NO SAMPLE PREPARATION REQUIRED

DMA-80

DMA-80 DIRECT MERCURY ANALYZER

5-MINUTE MERCURY DETERMINATION
IN SOLID AND LIQUID SAMPLES
About Milestone

Milestone was established in 1988 with the goal to provide chemists around the world with the best available technology for improving the sample preparation and analytical process.

With a global installed base of over 9000 systems covering 70% of Fortune 500 companies, as well as large and small research institutions, universities and laboratories, we are well on the path to achieve our mission.

The key to Milestone's technological leadership lies in bringing together individuals from diverse scientific and engineering disciplines to solve real world problems with innovative instrumentation.

This operating philosophy has enabled Milestone to develop an extraordinary range of products, from an unmatched portfolio of patents.

Our commitment is to engineering instruments with superior performance capabilities and maximum user safety.

THE IMPORTANCE OF MERCURY DETERMINATION

While the total amount of mercury on the planet has remained constant, the amount released into the biosphere has dramatically increased over the past century. Emissions from fossil fuel combustion (such as coal and oil-fired power plants) are responsible for generating the greatest amounts of mercury into the atmosphere, where it is then precipitated into the food chain through soil contamination and bioaccumulation in fish and animal tissue.

Other contamination sources include medical and hazardous waste incineration, industrial (paint, pesticides, batteries, paper) waste, and even broken thermometers and manometers.

The hazards of mercury contamination make accurate detection extremely important. While traditional Cold Vapor methods work well, they are difficult, highly time consuming, and generate their own kinds of hazardous waste.

Another method needed to be developed that would generate accurate and repeatable results quickly, simply, and waste-free.

INTRODUCING THE DMA-80

Milestone’s DMA-80 Direct Mercury Analyzer effortlessly analyzes liquid and solid samples with no sample preparation and no waste disposal. Automatically process 40 samples in about 4 hours, start to finish. An intuitive controller uploads sample weights, controls the analysis and processes data with built-in report generation and networking capabilities.
Wide Field of Application

The DMA-80 permits direct analysis of trace level mercury in several matrices in a wide variety of industries and laboratories:

- Solids: sediment, soil, sludge, food/feed, plant and animal tissues, coal, oil, fish, cement, paints, wood, plastic.
- Liquids: wastewater, beverages, biological fluids.
- Environmental, agriculture, petrochemical, food and feed, power plant, mines and resources laboratories.

Solid or liquid samples are weighed and introduced into the sample boat. The sample is initially dried and then thermally decomposed in a continuous flow of oxygen. Combustion products are carried off and further decomposed in a hot catalyst bed. Mercury vapors are trapped on a gold amalgamator and subsequently desorbed for quantitation.

The mercury content is determined using atomic absorption spectrophotometry at 254 nm.

The graphic shows a typical peak profile resulting from the determination of 1 ng of Hg.

The 1st peak corresponds to the long pathlength flow cell and measures Hg contents up to 20 ng.

The instrument determines the absolute amount of Hg and then the software calculates its concentration in the sample.

The 2nd peak corresponds to the short pathlength flow cell and Hg content in the range of 20-1000 ng.

The software measures the height, the half width and the area of the absorbance peak, which assists in both method development and troubleshooting.
DMA-80

- Results in 5 minutes
- Results are matrix independent
- Small footprint ideal for laboratory and field analysis
- No sample digestion step
- No chemical pretreatment step
- Eliminates use of reagents and their disposal
- Validated results for both solid and liquid matrices
- User intuitive software
- Autosampler allows unattended operation
- Removable flash card for data storage

AUTOMATIC MERCURY DETERMINATION IN LIQUID SAMPLES WITH NEW QUARTZ SAMPLE BOATS

Milestone has developed special high purity quartz boats to enable the DMA-80 to carry out precise and reliable analysis of liquid samples. Quartz boats have virtually no ‘memory’ effect and assure improved reproducibility and longer lifetime.

- Automatic analysis of up to 40 liquid or solid samples
- Lower memory effect and better reproducibility than with metal boats
- Quartz boat volume up to 1500 µl

Quartz boats typical reproducibility
Direct Hg Determination in Solids and Liquids

AUTOMATED THERMAL PROCESSING FOR SIMPLE AND PRECISE DETERMINATION OF MERCURY IN SOLID AND LIQUID SAMPLES IN THE LABORATORY AND IN THE FIELD

Standard mercury methods like Cold Vapor involve lengthy sample pretreatment that can involve a digestion and/or chemical oxidation followed by chemical reduction of the mercury to its elemental state. Sample preparation can take several hours and the reagents involved must be disposed of according to strenuous guidelines for solid and hazardous waste.

The thermal decomposition technique employed by the DMA-80 analyzes samples directly, eliminating digestion, chemical pretreatment and waste disposal.

US EPA Method 7473

Method 7473 is designed for the determination of mercury in solids, aqueous samples, and digested solutions in both the laboratory and field environments. The stability of the instruments is such that field and lab results are statistically identical. Due to the severe toxicity of mercury and to its pervasive pre-RCA mismanage-ment, the EPA envisions widespread use of this technology.

From ‘An Update of the Current Status of the RCRA Methods Development Program’ by Barry Lesnik and Ollie Fordham, US EPA, Office of Solid Waste, Methods Team (5307W), doc #4BLWP804.98.
The intuitive, user friendly software

Fully complies with CFR 21, part 11!
Secure electronic data keeping made easy with Milestone’s software!
Fully complies with CFR 21 part 11, which is also being considered by EPA for electronic data management and reporting.

Editor setup
The DMA-80 software allows you to create and store commonly used methods; create easily identifiable data files; and select mode operation (single or autosampler).

Main control panel
The software completely controls the systems operation and provides valuable feedback on the instrument’s performance. You can monitor the progress of the analysis and manipulate the autosampler.

Calibration curves
Two calibration curves are used; each cell has its own calibration curve to cover a wide range of Hg concentration.

Display of samples data
Document the sample ID and weight; the controller will report the Hg absorbance, absolute Hg in the sample in ng units and total Hg concentration. Once the sample analysis is finished, the data is automatically stored in a database. Edit the working parameters for any sample at any moment in time.
The **Accuracy** and **Precision** of the DMA-80

<table>
<thead>
<tr>
<th>Sample</th>
<th>Certified Hg content (µg/kg)</th>
<th>DMA-80 (µg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIST 1568a Rice Flour</td>
<td>5.8 ± 0.5</td>
<td>5.7 ± 0.1</td>
</tr>
<tr>
<td>NIST 1573a Tomato Leaves</td>
<td>34 ± 4</td>
<td>31.7 ± 1.4</td>
</tr>
<tr>
<td>NIST 1630a Coal</td>
<td>93.8 ± 3.7</td>
<td>93.4 ± 2.4</td>
</tr>
<tr>
<td>NIST 1633b Fly Ash</td>
<td>141 ± 19</td>
<td>148.6 ± 1.8</td>
</tr>
<tr>
<td>NIST 2709 Soil</td>
<td>1400 ± 80</td>
<td>1460 ± 20</td>
</tr>
<tr>
<td>NIST 2711 Soil</td>
<td>6250 ± 190</td>
<td>6240 ± 70</td>
</tr>
</tbody>
</table>

**THE SIMPLICITY AND SPEED OF THE DMA-80**

1. A representative sample is taken and homogenized
2. The sample is weighed on an analytical balance interfaced with the DMA-80
3. A series of samples is placed in the built-in autosampler
4. After 5 minutes the first result is obtained

**Rapid determination of Hg in fresh salmon**
DMA-80

Technical Specifications

- Sample treatment: fully programmable drying combustion steps via touch-screen terminal
- Liquid samples maximum volume: 1500 µL
- Solid samples maximum weight: 500 mg
- Control Terminal 640:
  - Touch-screen
  - Screen size 6,5"
  - Resolution VGA 640 x 480
- Control Terminal 1640:
  - Touch-screen
  - Screen size 12"
  - Resolution VGA 800 x 600
- Mercury detection system: single beam spectrophotometer with sequential flow through of measurement cells
- Light Source: low pressure mercury vapor lamp
- Wavelength: 253.65 nm
- Interference filter: 254 nm, 9 nm bandwidth
- Detector: silicon UV photodetector
- Detection limit: 0.005 ng Hg

- Typical reproducibility: <1.5 %
- Working range: (with automatic switch-over)
  - Low range: 0-20 ng Hg
  - High range: 20-1000 ng Hg
- Calibration: performed with standard solutions or solid (Standard reference materials)
- Carrier gas: Oxygen, 4 bar (60 psig) with ~200 ml/min flow rate
- Autosampler: 40 positions, built-in, for solids and liquids
- Software: documentation for TQM, GLP and ISO Norms. Fully complies with Code 21 of federal regulations (21 CFR, part 11)
- Sample weight data transfer: automatic through interface with external balance (not included)
- Power: 110-230V / 50-60Hz
- Dimensions: 80 x 42 x 30 (H) cm;
- Weight: total 56 kg

Specifications are subject to change without notice.