

The Dedicated Mercury Trace Analyzer

mercur DUO plus

Mercury Analysis



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Trace analysis of mercury is a global challenge. The growing industrialization, with the development of ever new technologies and materials, leads to increasing pollution of the environment. Mercury is a particularly critical polluting element due to its toxicity.

Standards and legislation worldwide continue to become ever more stringent. The maximum permissible concentrations of mercury are lower than those of any other routinely monitored element. Hg contents need to be determined with high certainty and repeatability down to the ultratrace level.

mercur DUO plus – the mercury analyzer from Analytik Jena

The mercur DUO plus is a compact system specially optimized for the complete, cost-efficient determination of mercury traces.

- **Highly automated** – in combination with an autosampler and easy to operate, it meets all expectations to a modern routine analysis system
- **Fast** – thanks to time-controlled flow injection with or without autosampler plus the unique FBR routine (Fast Baseline Return)
- **Reliable** – through the use of a bubble sensor, a specially optimized drying membrane, and dual amalgamation
- **Efficient** – due to automated, intelligent gas-liquid control, ensuring minimum reagent consumption and short measurement times



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Analytical Certainty Down to the ng Level

Modern techniques for mercury analysis have to meet a number of clear and exacting requirements:

- High sensitivity and selectivity
- High sample throughput
- Interference-free methods
- Easy routine operation

Atomic absorption and atomic fluorescence – in one system

The mercur DUO plus analyzer detects mercury contents by means of atomic fluorescence (AFS) or atomic absorption (AAS). Atomic fluorescence spectrometry, unlike absorption

spectrometry, measures the fluorescence radiation emitted by a sample. The mercur uses a high-energy low-pressure mercury vapor lamp as a radiation source for both, fluorescence and absorption spectroscopy. Its high energy output adds considerably to the sensitivity of the method.

Thanks to its excellent detection limits and its wide linear measuring range, atomic fluorescence spectrometry is often the method of choice in mercury trace analysis. On the other hand, atomic absorption has its advantages in difficult sample matrices because of its high tolerance towards interferences.





An added advantage: cold vapor technique

The mercur DUO plus combines the advantages of a highly sensitive detection technology and the cold vapor technique. Using the cold vapor technique, mercury is converted to the gaseous state by reduction of the dissolved cation with SnCl_2 and separated from the solution. The gaseous mercury is carried to the fluorescence or absorption cell by an argon gas stream. As the analyte is separated from the matrix, interferences and matrix effects are almost completely eliminated.

Optimum enrichment

To adapt the mercur DUO plus to varied analytical tasks, you can choose between three enrichment modes: no enrichment, simple enrichment, and dual amalgamation. The dual amalgamation feature, compliant to EPA requirements, comprises two coupled gold collectors, which ensures clean separation of the matrix and prevents quenching effects – thus providing maximum dependability even with complex samples. Enrichment times can be varied to match the sample matrix or the expected mercury concentration range.

Increasingly stringent standards

The worldwide most stringent standards governing mercury determination are based on the atomic fluorescence method. Designed to meet these requirements, the mercur DUO plus guarantees mercury analyses compliant with:

- EPA 245.1, EPA 245.2 EPA 245.7
- EN 1483, EN 12338, EN 13806, EN 13506

Efficient protection

The mercur DUO plus displays its true strength when handling complicated samples such as foaming solutions. These occur frequently in everyday laboratory practice and involve a high risk of contamination and carry-over. The mercur DUO plus features an important detail, the bubble sensor, which avoids unnecessary cleaning.

If a liquid threatens to spill into the system, this sensor causes the valves to close, and the liquid is automatically conducted to the waste container.

Positioned between gas-liquid separator and drying membrane, it protects the gold collector, measurement and absorption cell against contamination.

Clever dosage

Two pump systems separately meter sample and reagents and transport them to the reactor. Sample solution and acid are fed to the reactor in segments, controlled by a set of valves. The reductant is fed directly into the reactor. There the two solutions meet at an acute angle. The resulting chemical reaction immediately releases atomic mercury vapor. This mode of separating sample and acid ensures fast cleaning of the pump tubing after aspiration of the sample solution. This helps to save time and reduces the amount of reagents needed. It additionally prevents contamination in case of large concentration gradients within a sequence of measurements.

Intelligent control

To ensure a smooth reaction process in any of the various operating modes, the mercur features an intelligent gas/liquid control system. Thanks to the instrument's complex valve groups, tubing paths have been minimized to prevent contamination, and to keep carry-over as low as possible.

The system-flushing feature can be run in an automatic mode, operating whenever the calibrated concentration range is exceeded, or as a user-defined option. This guarantees a successful analysis in cases of strong variations of the mercury content within a sequence of measurements. These features are needed in order to take advantage of the wide linear range of the atomic fluorescence spectrometer in everyday routine analysis.

Prime Considerations: Operating Convenience and Automation

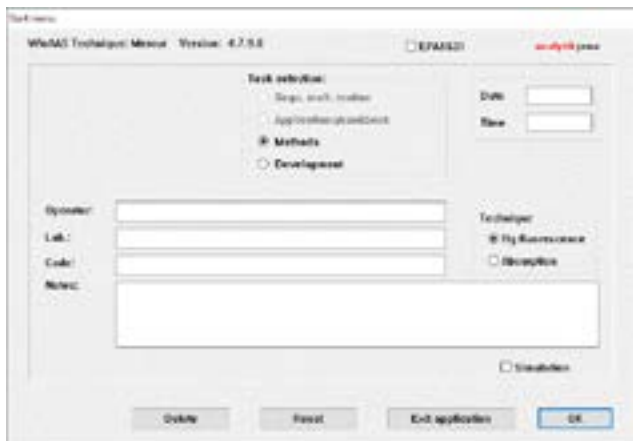
Comprehensive data processing and quality control

The WinAAS control and data analysis software not only handles all everyday routine tasks but also meets the strictest requirements of quality control. It provides optimum operation, for routine operation as well as for research. The software's automatic and versatile quality control system monitors your analytical data and releases appropriate instrument response if permissible limits are exceeded.

WinAAS fulfills all the requirements of modern routine and research laboratories, at highest operating convenience.

- Intuitive and user-friendly operation
- Integration of all accessories
- Complete documentation and reporting, conforming to GLP and FDA 21 CFR Part 11
- Quick and easy saving and loading of methods and parameter files
- Convenient sample table with many actions to choose from Automatic quality control for monitoring your analytical data

A method library comprising a number of different basic routine methods matching the various operating modes, facilitates the use of the mercur DUO plus in everyday routine and permits method optimization in the case of more complex analyses.



An action chart visualizes the simultaneous and sequential processes during a measurement cycle, so that you can follow the course of the analysis exactly.

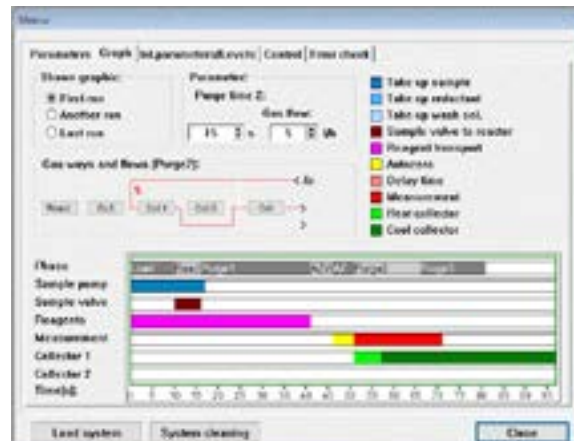
The FBR feature (Fast Baseline Return) substantially reduces the total analysis time and ensures fast sample throughput, with no compromise on the quality of measured data.

Continuous, efficient operation

The fundamental concept of the mercur permits continuous operation, whether in combination with the autosampler AS-F or AS-FD for maximum sample throughput, or in manual configuration:

- Automatic metering of reagents and sample
- Automatic flushing of the tubings
- Automatic cleaning of the carrier gas

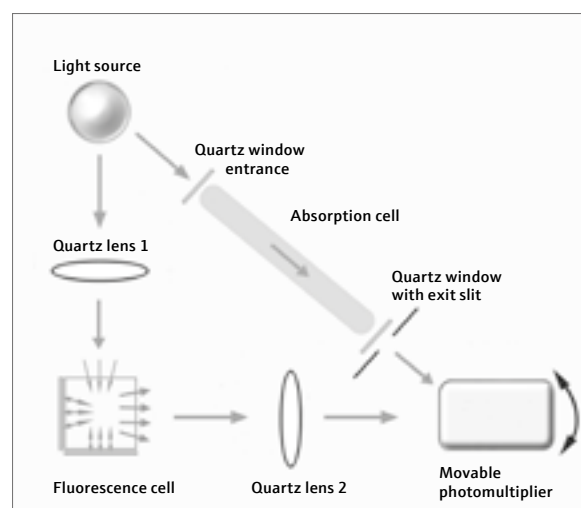
Combination with the autosampler ensures highly efficient laboratory work in your lab. High sample throughput, shortest possible tubing paths due to integration of the sampler, continuous flushing to avoid carry-over – it is the combination of these features that facilitates the routine analysis of mercury traces.



mercur DUO plus – an Instrument for Many Applications

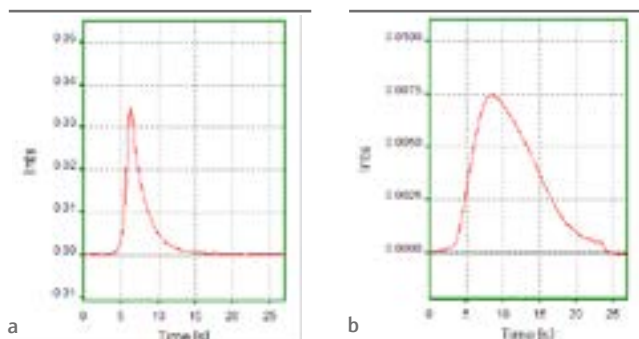
Mercury analysis is employed in a wide range of fields. Due to the harmful influence on the human organism, mercury is a focus of close attention: In medical disciplines such as occupational medicine and dentistry, as well as in drinking water and food control.

Wherever mercury concentrations must be strictly monitored to avoid violation of prescribed concentration limits, a system which can measure lowest mercury contents with certainty and repeatability is required. With its high detection sensitivity, the mercur is especially designed for analyzing and monitoring the toxic element mercury at trace and ultratrace levels.



Scheme of mercur DUO plus

Branch	Application
Environment	Drinking water, fresh water, rain water, waste water, soil, etc.
Medicine	Blood, urine, serum, saliva, etc.
Food	Fish, beverages, cereals, etc.
Geology	Rocks, ashes, minerals, etc.
Industry	Quality inspection, paper, plastics, etc.
Research & Teaching	Universities, research institutions, etc.



Signal shape with enrichment (a), without enrichment (b), both with FBR, $c = 25 \text{ ng/l}$



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