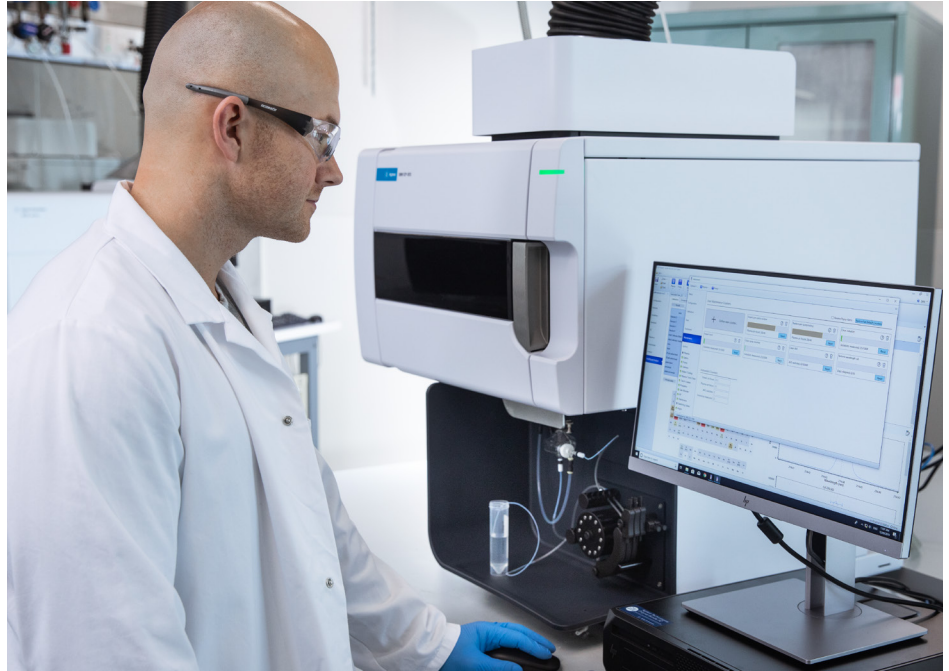


Smart Health Checks for ICP-OES



Your Agilent 5000 series ICP-OES is a state-of-the-art smart ICP system designed to deliver the right answers while reclaiming wasted time. To ensure your instrument is performing at its best, a health check can be run periodically. The Agilent 5000 series ICP-OES systems have smart functions built in including an automatic performance test to easily confirm your instrument is running at full potential.

Performance Test

The instrument performance test automatically completes an analytical performance suite of tests, including resolution, sensitivity and precision, simply by using the wavecal multielement standard and a blank solution.

How to run the instrument Performance test:
1. Click Instrument on the ICP Expert toolbar.
2. Click the Tests tab.
3. Deselect all tests except Instrument Performance. If you choose to use the autosampler instead of introducing samples manually, select Use Autosampler and then place the wavelength calibration, rinse, and blank solutions in the appropriate locations in the autosampler. Check the Autosampler tab on the worksheet page for solution locations.
4. Click Run Tests.
5. The method parameters are automatically filled in when the test begins.
6. Follow the on-screen prompts to introduce solutions if you are manually introducing the solutions.

The screenshot displays the ICP Expert software interface. On the left, a navigation pane shows the 'Tests' tab selected. The main area features a table of test results:

Test	Result
<input type="checkbox"/> Subsystem Communications Test	--
<input type="checkbox"/> Air Flow	--
<input type="checkbox"/> Water Flow	--
<input type="checkbox"/> Gas Flows	--
<input type="checkbox"/> RF Generator	--
<input type="checkbox"/> Camera Test	--
<input type="checkbox"/> Optics Test	--
<input checked="" type="checkbox"/> Instrument Performance	✓
<input type="checkbox"/> Advanced Valve System Test	--

Below the table, there are controls for 'Run Tests', 'Stop', and 'Export Report To PDF'. A 'Use Autosampler' checkbox is also present. The 'Auto Ignition Plasma Wait Time' is set to 5 minutes.

The 'Report Summary' section on the right provides the following details:

- Instrument Model: Agilent 5900 SVDV ICP-OES
- Instrument ID: G8020AA
- Instrument Serial Number: DEMO
- Software Version: 7.5.4.11997
- Firmware Version: 5444
- Tested By: Lindsey
- Test started on: 11/16/2021 12:12:55 PM
- Test Completed On: 11/16/2021 12:17:33 PM

The 'Result Summary' section shows the following test outcomes:

Test	Result
Subsystem Communications Test	Skipped
Air Flow Test	Skipped
Water Flow Test	Skipped
Gas Flows Test	Skipped
RF Generator Test	Skipped
Camera Test	Skipped
Optics Test	Skipped
Advanced Valve System Test	Skipped
Resolution Test	Pass
Sensitivity Test	Pass
Precision Test	Pass

At the bottom of the interface, a status bar indicates 'Tests Run - operator: Lindsey' and 'Instrument Performance- Started'. A green bar highlights the 'Instrument Performance Completed - Passed' message.

Figure 1. ICP Expert software includes the instrument performance test which automatically completes an analytic suite of tests to ensure instrument performance.

What if My Performance Test Fails?

If the performance test has a failure, you should first ensure that the sample is reaching the plasma prior to analysis. The next item to check is that the optics boost purge is enabled and stable. If the boost purge is turned off – or has not been on long enough – we may miss some of the wavelengths in the UV region.

If your performance test continues to fail after ensuring the polychromator boost is enabled and sample timing is correct, the sample introduction system should be evaluated for potential issues. Incorrectly installed/worn peristaltic pump tubing, a blocked nebulizer or a blocked torch injector could be the cause of the performance failure.



Figure 2. Simply click on the check box next to "Boost" and wait for the green light to indicate the polychromator boost is enabled and stable.

Peristaltic pump tubing: Erratic flow of sample can occur if the incorrect pressure is used on the peristaltic pump tubing. Remember not to overtighten the pressure on the tubing to ensure a smooth flow of liquid. If bubbles are observed, check for any loose connectors or a leak in the system. If the tubing is old, worn, or discolored it needs to be replaced. The tubing should be round and not have any flat spots. Typical tubing lifetime is 1 week based on normal 8 hour working day.



Figure 3. Extreme example of worn, discolored peristaltic pump tubing.

Blocked Nebulizer: A blocked nebulizer can restrict aerosol formation, decreasing sensitivity and degrading accuracy and precision. Reduced nebulizer flow is a particular concern because it contributes to poor performance. [Click here](#) to learn the simple steps for clearing a blocked ICP-OES Nebulizer.



Figure 4. Example of a blocked nebulizer.

Blocked Injector: Deposition of the sample matrix, salts or even carbon build-up can lead to injector blockage in the torch. A blocked injector can restrict the flow of sample aerosol into the plasma, decreasing sensitivity and degrading performance. [Click here](#) to learn the simple steps for clearing a blocked injector.

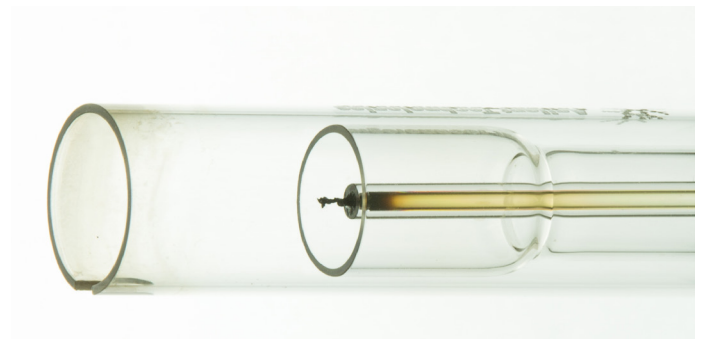


Figure 5. Blocked injector caused by carbon build-up.

Now that I've performed the health check and corrected any issues, how do you prevent them from happening in the future?

Routine cleaning and preventative maintenance are the best ways to ensure you keep your instrument running smoothly and minimize downtime and analysis failures.

Early Maintenance Feedback

The 5100, 5110, 5800 and 5900 ICP-OES instruments have over 100 sensors that monitor their performance. The ICP expert software includes an early maintenance feedback (EMF) function that utilizes these sensors and other counters to alert the operator when maintenance is required.

Traffic light color-coding of the counters show which maintenance activities should be done immediately and which can wait (Figure 6). The counters are useful for most general applications, but users can set the counter limits to suit their specific requirements.

EMF reduces downtime and repair costs by alerting user to schedule routine maintenance of components based on actual use, rather than at set time intervals.

Don't Feel Overpressured! Use NebAlert!

Neb Alert is a smart feature of the ICP Expert software that monitors nebulizer back-pressure during an analysis. Neb alert warns the user if a potential blockage or leakage is detected – a common problem when analyzing samples with a high TDS content or samples that include particles. The alert allows the analyst to stop the analysis and correct the issue rather than continue and collect potentially incorrect data.

To set neb alert click on File > Options > Instrument and select Neb Alert. It is recommended to set the upper and lower limits to those corresponding with the typically operating range of the nebulizer. When back pressure increases, a blockage is suspected and the nebulizer should be evaluated. When pressure decreases, a leakage is suspected and the gas/sample line connections should be inspected. The table below lists the recommended upper and lower limits for the top three most common nebulizers.

Nebulizer	Lower Limit	Upper Limit
Seaspray	225 kPa	315 kPa
OneNeb 2	180 kPa	250 kPa
Conikal	225 kPa	315 kPa

Need Further Guidance?

If you would like additional advice combined with tips and tricks to help ensure you are able to achieve the best performance, refer to the Agilent ICP Expert Help & Learning Center, [ICP-OES Resource Hub](#) and the [Agilent ICP-OES Troubleshooting and Maintenance Guide](#).

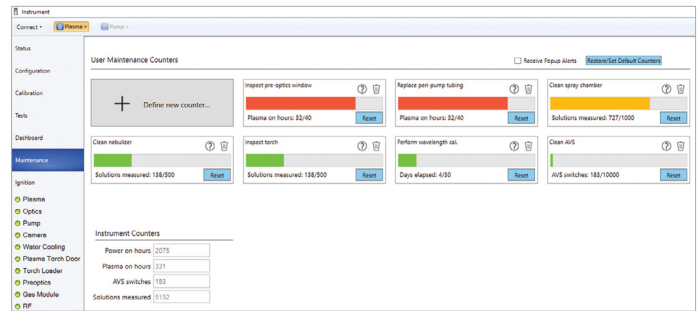


Figure 6. Early maintenance feedback functionality helps you keep your instrument properly maintained, reducing unplanned downtime and ensuring that you continue to produce consistent, high-quality results.

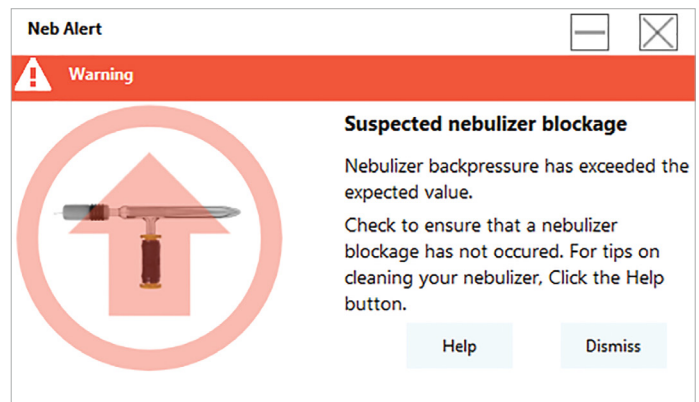


Figure 7. Neb Alert provides an instant notification to the user if a suspected nebulizer blockage or leakage is detected.

www.agilent.com.au/chem/icpoes-healthcheck

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