

And, If your problem is listed below,  
we already have the solution...!

#### MATRICES

Water  
Drinking  
River  
Estuarine  
Sea  
Rain  
Waste

Sediments  
Sludge  
Soil

Blood  
Breath  
Dental amalgam  
Fish  
Urine

Acids  
Air  
Alkalis  
Coal  
Condensates  
Crude oil  
Fly ash  
Hydrogen  
Metals  
Naphtha  
Natural gas  
Oxidants  
Reductants  
Salts  
Stack gas  
Syn gas  
Trade effluents

#### INDUSTRIES

Agriculture  
Analytical science  
Atomic energy  
Chloralkali  
Contract laboratories  
Dental analysis  
Environmental  
Food  
Gas  
Marine  
Metals  
Natural gas  
Oceanography  
Oil  
Petrochemical  
Photography  
Process engineering  
Research institutes  
Universities  
Utilities  
Water services  
Water treatment

...if not, PSA can be relied upon to find it!

Research on other applications continues. If you have a problem  
in an area that is not shown above – then call us for advice.

PSA

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PSA

## Millennium Merlin

AUTOMATED MERCURY ANALYSIS  
with the accuracy of atomic fluorescence



ISO 13506  
EPA 7474

EPA 1631

EPA 245.7



## ANALYTICAL EXPERTISE

There's something magical about the Merlin system for the measurement of mercury in the environment . . . P S Analytical's expertise in every essential stage of the analytical process – from sampling through to data presentation and interpretation of results enables us to provide complete solutions to sampling problems.

Since 1983 experts at P S Analytical have worked at the cutting edge of environmental monitoring, with a focus on automated low-level mercury analysis. The development of the innovative Merlin system, combining atomic fluorescence spectrometry (AFS) with vapour generation (VG) was the first step on a path which has led PSA to the forefront of technology.

PSA continues to invest in its research programme to provide total solutions to the marketplace. Systems provide the ability to carry out mercury speciation as well as offering total mercury determination. The Millennium Merlin system utilises the most sensitive technique for detecting mercury thereby offering unrivalled sensitivity and performance.

PSA has successfully installed systems in process applications world-wide and provides back-up for units operating in often hostile or explosive environments 24 hours-a-day, 7 days-a-week.

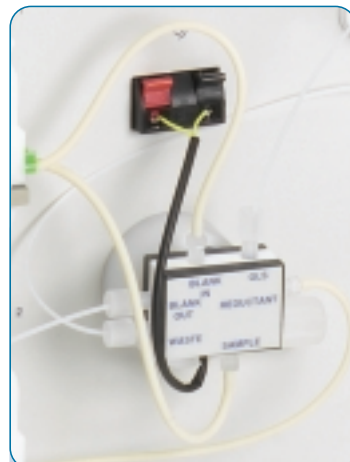
### MEETING THE DEMANDS

As industrialisation spreads around the world, Governments and their Regulatory Bodies are introducing ever more stringent guidelines to protect people and the environment from the menace of mercury – long recognised as toxic to humans, harmful to the environment and extremely troublesome to process plants due to its corrosive nature. As a result, analysts need to achieve the ever greater sensitivity that Millennium Merlin provides.

PSA's experts are working closely with Standards Bodies and Regulatory Agencies to develop instrumentation conforming to and often exceeding current worldwide requirements.



Gas liquid separators, - reliable tested products with minimal, if any foaming.



New valve concept to conserve reagents

### BEST ANALYTICAL OPTION

Because of the low levels of mercury present in areas of the environment, direct measurement using analytical techniques, such as atomic absorption, inductively coupled plasma (optical emission and mass spectrometry), are not always sensitive enough to provide accurate analysis at very low levels.

PSA has shown that AFS outperforms other techniques for measuring mercury due to its

linearity over many orders of magnitude. The Millennium Merlin system can detect mercury in widely varying sample concentrations, from 0.1 part per trillion (ppt) to more than 10 parts per million (ppm) without the need for instrument adjustment and without interference through carryover from one sample to another. In addition, the Millennium Merlin offers speedy analysis – with an analysis rate of over 80 samples-an-hour.

### USER BENEFITS

#### Atomic fluorescence detector

- Sensitivity better than 0.1 ppt with linearity up to 10 ppm
- Enables reliable detection of mercury in even the most complex samples
- Minimal carryover – no need to sort samples before analysis

#### Integrated system

- Performance optimised
- Easy to use
- Easy access to components
- Small footprint saves bench space

#### Full computer control

- Unattended operation and shut down
- Simple to select method required
- Saves time and money

#### Perma Pure dryer

- Improves precision
- No regular changing of chemical desiccant

# The Millennium Merlin System

### GETTING DOWN TO 0.1 PPT

With AFS, PSA integrated vapour generation techniques to develop the Millennium Merlin system, which provides unsurpassed accuracy and precision, with a wide linear dynamic range, and detection levels down to 0.1 ppt for real samples.

Designed for routine use, the Millennium Merlin system provides the full range of facilities required by researchers and method development chemists.

The Millennium Merlin system offers standard modules that can be configured to meet current legislation:

- EPA Methods 1631, 245.7, 245.1 and 7474; and,
- ISO(CEN) 13506 standard.

PSA's Millennium windows software controls the Millennium range of instruments allowing discrete data capture and integration into user networks and formats.

### GALAHAD GOLD PRE-CONCENTRATOR

To conform to US EPA Method 1631, PSA has configured its 10.035 instrument with the Galahad Gold pre-concentrator. The mercury from samples is first concentrated on gold foil in the amalgamation module. The mercury is then re-vaporised into the AFS detector. Detection levels are systematically lower using this approach. The amalgamation module can be removed readily to allow the instrument to operate as a standard AFS instrument.

### COUPLING FOR MERCURY SPECIATION

The Millennium Merlin can easily be coupled to chromatographic techniques, such as high-performance liquid chromatography (HPLC) and ion chromatography



(IC), to provide measurements of individual mercury species in a sample. The species, which are separated on the chromatographic column, are then mixed with tin (II) chloride reagent to evolve mercury [Hg(0)] for measurement in the AFS detector.

PSA has available accessories to enable users to assemble their mercury-speciation systems quickly. Also, a simple software package evaluates the chromatograms produced. In addition, the Millennium Merlin can be linked to commercially available systems of the user's choice.

### MERCURY IN GASES

To measure mercury in gaseous matrices, PSA's Amasil trapping technology can be combined with the Millennium Merlin system. The Galahad Gold pre-concentrator allows samples collected on the Amasil traps to be measured using the Millennium Merlin system. The PSA M035S100 module calibrates the instrument prior to measuring the samples collected on the gold traps.

### SUPPORT

PSA provides comprehensive customer support world-wide through our fully trained distributors and in-house technical, chemical and IT support teams. Our on-going commitment to research and development, both in-house and through supported programmes in universities worldwide continues to provide major advances in the field of elemental analyses.

PSA provide solutions to difficult problems with mercury analysis, by innovative use of instrumentation and by utilising the expertise of our research and development team.

### TECHNICAL SPECIFICATION

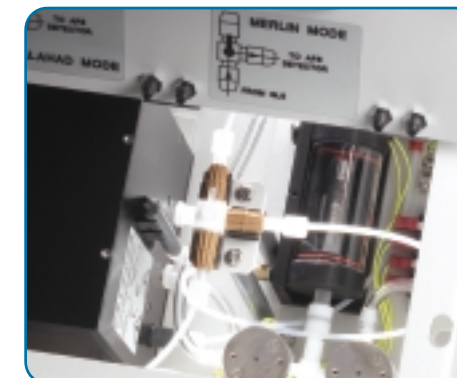
Weight:	Approximately 20 kilos	Height:	185mm
Length:	445mm	Depth:	320mm
Voltage:	240 V AC at 50 Hz	Power:	192 VA
	120 V AC at 60 Hz	Class:	II



Front loading cassettes with customised tubing extends tube life



Perma Pure cassette continuously removes moisture



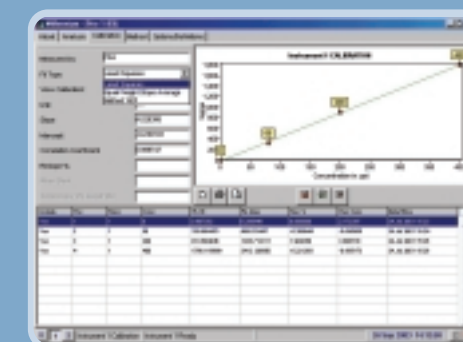
The EPA 1631 compliant Millennium Merlin Galahad (shown here with raised lid revealing its innovative gold trap assembly).

## MILLENNIUM SOFTWARE

The PSA Millennium Software provides instrument control and data acquisition running under MS Windows



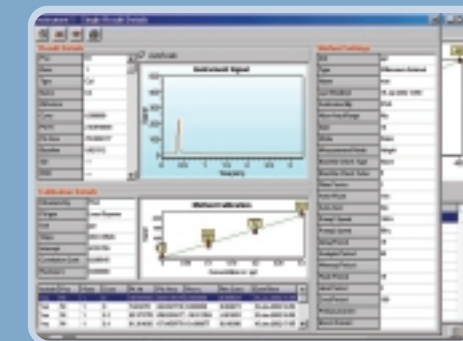
Complete control of all instrument parameters from method



Extended calibration range with up to 12 standards. Full amending of fit type and points allowed



Easy to edit autosampler sequence with standards, checks and samples



Ability to look at peak shapes during and after run. Peak shown 10 ppt Hg

- Fully Multi-Tasking
- Add a calibration, multiple samples and checks at the touch of a button
  - Set the system to automatically shut down at the end of a run
  - User definable results display
  - Set overrange criteria, such as automatically running a blank after a high sample
  - Export to LIMS software
  - Complete saving of all information about a particular sample
  - Keep a history of all modifications made to a particular method

**PSA**

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