interferences of the 720/730 Series ICP-OES ensures that your laboratory can analyze more samples every day.

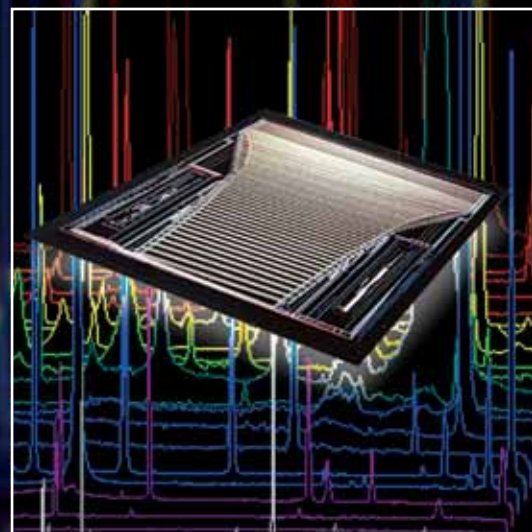
## Robust performance

If long term analysis of the most difficult sample types is required, then Agilent's 725/735 Series offers the benefits of robust operation with minimal maintenance. The radially-viewed plasma is vertically oriented, providing immediate venting of exhaust vapors for reduced injector tube blockage and ensuring long term stable performance, even with high levels of dissolved salts or solids. Dual view plasma systems, which feature horizontal torches, cannot match the rugged, high solids performance of the 725/735.



For a replicate time of 10 seconds, AIT simultaneously collects many short readings for high intensity lines, and fewer, longer readings for low intensity lines, providing the best signal-to-noise ratio.

# robust

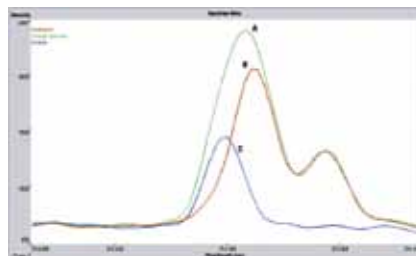


## CLEARLY BETTER SOFTWARE

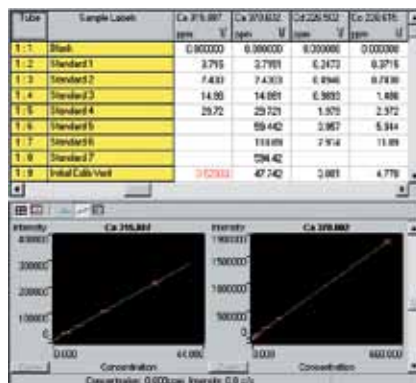
User friendly software with all instrument controls, sample results and signal graphics accessible from one window.

### Software designed for real samples

- Easy-to-use worksheet-based software contains wizards and comprehensive multimedia tools to guide you through operation.
- Fitted background correction simplifies method development as you don't need to select correction points. This ensures better correction and fast analysis start-up.
- Agilent's Fast Automated Curve-fitting Technique (FACT) resolves complex spectral interferences, ensuring greater accuracy in difficult matrices. FACT modeling can be conducted post-analysis.
- AutoMax eliminates manual optimization and provides fast automated method development.
- SmartRinse speeds up sample washout, reducing carryover and increasing productivity.
- Spectroscopy Configuration Manager allows you to enhance the ICP Expert II software to assist in achieving compliance with the US FDA 21 CFR part 11 rule (optional software).
- With MultiCal you can monitor results at two or more wavelengths for each element — giving you confidence in the accuracy of your results and confirming they are interference free.



**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 (500 mg/L Fe)  
c. Corrected signal for the Cd analyte.

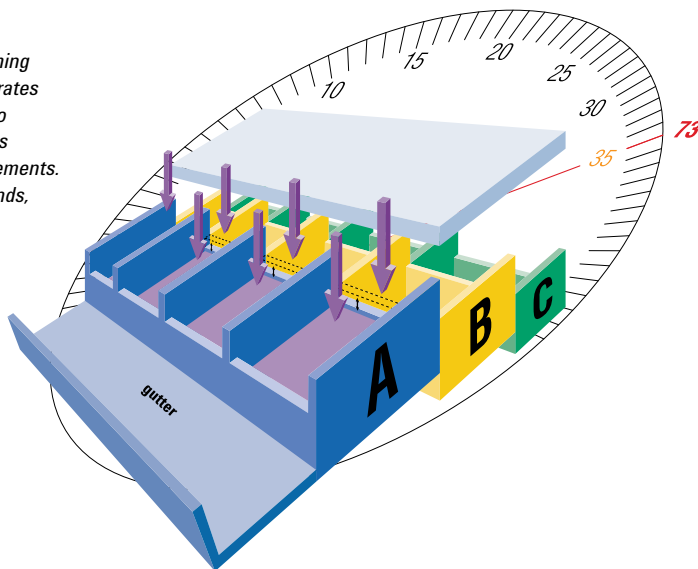


**Confirm results automatically**  
With MultiCal, results are automatically assigned either to the Ca 315.887 nm wavelength calibrated to 30 mg/L or the 370.602 nm wavelength calibrated to 600 mg/L. The Initial Calibration Verification standard is accurately recovered at 47.7 mg/L (%R = 106%).

# THE WORLD'S FASTEST ICP-OES

## Measure 73 elements in 35 seconds

Unlike segmented CCD detectors, the VistaChip features anti-blooming protection on every pixel. If during a reading an intense signal saturates a pixel (a) the excess electrons drain into the gutter rather than into nearby pixels or the other registers (b and c), allowing simultaneous measurement of trace analytes in the presence of concentrated elements. With the Agilent 720/730 you can measure 73 elements in 35 seconds, making it the world's fastest ICP-OES.



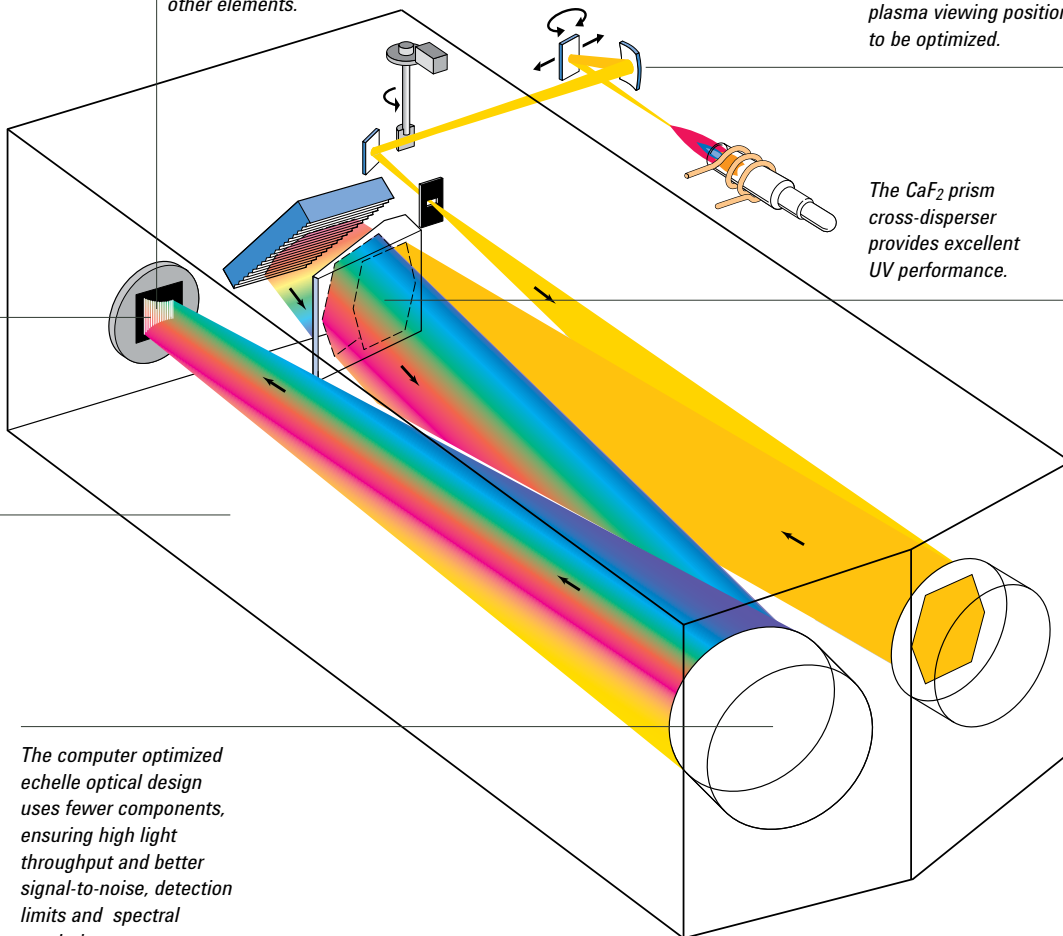
The 720/730 Series provides true simultaneous measurement of all analytes, background and internal standards. All wavelengths are captured in one reading without time consuming scanning.

The patented VistaChip provides anti-blooming protection on every pixel, ensuring trace analytes can be accurately measured in the presence of high concentrations of other elements.

Computer controlled mirrors enable the plasma viewing position to be optimized.

The fast operational speed of the VistaChip reduces running expenses by saving on maintenance and argon costs, as well as providing more accurate day sample analyses each day.

The CaF<sub>2</sub> prism cross-disperser provides excellent UV performance.



The echelle polychromator is thermostatted to provide excellent long-term stability and reduce start-up time.

The computer optimized echelle optical design uses fewer components, ensuring high light throughput and better signal-to-noise, detection limits and spectral resolution.

# accurate



## FOOD AND AGRICULTURE APPLICATIONS

You are committed to providing food, beverages and agricultural products of consistent quality and uncompromising safety. Agilent provides products and services to help you deliver on that promise.

- The axially-viewed 720/730 is optimized to give maximum sensitivity for trace-level applications, including the determination of major, trace and toxic elements in food and agricultural samples.
- Using Agilent's MultiCal feature, major elements can be simultaneously quantitated accurately, providing the dynamic range needed to cover food and agricultural samples.
- Improve detection limits and reduce interferences when determining Hg and hydride forming elements by using the Vapor Generation Accessory (VGA 77P). Add the SPS 3 autosampler for unattended hydride analysis.
- Increase productivity by 33% and reduce argon consumption by 25% with the Switching Valve System (standard on the 730 Series).

		Mg %	K %	P %	Ca mg/kg	Na mg/kg	Zn mg/kg	Fe mg/kg	Mn mg/kg	Cu mg/kg
NIES CRM No.10-a Rice Flour	Certified value	0.134 ± 0.008	0.280 ± 0.008	0.340 ± 0.007	93 ± 3	10.2 ± 0.3	25.2 ± 0.8	12.7 ± 0.7	34.7 ± 1.8	3.5 ± 0.3
	Measured	0.133 ± 0.002	0.264 ± 0.006	0.332 ± 0.006	90 ± 1	10.7 ± 0.3	23.9 ± 0.8	12.2 ± 0.6	31.9 ± 1.0	3.3 ± 0.1
NIST SRM 8436 Durum Wheat	Certified value	0.107 ± 0.008	0.318 ± 0.014	0.290 ± 0.022	278 ± 26	16.0 ± 6.1	22.2 ± 1.7	41.5 ± 4.0	16.0 ± 1.0	4.30 ± 0.69
	Measured	0.105 ± 0.003	0.287 ± 0.006	0.261 ± 0.009	266 ± 10	16.8 ± 0.9	21.2 ± 0.5	42.6 ± 0.8	15.0 ± 0.2	4.03 ± 0.20
NIST SRM 8435 Milk Powder	Certified value	0.0814 ± 0.0076	1.363 ± 0.047	0.780 ± 0.049	9220 ± 490	3560 ± 40	28.0 ± 3.1	1.8 ± 1.1	0.17 ± 0.05	0.46 ± 0.08
	Measured	0.0795 ± 0.0034	1.264 ± 0.022	0.717 ± 0.024	9435 ± 363	3407 ± 79	21.2 ± 0.5	1.9 ± 0.8	0.172 ± 0.002	0.43 ± 0.05
NIST SRM 1571 Orchard Leaves	Certified value	0.62 ± 0.02	1.47 ± 0.03	0.21 ± 0.01	2.09 ± 0.03	82 ± 6	25 ± 3	(270)**	91 ± 4	12 ± 1
	Measured	0.57 ± 0.01	1.38 ± 0.04	0.187 ± 0.003	1.94 ± 0.06	79 ± 1	24.5 ± 0.7	268 ± 7	83.1 ± 2.0	11.0 ± 0.2
NIST SRM 1573a Tomato Leaves	Certified value	1.2	2.70 ± 0.05	0.216 ± 0.004	5.05 ± 0.09	136 ± 4	30.9 ± 0.7	368 ± 7	246 ± 8	4.70 ± 0.14
	Measured	1.07 ± 0.01	2.55 ± 0.03	0.207 ± 0.004	4.89 ± 0.01	115 ± 3	29.9 ± 0.7	338 ± 8	234 ± 2	4.57 ± 0.14

### High throughput for agriculture applications

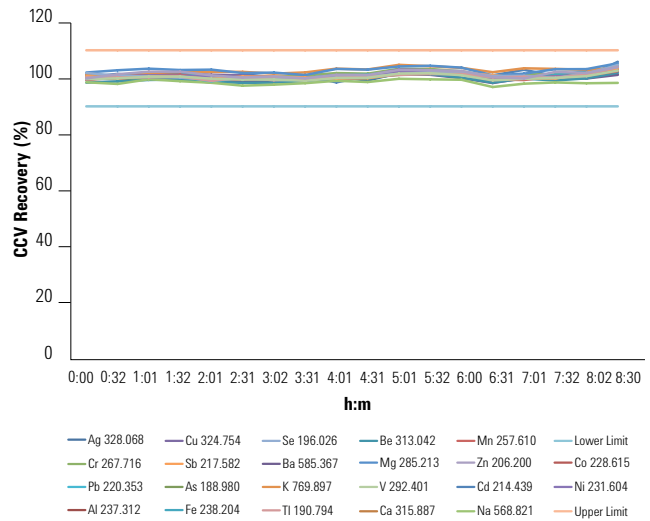
Results from analysis of acid extractable trace, minor and major elements in flour and plant tissue using the Agilent 730 ICP-OES illustrate the wide dynamic range and high throughput. Typical analysis including uptake and washout took 50 seconds.



# ENVIRONMENTAL APPLICATIONS

In a field that demands accuracy, productivity and regulatory compliance, your challenges have never been greater. Today, environmental analysis must be done more reliably, more efficiently, and with even higher quality results than ever before.

- The axially-viewed 720/730 is optimized to give maximum sensitivity for trace-level applications, including the determination of trace and toxic elements in soils and waters.
- Multi-Cal feature extends the linear range of analysis from parts-per-billion to percentage levels, providing the dynamic range needed for simultaneous determinations using one plasma view.
- The thermally stabilized optics contain no moving parts, ensuring excellent long-term stability so you can satisfy all the required regulatory limits without recalibration.
- The ICP Expert II software provides complete automation of all US EPA protocols. Customizable QC tests enable you to satisfy the requirements of other regulatory bodies.
- Enhance the performance of the 720/730 with the Ultrasonic Nebulizer, which is ideal for trace level determinations, providing a 5–50 fold improvement in performance compared to pneumatic nebulizers.



### Excellent long term stability

Shown is US EPA CLP ILMO 5.3, Continuing Calibration Verification (CCV) solution achieving <1% RSD repeatability for all elements over 8 hours, without internal standardization.

		Al (%)	Ca (%)	Fe (%)	Mg (%)	K (%)	P (%)	Na (%)
<b>NIST SRM 2710 Montana soil</b>	Certified Range	1.2-2.6	0.38-0.48	2.2-3.2	0.43-0.60	0.37-0.50	0.106-0.11	0.049-0.062
	Measured	2.07 ± 0.01	0.376 ± 0.003	2.50 ± 0.03	0.510 ± 0.016	0.497 ± 0.003	0.0677 ± 0.0008	0.0613 ± 0.0003
<b>NIST SRM 2709 San Joaquin soil</b>	Certified Range	2.0-3.1	1.4-1.7	2.5-3.3	1.2-1.5	0.26-0.37	0.05-0.07	0.063-0.11
	Measured	2.00 ± 0.01	1.38 ± 0.01	2.63 ± 0.01	1.15 ± 0.01	0.347 ± 0.001	0.0442 ± 0.0003	0.0636 ± 0.0005
		Ti (%)	Zn (mg/kg)	Mn (mg/kg)	Cu (mg/kg)	Ba (mg/kg)	Sr (mg/kg)	Pb (mg/kg)
<b>NIST SRM 2710 Montana soil</b>	Certified Range	0.092-0.11	5200-6900	6200-9000	2400-3400	300-400	94-110	4300-7000
	Measured	0.122 ± 0.001	5815 ± 46	7054 ± 86	2426 ± 20	307 ± 4	90.9 ± 1.1	4433 ± 22
<b>NIST SRM 2709 San Joaquin soil</b>	Certified Range	0.03-0.04	87-120	360-600	26-40	392-400	100-112	12-15
	Measured	0.0234 ± 0.0001	87.2 ± 0.3	483 ± 3	29.2 ± 0.3	367 ± 1	88.7 ± 0.5	10.7 ± 0.1
		As (mg/kg)	Cr (mg/kg)	Ni (mg/kg)	Co (mg/kg)	Cd (mg/kg)	Mo (mg/kg)	V (mg/kg)
<b>NIST SRM 2710 Montana soil</b>	Certified Range	490-600	15-23	8.8-15	6.3-12	13-26	13-27	37-50
	Measured	514 ± 4	19.3 ± 0.1	10.4 ± 0.1	8.90 ± 0.06	16.4 ± 0.1	14.9 ± 0.1	48.7 ± 0.5
<b>NIST SRM 2709 San Joaquin soil</b>	Certified Range	<20	60-115	65-90	10-15	<1	<2	51-70
	Measured	15.3 ± 0.1	61.8 ± 0.2	67.7 ± 0.6	11.1 ± 0.1	<0.2	1.51 ± 0.03	60.0 ± 0.2

### Wide dynamic range

Multi-element determination of soils prepared using microwave assisted digestion, based on US EPA method 3051A digestion protocols. Extractable major, minor and trace elements in soil are shown.

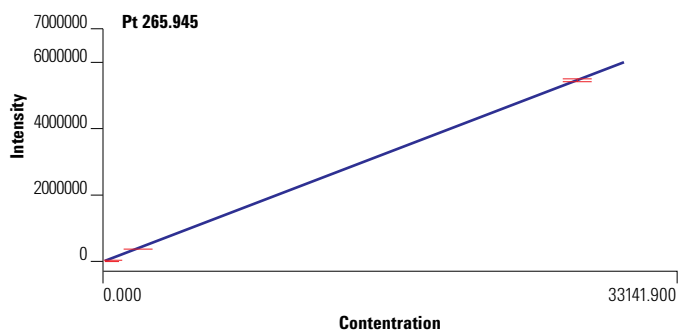
# reliable



## METALS AND MINING APPLICATIONS

Whether your challenge is determining traces in the presence of line rich elements such as iron and titanium which may induce spectral interferences, determining analytes from trace to percentage levels, or handling digests with high levels of dissolved solids, the 725/735 deliver.

- The radially-viewed 725/735 feature an efficient sample introduction system for maximum robustness, allowing you to analyze the most demanding samples with ease and accuracy.
- Full wavelength coverage and high resolution optics provide flexibility in wavelength selection so that you can optimize signal-to-noise and eliminate spectral interferences.
- Agilent's unique Multi-Cal feature extends the linear range by monitoring your results at two or more wavelengths, providing the dynamic range needed to cover mineralogical samples.
- ICP Expert II software provides the correction options essential for accurate results. Choose from fitted correction to handle sloping baselines, FACT for fast and easy removal of spectral interferences or IECs for direct spectral overlap at the same wavelength.



Pt 265.945 Calibration (mg/L) on Dec 7 2009, 09:27:55 pm

Standard	Flags	Int (c/s)	Std Conc	Calc Conc	Error	%Error
Blank	---	6.4		0.000000	0.000000	0.000
Standard 1	---	367.3	2.0000	1.8130	-0.187	-9.351
Standard 2	---	3694.4	20.000	18.522	-1.478	-7.390
Standard 3	---	37090.9	200.00	186.25	-13.754	-6.877
Standard 4	---	369911.3	1961.0	1857.7	-103.262	-5.266
Standard 5	---	5455279.5	27390	27397	7.494	0.027
Correlation Coefficient		0.999993				

### Minimize interferences

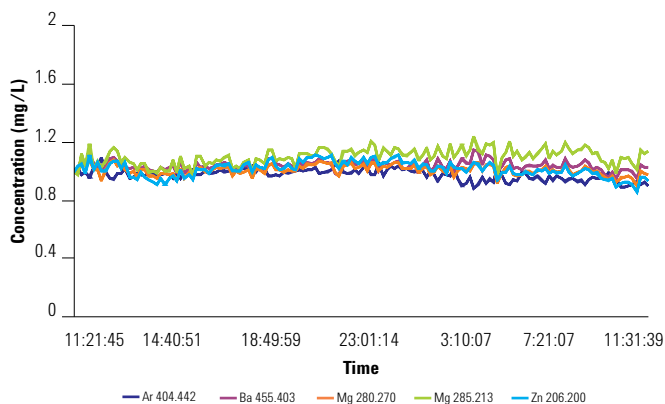
With true simultaneous measurement capability and full wavelength coverage, the 725 ICP-OES can measure high % levels of precious metals with exceptional precision and superb linearity. This Pt calibration covers the range to 27,000 ppm with precision < 0.3 % RSD for each standard.

# INDUSTRIAL, CHEMICAL AND PETROCHEMICAL APPLICATIONS

Production demands, efficiency improvements, and good environmental management impose increasingly tough demands on your business. Agilent understands your success depends on fast, accurate results from rugged, reliable instrumentation that can handle difficult sample types.

Vertically orientated, radially-viewed plasma systems are the accepted standard in many industries including chemicals manufacture, salt production, wear metals analysis, petrochemical production and precious metals refining.

- The vertically oriented 725/735 provides immediate venting of exhaust vapors for reduced injector tube blockage and long term stable performance even with very high levels of dissolved solids.
- The radially-viewed plasma of the 725/735 achieves maximum robustness, allowing you to easily and accurately analyze the most demanding samples.
- Optional inert sample introduction system for samples containing hydrofluoric acid (HF).
- Optional robust axial and radial sample introduction systems for chemicals, organic solvents and high dissolved solid samples.



### Stable results with high TDS samples

Measurement of a range of elements at 1.0 mg/L in 25% NaCl using an axial system with the high solids torch. Excellent long term stability is achieved, even with continuous aspiration over 24 hours. No internal standard correction was applied. Reproducibility over 24 hours was < 5% RSD.

NIST 1084a Wear Metals	Wavelength nm	Certified mg/L	Measured mg/L	Upper Linear Range mg/L
Ag	328.068	101.4	96.3	250
Al	167.019	(104)	105.6	100
Cr	267.716	98.3	96.9	250
Cu	327.395	100	99.1	250
Fe	238.204	98.9	100.6	100
Mg	279.553	99.5	100.6	100
Mo	202.032	100.3	96.6	250
Ni	231.604	99.7	99.5	250
Pb	220.353	101.1	107.7	1500
Si	251.611	(103)	100.7	250
Sn	189.927	97.2	91.5	250
Ti	336.122	100.4	101.3	250
V	292.401	95.9	101.3	250

### High throughput for petrochemical applications

Results of high throughput analysis of NIST 1084 Wear Metal in Oil SRM diluted 1:10 with kerosene using a 725 ICP-OES. Typical sample to sample analysis time is 39 seconds using Rapid Flow Nebulization.

NIST 1761 Low Alloy Steel	Certified wt %	Measured wt %
Al	0.055	0.069
As	0.011	0.012
Co	(0.028)	0.022
Cr	0.22	0.231
Cu	0.30	0.318
Mn	0.678	0.720
Mo	0.103	0.104
Ni	1.99	1.943
P	0.040	0.047
S	0.035	0.034
Si	0.18	0.173
Sn	(0.05)	0.050
Ti	0.18	0.193
V	0.053	0.055

### Accurate measurement with minimal preparation

Results for direct measurement of NIST 1761 Low Alloy Steel SRM using the Cetac Solis-500 laser ablation system with the 720 ICP-OES show excellent agreement with the certified values, confirming stable, accurate measurements can be achieved with minimal preparation.

# THE COMBINED BENEFITS OF TWO LEADERS IN ATOMIC SPECTROSCOPY

With the 2010 addition of Varian, Inc., Agilent now offers an even greater range of instrumentation and the most comprehensive columns and supplies portfolio in the market. Just as important are the best-in-class service and technical support teams, focused on finding solutions for our customers. Agilent is here to provide the technology — and *the Measure of Confidence* — you need to be successful.

## An expanded portfolio of solutions from the leader in ICP-MS

The range of Agilent AA, ICP-OES and ICP-MS instruments offers unmatched performance, and the highest level of reliability and ease-of-use. The instruments are backed by a combined global network of dedicated and experienced support staff.

Agilent 7700 Series ICP-MS offers unmatched matrix tolerance and interference removal, and the smallest footprint of any ICP-MS.



Agilent's AA range includes the world's fastest flame AA and the world's most sensitive furnace AA.



**Our catalog of new applications is ever growing.**

To learn about the latest, contact your local Agilent Representative or visit us at:  
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