



Agilent 200 Series AA Systems

# AGILENT ATOMIC ABSORPTION SPECTROMETERS

The Measure of Confidence



**Agilent Technologies**

## PRODUCTIVE, PRECISE, RELIABLE.

**Agilent's AA range is productive, user-friendly and exceptionally reliable. The instruments deliver the high performance that analysts require, while being equally at home in routine laboratories where reliability and simple operation are vital.**

### **A family of Atomic Absorption solutions**

- Agilent's 240 AA combines flexibility with reliable hardware, providing budget-sensitive users with a high performance AA for routine flame/furnace/vapor analyses.
- Agilent's 240FS/280FS AA are the world's fastest, and most productive flame AA systems, with Fast Sequential operation doubling sample throughput and dramatically reducing running costs. Able to handle multi-element suites with ease, they are ideal for food and agriculture or any high throughput labs.
- Agilent's 240Z/280Z AA Zeeman Graphite Furnace AA (GFAA) systems are productive and precise, providing superior furnace performance and accurate background correction.

- Double your productivity with Agilent's AA Duo, the world's only AA systems that provide true simultaneous operation of flame and graphite furnace without changeover delays.

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.



Agilent offers a range of AA systems to match your analytical needs and budget, including the world's fastest flame AA, featuring unique Fast Sequential capability, and most sensitive furnace AA.

# 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.

	<b>INDUSTRIAL</b>	<b>CHEMICAL &amp; PETROCHEMICAL</b>	<b>ENVIRONMENTAL</b>	<b>FOOD &amp; AGRICULTURE</b>	<b>METALS/MINING</b>
<b>FS Flame AA</b> 240FS/280FS AA + SIPS 20	Pb & Cd in consumer goods e.g., toys, jewelry Ca, Cr, Cu, Fe, K, Mg & Na in plating solutions	Na & K in FAME (fatty acid methyl esters) Pb & Mn in unleaded gasoline	Heavy metals in soils	Major elements in food, beverage & agricultural samples Cations & nutrients in soils	Au, Ag & Pt group elements in ore grade material
<b>Flame AA</b> 240 AA	Chemical analysis of cement Zn & Sb in paper Ca, Cr, Cu, Fe, K, Mg & Na in plating solutions	Wear metals in used oils Additives (e.g. Ba, Ca, Mn & Zn) in fresh lubricating oils Major elements in polymers	Pb in airborne particulates		Major components in steel & alloys Analysis of high purity gold
<b>Vapor Generation AA</b> 240FS/280FS AA + VGA 77	As, Hg & Sb in coal fly ash As in human hair		As, Sb and Se in sediments Hg in waters, effluent, etc. (US EPA Method 245.1) Hg in electronics & plastics (WEEE/RoHs)	Hg and As in fish & sea foods Trace As & Sb levels in plant materials	As & Sb in zinc plate solutions
<b>GFAA</b> 240FS/280FS AA + GTA 120	Al & Fe in paper Pb in whole blood	Ni, V, Fe & Na in crude oils Trace metals in engine oil		Pb and Cd in fish, sea foods & plant materials	Trace metals in high purity copper
<b>Zeeman GFAA</b> 240Z/280Z AA	Trace elements in high purity sulfuric acid Na, Ca and Si in pure process water Al in dialysis solutions Se in serum	Trace elements in heavy, industrial fuel oils	Cd, Cu, Pb, Co & Ni in marine invertebrates Toxic elements in waters & soils (US EPA Method 200.9) Pb, Cd & Cr in electronics & plastics (WEEE/RoHs)	Cu, Fe & Ni in edible oils	Minor components in steel & alloys

## Maximize your productivity and data quality with genuine Agilent atomic spectroscopy supplies

Agilent AA supplies are manufactured to stringent specifications and rigorously tested to ensure you can optimize performance. Designed to maintain the high performance that today's applications demand, Agilent also offers an extensive range of single-element and solid cathode multi-element lamps and high intensity UltrAA lamps for superior, cost effective performance. Why risk compromising your analytical result with anything else?

For more information see [www.agilent.com/chem/specsuppliesinfo](http://www.agilent.com/chem/specsuppliesinfo)



## THE FASTEST FLAME AA.

**Achieve the productivity and speed of sequential ICP with Agilent's Fast Sequential (FS) AA systems. Agilent's FS systems deliver productivity and profitability for your lab.**

### 240FS/280FS AA

By measuring all elements in a single analysis of each sample, Agilent's Fast Sequential AA provides complete results for each sample in minutes. In addition to saving you valuable time and doubling sample throughput, the 240FS/280FS AA also reduce running costs.

- Determine your entire element suite without repeatedly aspirating samples
- Halve your analysis time by reducing sample analysis delays
- Determine 10 elements per sample in < 2 minutes without sacrificing data quality
- Get full elemental coverage, no matter how many elements you are determining
- Reduce sample consumption — with less delay throughout analysis, less sample is wasted
- Save labor and reduce running costs — the more elements you determine, the more you save on gas, reagent and lamp usage
- Improve precision and accuracy with online internal standard corrections for physical differences, sample preparation errors, or drift

### How does Fast Sequential AA work?

1. Determination time is optimized as the FS wizard sorts the elements by wavelength and flame type
2. Optimum flame conditions are used for each elemental determination — the Hammer gas control initiates instantaneous changes to programmed flows and provides superb reproducibility
3. Reproducible wavelength positioning is achieved with minimal delays by the high speed wavelength drive (2,000 nm/min) operating under intelligent software control
4. Simultaneous operation of all lamps in FS mode
5. Fast lamp selection using a motor driven mirror



Agilent 240FS AA

## PRODUCTIVE SOLUTIONS FOR INDUSTRIAL & PETROCHEMICAL

Whether you are analyzing raw materials and components, or conducting product testing, robust reliable solutions are essential to your success.

Agilent's AA range is ideal for mid-sized laboratories handling a wide variety of sample types such as feed or reagents, intermediate and final products, samples from cooling systems, waste products and final residues or effluents.

Tube	Sample Label	K 766.5	Na 589.0	Cr 357.9	Cu 324.8	Mg 285.2	Mn 279.5	Fe 248.3	Co 248.7	Ni 232.0
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1:8	Sample 001	0.6907	0.3262	0.300	0.558	8.536	0.33			
1:5	Sample 002	0.6887	0.4823	0.437	0.588	8.7852	0.48			
1:10	Sample 003	0.3613	0.5990	0.551	0.592	8.9495	0.54			
1:11	Sample 004	0.5345	0.4125	0.352	0.597	8.6794	0.37			
1:12	Sample 005	0.5337	0.5188	0.510	0.645	8.8574	0.475			
1:13	Sample 006	0.6000	0.8236	0.720	0.550	1.2955	0.76			
1:14	Sample 007	0.4002	0.5406	0.406	0.379	8.0740	0.505			
1:15	Sample 008	0.3168	0.7130	0.645	0.308	8.6820	0.554			
1:16	Sample 009	0.4075	0.5723	0.553	0.475	8.9458	0.39			
1:17	Sample 010	0.7119	0.4630	0.627	0.567	1.1316	0.637			
1:18	Sample 011	0.2117	0.4257	0.586	0.603	8.7544	0.423			
1:19	Sample 012	0.2878	0.5909	0.440	0.518	8.9822				
1:20	Sample 013	0.6044	0.6337	0.611	0.776	1.0706				
1:25	Sample 014	0.3003	0.6330	0.388	0.538	8.5294				
2:1	Sample 015	0.4243	4.0034	0.295	0.383	8.0853				
2:2	Sample 016	0.3273	0.0162	0.434	0.587	8.0819				
2:3	Sample 017	0.2729	0.5778	0.560	0.538	8.0818				
2:4	Sample 018	0.2493	0.4599	0.384	0.598	8.0813				
2:5	Sample 019	0.3508	0.4136	0.474	0.459	8.0810				
2:6	Sample 020	0.3827	0.5862	0.755	0.576	8.0803				
2:7	Sample 021	0.3757	0.6377	0.507	0.414	8.8995				
2:8	Sample 022	0.6018	0.3192	0.686	0.307	8.6113				
2:9	Sample 023	0.3758	0.4812	0.577	0.477	8.7785				

Conventional AA determines only one element at a time, so samples are analyzed time and time again during a multi-element sequence.

Tube	Sample Label	K 766.5	Na 589.0	Cr 357.9	Cu 324.8	Mg 285.2	Mn 279.5	Fe 248.3	Co 248.7	Ni 232.0
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
1:8	Sample 001	0.7156	1.1602	1.318	1.001	1.6712	8.976	1.019	1.005	0.957
1:9	Sample 002	0.7120	1.1257	0.967	1.002	1.6711	8.977	1.028	1.005	1.000
1:10	Sample 003	0.7038	1.1417	0.937	1.009	1.6728	8.979	1.064	1.000	1.038
1:11	Sample 004	0.6337	1.1295	0.903	0.996	1.6717	8.980	1.018	1.011	0.985
1:12	Sample 005	0.6883	1.1348	0.938	0.996	1.6636	8.989	1.064	1.015	0.971
1:13	Sample 006	0.7018	1.1444	0.972	1.009	1.6852	8.976	1.016	1.012	1.023
1:14	Sample 007	0.6993	1.1314	0.968	0.990	1.6705	8.990	0.963	1.020	0.992
1:15	Sample 008	0.3304	8.6015	0.526	0.551	0.3376	8.528	0.523	0.961	0.579
1:16	Sample 009	0.6842	1.1222	0.953	1.000	1.6688	8.976	0.977	0.979	1.029
1:17	Sample 010	0.3617	8.6400	0.959	0.572	0.3930	8.558	0.561	0.607	0.641
1:18	Sample 011	0.6718	1.1270	0.972	0.993	1.6627	8.966	1.033	1.043	1.048
1:19	Sample 012	0.5985	8.8896	0.785	0.911	1.3586	8.754	0.901	0.834	0.804
1:20	Sample 013	0.6972	1.1472	0.978	1.011	1.6624	8.982	1.061	1.017	1.055
1:21	Sample 014	0.4959	8.8022	0.701	0.733	1.2536	8.710	0.798	0.755	0.736
2:1	Sample 015	-0.0049	-0.0158	0.146	0.003	-0.0016	8.011	0.108	0.086	0.133
2:2	Sample 016	0.4642	8.6040	0.572	0.728	1.2440	8.710	0.808	0.762	0.785
2:3	Sample 017	0.6788	1.1275	0.952	1.000	1.6699	8.982	1.062	1.048	1.045
2:4	Sample 018	0.3874	8.5316	0.502	0.490	0.3442	8.484	0.533	0.535	0.515
2:5	Sample 019	0.6760	1.1277	0.901	1.004	1.6695	8.985			
2:6	Sample 020									
2:7	Sample 021									
2:8	Sample 022									
2:9	Sample 023									

Using Fast Sequential AA, samples are only aspirated once and all elements are measured before progressing to the next sample.

## Flexible sample handling

Automate your analyses with Agilent's SPS 3 Sample Preparation System and speed up flame AA even further. Using the SPS 3, you can create a convenient sample preparation platform for your laboratory.

- Fastest ever sample to sample changes
- High sample capacity to enhance laboratory productivity with support for rack exchange during analysis
- Advanced rinse options to reduce carryover
- Flexible configuration with standard laboratory racks for different tube types and probes
- Optional environmental enclosure for purging/fume extraction



Agilent SPS 3 Autosampler

## THE MOST SENSITIVE FURNACE AA.

**Graphite furnace AA is the preferred technique for ppb level determinations of toxic, heavy metals such as Pb and Cd. The 240Z/280Z AA with Zeeman background correction provides superior furnace performance and accurate background correction to eliminate interferences.**

### 240Z/280Z AA Zeeman dedicated GFAA

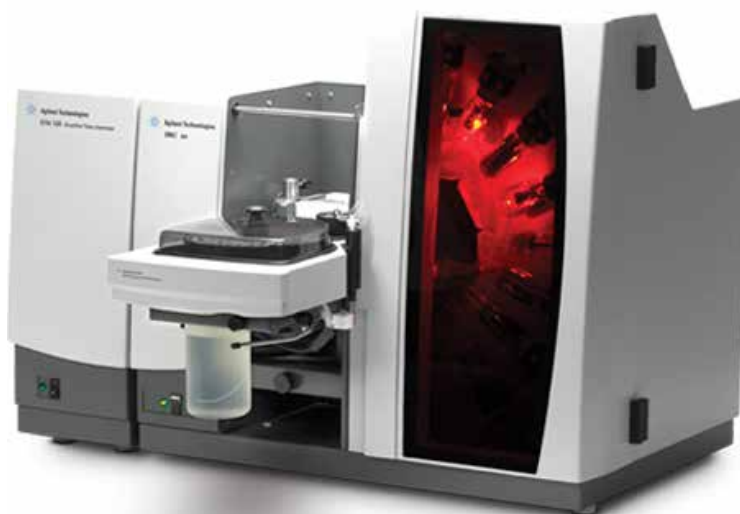
The 240Z/280Z AA features Zeeman background correction for correction over the full wavelength range, structured background, spectral interferences and high background absorbances.

- Outstanding performance at ppb levels from the Constant Temperature Zone (CTZ) furnace design
- High sensitivity and freedom from interferences. Competing systems may limit performance by restricting elements, the wavelengths available for analysis, or compromising furnace conditions
- Easy alignment — only a single light source is required
- Most accurate correction with Agilent's unique magnetic waveform providing double the background correction speed of longitudinal Zeeman instruments and three point polynomial interpolation
- Simple setup and operation. Tube-CAM furnace viewing camera and Surface Response Methodology (SRM) furnace optimization wizard simplify method development, enabling you to easily select optimum conditions for your analysis

### 240FS/240Z AA Duo system

The 240FS/240Z AA Duo system offers simultaneous flame and furnace operation that delivers the lowest cost per analysis, making it ideal for busy laboratories.

- Double the productivity of your laboratory — the Agilent AA Duo is the world's only AA system that provides true simultaneous operation of flame and graphite furnace from a central computer
- Save time with dedicated atomizers that eliminate complex setup and time consuming changeovers. Each atomizer is permanently aligned for immediate use and never needs re-alignment
- Analyze any sample, with the widest linear dynamic range from sub ppb (using furnace and hydride techniques) to percent levels (flame)
- Simplify setup and operation with advanced features such as automated wavelength and slit selection
- User friendly software delivers rapid instrument setup, easy operation and simple method development



Agilent 280Z AA

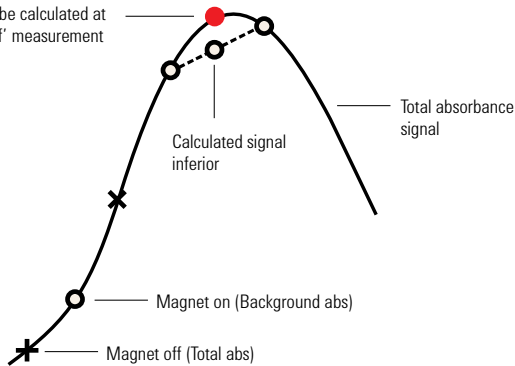
## PRECISE SOLUTIONS FOR ENVIRONMENTAL

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.

Agilent's AA range is ideal for government and contract laboratories routinely testing elements in waters, effluents, sludges and soil at major levels, and toxic elements at trace levels.

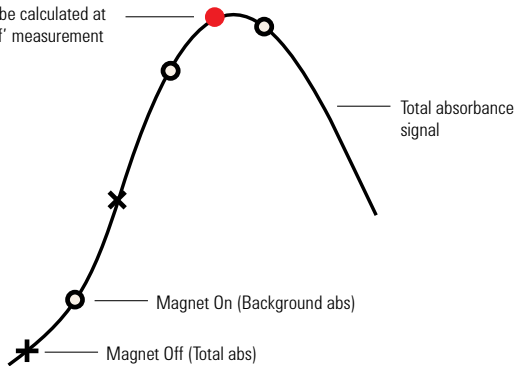
### Linear Interpolation Procedure

Background to be calculated at this 'magnet off' measurement



### Polynomial Interpolation Procedure

Background to be calculated at this 'magnet off' measurement



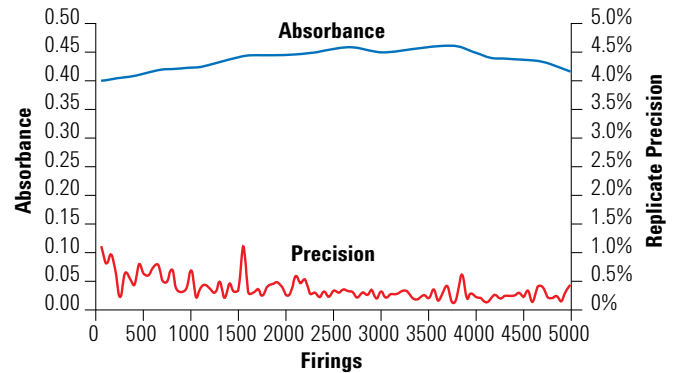
Agilent Zeeman systems use three point polynomial interpolations to accurately track the background signal, resulting in an 11-fold improvement in correction accuracy.

## The world's best Zeeman AA

Zeeman background correction has been widely accepted by international regulatory agencies (such as the US EPA) as the most effective background correction technique for regulated environmental analyses.

Agilent Zeeman systems feature the transverse AC modulated Zeeman configuration with the field applied across the atomizer.

This avoids the sensitivity losses observed with a DC (permanent) magnet, and maximizes light throughout compared with longitudinal designs where end caps restrict the light passing through the pole pieces of the magnet. This ensures outstanding sensitivity and maximum performance with challenging sample matrices.



Extend tube lifetimes and reduce gas consumption by 40% with the GTA 120. Typical lifetimes for an aqueous copper standard with an atomization temperature of 2300 °C are shown (above).

## MEET YOUR ANALYSIS CHALLENGES.

With an extensive range of accessories to extend the capabilities of Agilent AA instruments, you can meet all your analysis challenges.

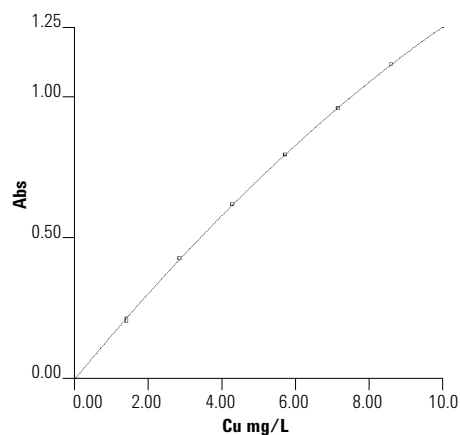
### SIPS 20

Agilent's Sample Introduction Pump Systems (SIPS) improve productivity with a range of unique benefits for flame AA.

- On-line addition of ionization suppressants during analysis, eliminating manual preparation before analysis
- Eliminates tedious, manual preparation of multiple calibration standards. SIPS requires only one calibration standard
- Fast, online dilution — even if your sample is out of the calibration range, you'll get an immediate result
- Enhances accuracy and precision — with < 2% error SIPS reduces manual dilution errors
- Performs online spiking of samples for spike recovery studies
- Automates the tedious task of flame standard addition calibrations when tackling samples with complex matrices

#### Improve your calibration data

SIPS generates perfect calibrations every time — eliminating calibration errors and reducing tedious standard preparation.



#### Eliminate manual dilution errors

SIPS provides better accuracy and reproducibility than manual dilution

SIPS dilution performance			
Actual Conc. mg/L	Measured Conc. mg/L	Dilution Factor	Dilution Error %
10.0	10.1	3.1	0.2
50.8	50.8	7.5	0.1
56.4	56.7	18.7	0.6
101.6	102.8	35.5	1.2
202.8	204.4	55.0	0.8
400.0	401.6	62.4	0.4
456.7	455.8	78.3	0.2
500.0	497.2	138.4	0.6
500.0	501.3	151.8	0.3



Agilent SIPS 20

## RELIABLE SOLUTIONS FOR FOOD & AGRICULTURE

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.

Agilent's AA range is ideal for small to mid-sized screening laboratories needing to determine essential nutrients and elements at major levels, and toxic elements at trace levels.

### VGA 77

The 240 AA flame with Vapor Generation Accessory (VGA 77) is well suited to cost-conscious environmental and food and agriculture laboratories. It offers a dedicated solution for trace level determination of Hg using the regulatory approved proven cold vapor technique, or hydride forming elements such as As and Se using the vapor generation technique.

- Determine mercury and hydride forming elements (As, Se, etc.) at ppb levels
- Convenience of flame AA operation with better sensitivity than flow injection
- Achieve precisions of <2% RSD at ppb levels using conventional integration of the steady state signal. Flow injection produces transient signals requiring multiple injections and delivering less accurate results
- Greater productivity – results are obtained in less than a minute, even with three replicates per sample
- Reduce sample consumption to as little as 8 mL per element during analysis
- Simple and automatic operation, as samples are automatically combined with a continuous flow of acid and reagent, for rapid reaction and best sensitivity
- Simple changeover. Reduce setup time and eliminate cross contamination by changing modules when switching between elements with conflicting chemistries

### GTA 120 GFAA

Agilent's integrated GTA 120 Graphite Tube Atomizer provides superior furnace performance, no matter how difficult the sample, making them ideal for applications as diverse as chemical, petrochemical, food and agriculture.

- Extremely fast atomization even with difficult sample matrices
- Best signal-to-noise, due to the long atomization cell. This ensures the highest sensitivity and lowest detection limits
- Reduces running costs with extended tube lifetimes and a 40% decrease in gas consumption
- Simplifies method development. Use Tube-CAM to accurately set the probe dispensing height and confirm the optimum drying temperature. The SRM wizard also optimizes the ashing and atomization temperatures
- Run unattended longer — with capacity for 135 solutions, carousel changes are reduced for high throughput labs



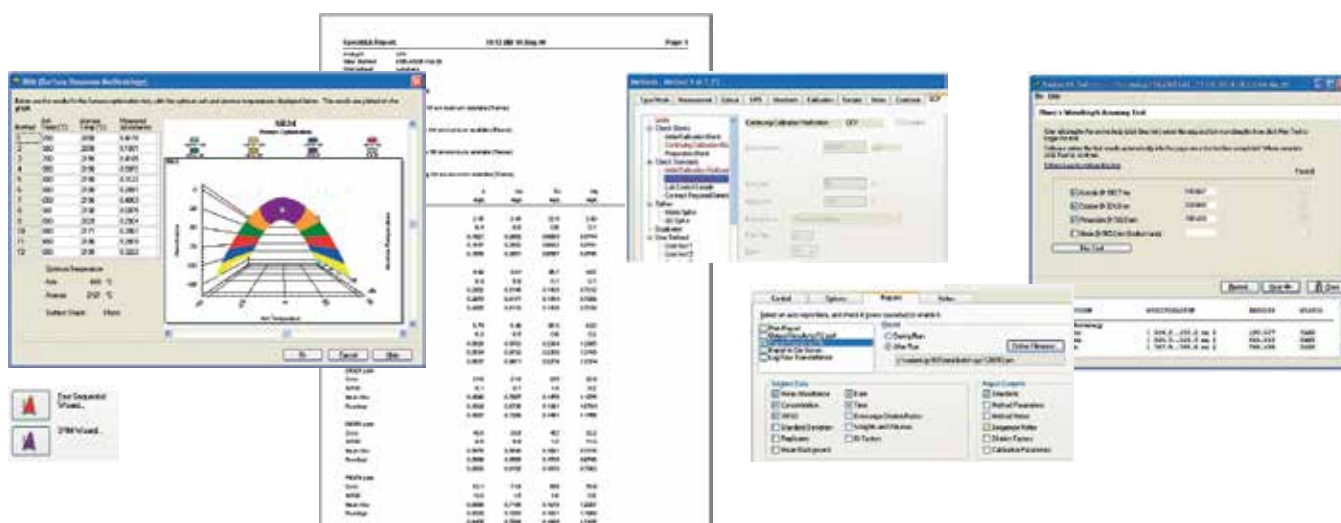
Agilent VGA 77



# SOFTWARE TO SIMPLIFY YOUR ANALYSIS.

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

- Be guided through every aspect of analysis, such as setting up a Fast Sequential sequence or creating custom racks and layouts for use with the SPS 3.
- Eliminate method development and automate furnace optimization with the Surface Response Methodology (SRM) wizard. This wizard recommends the optimum parameters and automatically creates a method using these conditions.
- Got an urgent sample to run? Simply click the Random Sample option to run it immediately. When complete, the system will resume the programmed sequence.
- With flexible reporting options you can select which data to include and the report type, including sequential or multi-element formats. You can also report your sample results in units that are independent of the concentration units used for calibration. Simply define the units required and the conversion factor (e.g., % oxide) – the software does the rest for you.
- Save on downtime and running costs by tracking the operating lifetime of key consumables such as lamps, electrodes and pump tubing. For GLP compliance, you can also track how many replicates or samples have been run.
- Validate your results during analysis with a comprehensive range of QC tests. Measure a matrix spike or certified QC standard, or program the system to ensure full compliance with US EPA requirements.
- Integrate your Agilent AA into your workflow by interfacing with your third party LIMS or other data management system. Directly import and export to the LIMS online, eliminating tiresome and error-prone manual transfers.
- Certify instrument performance using Agilent's Qualification services. Comprehensive qualification plans for flame, furnace and vapor operation are available, ensuring system performance is regularly checked and certified to factory specifications.
- Optional Spectroscopy Configuration Manager (SCM) and Spectroscopy Database Administrator (SDA) software helps you achieve compliance with the US FDA 21 CFR Part 11 electronic records regulations.



Guide >

Report >

Validate >

Integrate >

Certify >

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## Services let you focus on what you do best

Whether you need support for a single instrument or multiple labs, Agilent can help you solve problems quickly, increase uptime, and maximize the productivity of your team with:

- On-site maintenance, repair and compliance.
- Service agreements for all your systems and peripherals.
- Application training and consulting from our dedicated, worldwide network of specialists.

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## Leading the way in atomic spectroscopy innovation

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Agilent AA



Agilent MP-AES



Agilent ICP-OES



Agilent ICP-MS



Agilent ICP-QQQ

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