

# Agilent 5800 ICP-OES

Reclaim your wasted time



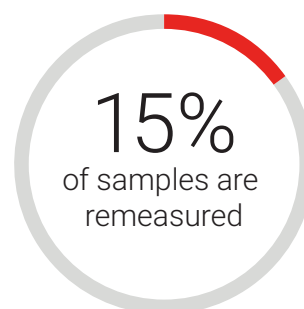
# The Smart Way to Stop Wasting Time and Get the Right Answers

There are many reasons why ICP-OES samples need to be remeasured: QC failures, instrument problems, incomplete sample digestion, simple sample mix-ups, and more.

There are also many reasons why you might be worried about the accuracy of the results you are reporting.

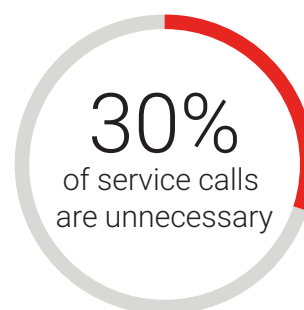
The Agilent 5800 has an ecosystem of embedded sensors—powerful processors with smart algorithms and diagnostics designed to automate troubleshooting, preempt maintenance, and identify problems that could impact results. Always working behind the scenes, the 5800 thinks like an expert, and can make recommendations and solve problems before they happen. This smart functionality reduces the number of samples you have to remeasure and gives you more confidence in your results.

## Top lab time wasters



## Remeasuring samples

A recent poll\* found that, on average, labs are remeasuring 15% of their ICP-OES samples. Interestingly, over 15% of labs don't consider their sample remeasurement rate at all, so have no idea of the time they are wasting or how much it's costing them.



## Instrument maintenance and downtime

Up to 30%† of service calls are unnecessary. The instrument operator could have solved the problem if only they knew what was going wrong and how to fix it.

\* Results from an online poll of over 200 laboratories, conducted in 2019

† Agilent service data, from November 2017 to October 2018

# The Agilent 5800 ICP-OES



*The smart features of the 5800 are like having an experienced analyst beside you – guiding you to achieve the right answer the first time.*

## **Just because QCs pass, it doesn't mean the results are correct**

The U.S. Environmental Protection Agency Office of Technical Standards issued an alert<sup>1</sup>, stating that an estimated 25 to 50% of arsenic results are false-positive in environmental data reported using ICP-AES. Three subsequent case studies<sup>2</sup> demonstrated arsenic bias. This was despite US EPA method quality control results being acceptable. It was demonstrated that batch QC samples do not always accurately assess the effects of the environmental sample matrix on the accuracy and precision of the results for samples contained within the batch.

1. United States Environmental Protection Agency (US EPA). (2001a). OTS Alert #2, Use of the ICP analytical method (CLP SOW ILM04.1, SW-846 6010, MCAWW 200.7) for drinking water samples may result in false positive detections of arsenic, lead, and/or thallium above their respective MCLs. Office of Technical Standards. Washington, DC.

2. Susan D. Chapnick, Leonard C. Pitts, Nancy C. Rothman. Arsenic and Thallium Data in Environmental Samples: Fact or Fiction? REMEDIATION Autumn 2010, Wiley Periodicals, Inc.

# Learn More About Your Samples

Get insight into what's in your sample and how to best measure it

## IntelliQuant puts the power of an experienced analyst inside your instrument—and only Agilent has it

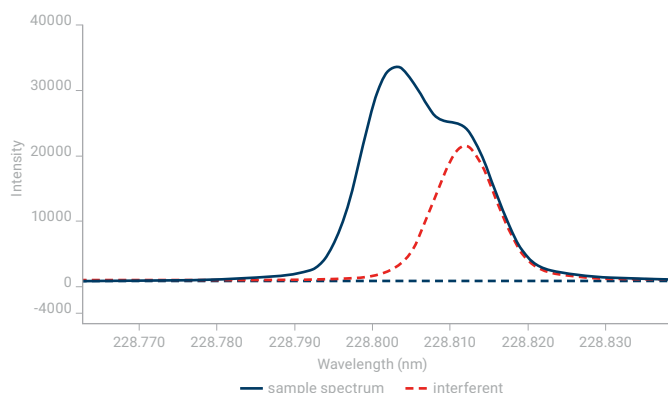
IntelliQuant captures data from the entire wavelength range as each sample is measured, then uses this broader view to calculate the approximate concentration of up to 70 elements in a sample. By collecting more than just the data at the wavelengths nominated, IntelliQuant sees spectral interferences and provides you with recommendations to ensure you get the right answers every time.

Running unknown or atypical samples? Put IntelliQuant to work, and ease your method development, troubleshooting, and sample screening challenges.

## It's like having QC on every sample

If your results are too high, it could be due to a spectral interference from another element. Results that are too low could be due to chemistry problems. IntelliQuant uses data analytics to automatically identify spectral overlaps that can lead to false-positive results, and recommends the emission wavelength that will give the most accurate result.

The example on the right shows the measurement of cadmium at 228.802 nm. The measured emission (blue line) has been erroneously increased by the presence of an emission from arsenic (red line). IntelliQuant will flag this wavelength as being problematic using a star ranking feature (shown below) to make it easy for the user to select the right wavelength to report on.



|   |         |       |   |
|---|---------|-------|---|
| <b>Cd</b>   |         |       |   |
| ✓   | 214.439 | ***** |   |
|   | 226.502 | ***   |   |
|   | 228.802 | *     | ? |
|   | 361.051 | *     |   |
|   | 326.105 | **    |   |
|   | 508.582 | *     |   |
| <div><b>Analyte:</b> Cd(228.802)<br/><b>Confidence:</b> moderate<br/><b>Interference:</b> As(228.812)<br/><b>Confidence:</b> strong</div> |         |       |   |

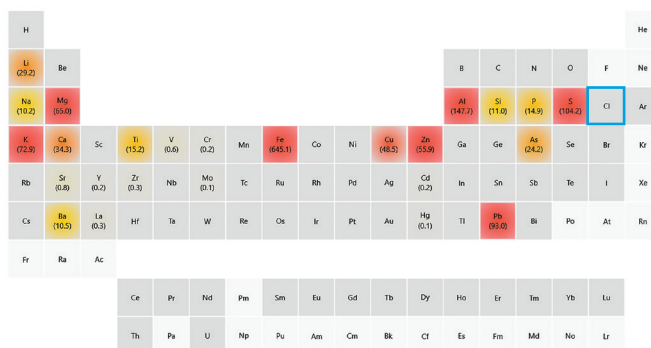
IntelliQuant Star ranking output for Cd. A five-star ranking with green check mark indicates Cd 214 wavelength to be the best. The red question mark indicates there is an issue on Cd 228, and the pop-up tip indicates the Cd 228 result has only moderate confidence as it has a strong arsenic interference.





## Spot sample preparation mistakes

Did someone forget to put HCl in during the digestion process? By running your eye over the IntelliQuant results, shown as a heat map on the right, you can quickly identify whether Cl is present and know that the digestion was done correctly. The same approach can be used for most acids used for sample digestion.



Elements shaded red are in high concentration, orange are in mid-range concentration, and those in yellow are in low concentration. Unshaded elements are not at detectable levels in the sample. In this case, Cl is missing, indicating that HCl was not used during sample preparation.

## Flagging outlying results

An outlier alert highlights results that exceed a nominated range or don't pass a test. The outlier alert system can monitor a range of parameters, from %RSD through to failed QC tests, and can be configured to your requirements.

Results can be filtered to show only the samples that have failed. Filtering makes it easy to see which results need to be reviewed.

The image below shows the flagging of outlier results on the sample results screen. On the right is shown a filter applied to display only the outliers that are in need of review.

|                          | Rack Tube | Solution Label | Outlier Summary | Co<br>8.615 nm<br>ppm | Co<br>230.786 nm<br>ppm | Cr<br>267.716 nm<br>ppm | Cu<br>327.395 nm<br>ppm | Fe<br>273.350 nm<br>ppm | K<br>766.491 nm<br>ppm | La<br>408.671 nm<br>ppm | Li<br>670.783 nm<br>ppm | M<br>279.80<br>ppm |
|--------------------------|-----------|----------------|-----------------|-----------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|--------------------|
| <input type="checkbox"/> | 2.2       | ORESA 45e 2    |                 | 1.3645                | 1.1683                  | 19.5747                 | 14.8628                 | 3340.6496               | 57.8595                | 0.0167                  | 0.1325                  | 7                  |
| <input type="checkbox"/> | 2.3       | SRM 2781 1     |                 | 0.2291                | 0.1247                  | 3.7995                  | 11.3385                 | 520.5713                | 93.9258                | 0.3927                  | 0.1407                  | 107                |
| <input type="checkbox"/> | 2.4       | SRM 2781 2     |                 | 0.2323                | 0.1270                  | 3.8096                  | 11.8384                 | 531.5788                | 97.1176                | 0.3894                  | 0.1445                  | 109                |
| <input type="checkbox"/> | 2.5       | SRM 2782 1     | A               | 1.5177                | 1.4996                  | 2.3091                  | 53.5224                 | 5852.2210 o             | 71.4071                | 1.2246                  | 0.1355                  | 55                 |
| <input type="checkbox"/> | 2.6       | SRM 2782 2     |                 | 1.4482                | 1.4303                  | 2.1963                  | 61.4172                 | 6474.6380               | 67.6546                | 1.1696                  | 0.1378                  | 52                 |
| <input type="checkbox"/> | 2.1       | ORESA 45e 1    |                 | 1.4282                | 1.2215                  | 20.2531                 | 15.9087                 | 3385.5674               | 61.0864                | 0.0047                  | 0.1407                  | 4                  |
| <input type="checkbox"/> | 2.2       | ORESA 45e 2    |                 | 1.4042                | 1.1999                  | 20.0833                 | 15.1864                 | 3409.9162               | 59.4210                | 0.0166                  | 0.1320                  | 7                  |
| <input type="checkbox"/> | 2.3       | SRM 2781 1     |                 | 0.2293                | 0.1244                  | 3.8020                  | 11.4742                 | 534.8713                | 96.1179                | 0.3911                  | 0.1418                  | 110                |
| <input type="checkbox"/> | 2.4       | SRM 2781 2     |                 | 0.2405                | 0.1306                  | 3.9745                  | 12.0563                 | 550.3115                | 100.0555               | 0.4072                  | 0.1418                  | 112                |
| <input type="checkbox"/> | 2.5       | SRM 2782 1     | A               | 1.5041                | 1.4722                  | 2.2825                  | 53.6837                 | 5822.7552 o             | 71.1665                | 1.2091                  | 0.1284                  | 55                 |
| <input type="checkbox"/> | 2.6       | SRM 2782 2     |                 | 1.4680                | 1.4463                  | 2.2234                  | 61.6004                 | 6436.4548               | 66.9066                | 1.1841                  | 0.1276                  | 51                 |
| <input type="checkbox"/> | 2.1       | ORESA 45e 1    |                 | 1.4573                | 1.2448                  | 20.6513                 | 16.0510                 | 3447.9631               | 62.1334                | 0.0053                  | 0.1377                  | 4                  |
| <input type="checkbox"/> | 2.2       | ORESA 45e 2    |                 | 1.4048                | 1.2037                  | 20.1358                 | 15.2630                 | 3419.2366               | 59.4457                | 0.0166                  | 0.1269                  | 7                  |
| <input type="checkbox"/> | 2.3       | SRM 2781 1     |                 | 0.2334                | 0.1267                  | 3.8933                  | 11.6111                 | 551.2126                | 98.6493                | 0.3990                  | 0.1374                  | 113                |

|                          | Rack Tube | Solution Label | Outlier Summary | Co<br>8.615 nm<br>ppm | Co<br>230.786 nm<br>ppm | Cr<br>267.716 nm<br>ppm | Cu<br>327.395 nm<br>ppm | Fe<br>273.350 nm<br>ppm | K<br>766.491 nm<br>ppm | La<br>408.671 nm<br>ppm | Li<br>670.783 nm<br>ppm | M<br>279.80<br>ppm |
|--------------------------|-----------|----------------|-----------------|-----------------------|-------------------------|-------------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|--------------------|
| <input type="checkbox"/> | 2.2       | ORESA 45e 2    |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.3       | SRM 2781 1     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.4       | SRM 2781 2     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.5       | SRM 2782 1     | A               |                       |                         |                         |                         | 5852.2210 o             |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.6       | SRM 2782 2     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.1       | ORESA 45e 1    |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.2       | ORESA 45e 2    |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.3       | SRM 2781 1     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.4       | SRM 2781 2     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.5       | SRM 2782 1     | A               |                       |                         |                         |                         | 5822.7552 o             |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.6       | SRM 2782 2     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.1       | ORESA 45e 1    |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.2       | ORESA 45e 2    |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |
| <input type="checkbox"/> | 2.3       | SRM 2781 1     |                 |                       |                         |                         |                         |                         |                        |                         |                         |                    |

| Flag | Flag Rule   | Pass Value | Enable                              |
|------|---|------------|-------------------------------------|
| A    | Result Concentration Overrange                      | N/A        | <input checked="" type="checkbox"/> |
| B    | Result Concentration % RSD > Pass Value             | 10.00      | <input type="checkbox"/>            |
| C    | Result Concentration < MDL                          | N/A        | <input type="checkbox"/>            |
| D    | Internal standard % recovery variation > Pass Value | 15.00      | <input type="checkbox"/>            |
| E    | QC Equation Test Fail                               | N/A        | <input type="checkbox"/>            |

☐ Only apply when result > 10.0 \* MDL

# Smart Instrument Health Tracking

Pre-emptive alerts to reduce downtime and maintenance costs

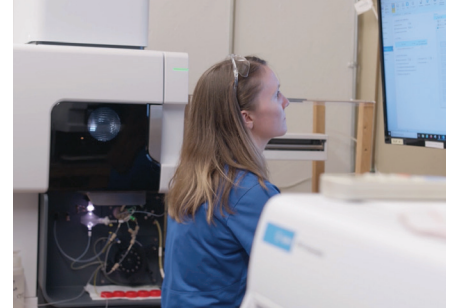
## Avoid downtime and wasted time with the right amount of maintenance

Insufficient maintenance of an ICP-OES and accessories can lead to costly unplanned downtime, or analysis failures that cause time-wasting sample remeasurement. Maintenance that is too frequent also wastes time and can increase the cost of consumables.

Just like modern cars, the 5800 includes sensors and counters that guide the user when maintenance is needed, so you can schedule maintenance at a convenient time that doesn't disrupt your working day – and most importantly, maximize instrument uptime.

Traffic light color-coding of the counters visually shows which maintenance activities should be done immediately, and which can wait.

The maintenance log digitally records the maintenance history of the ICP-OES. When troubleshooting a problem it is easy to determine if the instrument has been sufficiently maintained.



AgSource Laboratories uses three generations of Agilent ICP-OES instruments to analyze soils, plants, and manures to support farming activities in Wisconsin, USA.

[Learn more in this case study.](#)

Connect

Plasma

Pump

ADS 2

Status

ADS 2

Configuration

Calibration

Tests

Dashboard

Maintenance

Ignition

Plasma

Optics

Pump

Camera

Water Cooling

Plasma Torch Door

Torch Loader

Preoptics

Gas Module

RF

Electronics

Switching Valve

Argon

IsoMist

ADS 2

User Maintenance Counters

☐ Receive Popup Alerts

Restore/Set Default Counters

+

Define new counter...

Clean nebulizer

Solutions measured: 403/1000

Reset

Clean spray chamber

Solutions measured: 403/2000

Reset

Perform wavelength calibration

Days elapsed: 28/30

Reset

Inspect pre-optics window

Plasma on hours: 36/40

Reset

Inspect torch

Solutions measured: 403/1000

Reset

Replace pump tubing

Plasma on hours: 10/40

Reset

Clean AVS

AVS switches: 397/5000

Reset

Clean ADS

ADS Switches: 242/10000

Reset

Inspect Syringes

Syringe Actuations: 1022/13500

Reset

Instrument Counters

ADS 2 Counters

Maintenance Log

Power on hours

19828

Plasma on hours

562

AVS switches

6012

Solutions measured

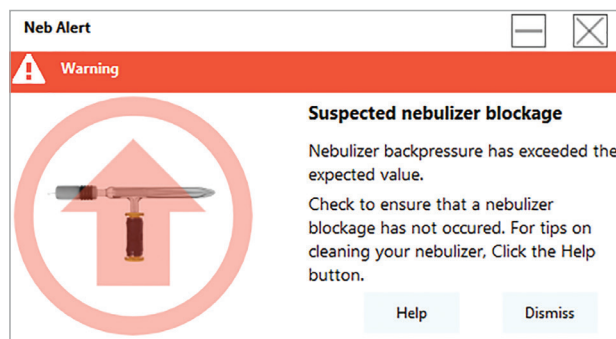
7879

| Timestamp              | Operator | Maintenance Performed | Comment  |
|------------------------|----------|-----------------------|--|
| 11/23/2023 10:29:43 AM | santsiva | Counter reset         | Counter 'Clean AVS' has been reset after 6005 of 5000 counts       |
| 11/23/2023 10:29:17 AM | santsiva | Counter reset         | Counter 'Replace pump tubing' has been reset after 48 of 40 counts |



## Prevent common reasons for ICP-OES service calls

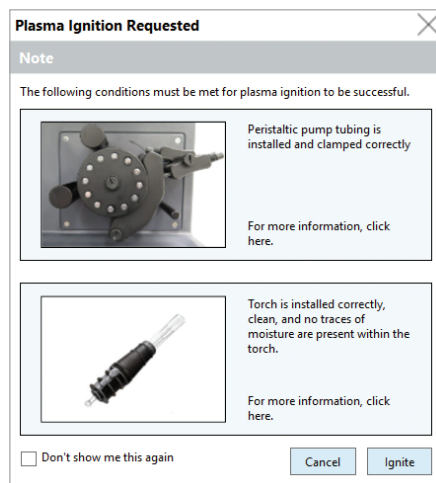
A blocked nebulizer causes wasted time and the expense of troubleshooting. And it's completely preventable. The 5800 continuously monitors the nebulizer, alerting you when the nebulizer needs cleaning or is leaking.



## Plasma ignition health

On-screen tips provide reminders to prevent common causes of plasma ignition failure.

In the case of the occasional plasma ignition failure, onboard smart tools provide clear advice on how to resolve. For example, "The gas flows are incorrect. Reset the plasma ignition values in the ignition table (instrument screen) by clicking the Default button and retry plasma ignition".

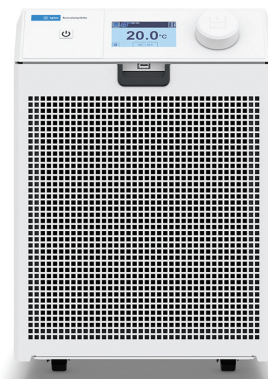


## Avoid unnecessary failures

When left undetected, water-cooling faults can lead to unexpected downtime.

The Agilent recirculating chiller is an optional accessory that enables the analyst to monitor and set water-cooling parameters directly from the instrument PC. On-screen notifications allow labs to respond immediately to faults and avoid more serious breakdowns.

Save valuable time and inconvenience by switching the chiller on/off without having to leave the lab. Power costs are reduced by automatically turning it off at the end of an analysis.



|                        |       |      |
|------------------------|-------|------|
| Chiller                |       |      |
| Status                 |       |      |
| Fluid Level            |       |      |
| Fluid Temperature (°C) | 18.00 | 18.5 |



# Hardware Built for Performance and Longevity



## The Agilent 5800 is available in two configurations:

- Vertical Dual View (VDV) – offers high throughput, and is upgradable on-site to the Synchronous Vertical Dual View (SVDV) configuration if your lab throughput demands increase.
- Radial View (RV) – ideal for labs needing a fast, high-performance radial ICP-OES.

## High speed, intelligent detector

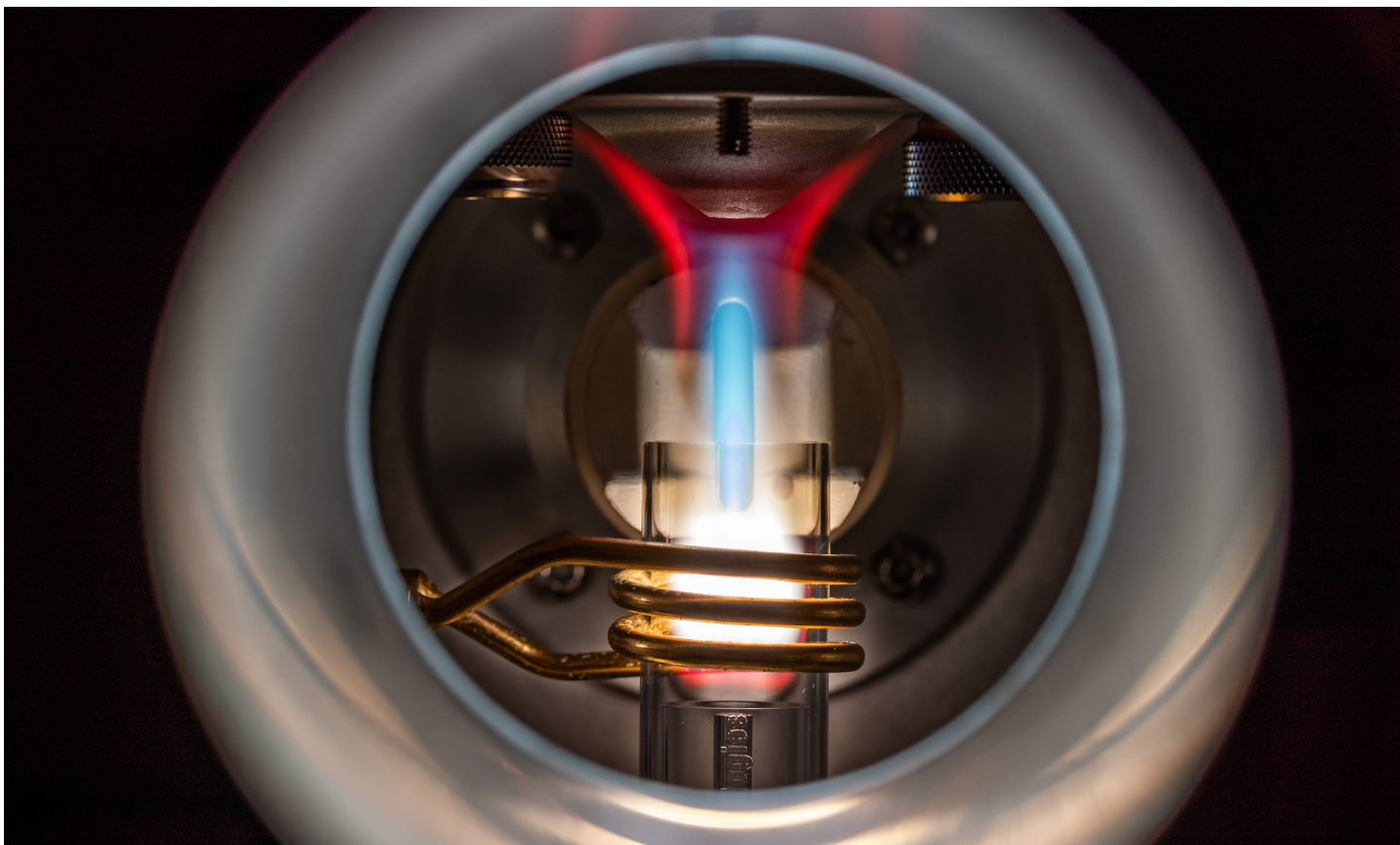
A unique detection system delivers fast, simultaneous measurement over the full wavelength range, irrespective of concentration or signal strength. Detector advancements take smart software features to the next level – guiding you to achieve the right answer the first time.

## Smart algorithms

Take the guesswork out of method development and automate troubleshooting with built-in smart algorithms:

- **Fitted background correction** (FBC) automatically provides accurate background correction.
- **Fast Automated Curve-fitting Technique** (FACT) or **Inter Element Correction** (IEC) technique for spectral interference correction.
- **IntelliQuant** allows rapid identification of all elements in a sample and their relative concentration. Ideal for method development, troubleshooting and sample screening.





### **Resilient vertical torch**

The vertically oriented torch (pictured above) means less cleaning, less downtime and fewer replacement torches. A torch loader mechanism automatically aligns the torch and connects gases for fast startup and reproducible performance.

### **Built-in performance tests**

How do you know an ICP-OES is operating as it should? The performance tests built into the 5800 quickly confirm that everything is OK, before you start measuring samples.

### **High performance with lower argon cost**

Innovative Freeform optics deliver low detection limits and high resolution, even when using 99.99% purity bottled argon. The optical layout is compact, so is quick to purge, reducing the wait time before samples can be measured.

### **Self-diagnosis and health tracking**

Self-diagnosing electronics monitor instrument status, allowing rapid identification of component health issues. Sensors and counters alert the analyst when maintenance is required.

### **Corrosion resistant, dust resistant**

The 5800 is made from corrosion-resistant material and uses internal positive pressures and optimized airflows to keep out acid vapors. An easy-to-remove air filter protects your instrument in dusty environments and an air flow monitor alerts you when the filter needs replacing.

### **Small footprint**

As one of the smallest ICP-OES available, the 5800 saves valuable bench space. Connections for power, gas, cooling, water, and communications are easily accessed—from the side rather than the rear.

# The Integrated, All-Agilent Automation System



## Multiple levels of automation

By adding various accessories to the 5800 instrument, you can achieve increasing levels of automation for your ICP-OES analyses.

**Add the SPS 4 autosampler**—to automate sample presentation, enabling unattended analysis

**Add an AVS switching valve**—to double sample throughput

**Add the ADS 2 autodilutor**—to automate standard preparation and pre-run sample dilution. It also eliminates post-run sample dilutions by doing reactive dilutions to overrange samples during the run.

With all three accessories, you have an all-Agilent automation system that is designed and manufactured to be completely integrated.

### Our all-Agilent workflow automation systems:

- Are fully-integrated. There's no 3rd party.
- Are optimized for Agilent ICP-OES's.
- Are designed to work as one system, with all settings included in the method and advanced features that can only be achieved when software and hardware are designed as one.
- Offer a simpler purchasing process and faster product support from a single point of contact.
- Require less staff training with only one software platform to learn.
- Contain no surprises. The system is tested to Agilent's strict QC requirements.

# Accessories

Options to further enhance your workflow



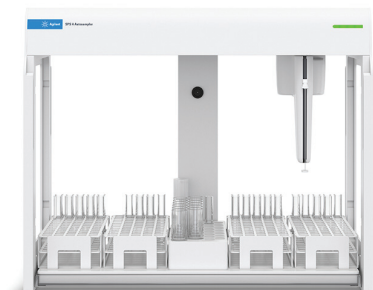
## Advanced Valve System (AVS)

Four-, six-, or seven-port switching valve systems can improve productivity and lower the cost of ownership. To simplify operation, the valves are conveniently located and are fully integrated with the instrument hardware and software.



## Advanced Dilution System (ADS 2)

The ADS 2 automates standard preparation and pre-run sample dilutions. It also automates post-run sample dilutions for over-range samples using real-time reactive dilutions during the analysis.



## SPS 4 Autosampler

This flexible-configuration automatic sampler holds up to 360 samples. It is robust, easy to use, and ideal for unattended elemental analysis.



## Multimode Sample Introduction System (MSIS)

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



## Application-specific sample introduction options

Optimized torches and sample introduction kits are available for:

- Organic solvents
- High salt or high matrix samples
- Samples containing hydrofluoric acid

Minimize costs with demountable torches, designed for fast changeover, and economical operation.

## Agilent CrossLab: Real insight, real outcomes

CrossLab goes beyond instrumentation to bring you services, consumables, and lab-wide resource management. So your lab can improve efficiency, optimize operations, increase instrument uptime, develop user skill, and more.



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