

Model 1135 Particulate Mercury Unit (Patented)

Rev. 041514



The **Tekran**[®] Model 1135 Particulate Mercury Unit is used with the Model 1130 Speciation Unit and the Model 2537 Mercury Analyzer to simultaneously monitor *particulate bound mercury* (Hg^{P}), *elemental mercury* (Hg^0) and *reactive gaseous mercury* (RGM) in ambient air. The system allows fully automated, unattended operation with all three components being measured concurrently.

Although the majority of atmospheric mercury is present in elemental form, differentiation among the three types is important due to the widely varying local impact of each type. (Particulate and reactive gaseous mercury have higher wet and dry deposition rates than does elemental.) Ambient air speciation is of particular interest close to industrial sources such as waste incinerators, which often discharge the majority of their mercury emissions in particulate or ionic form. The Tekran speciation system has also been used in Polar Regions to delineate the conversion of elemental mercury to other forms during polar sunrise.

One of the greatest problems with conventional particulate mercury measurement methods is that reactive gaseous mercury will be trapped on the filter medium along with the particulate bound mercury. This can result in large measurement artefacts. The Tekran speciation system solves this problem by removing the reactive gaseous component using a denuder *before* sampling the particulate mercury.



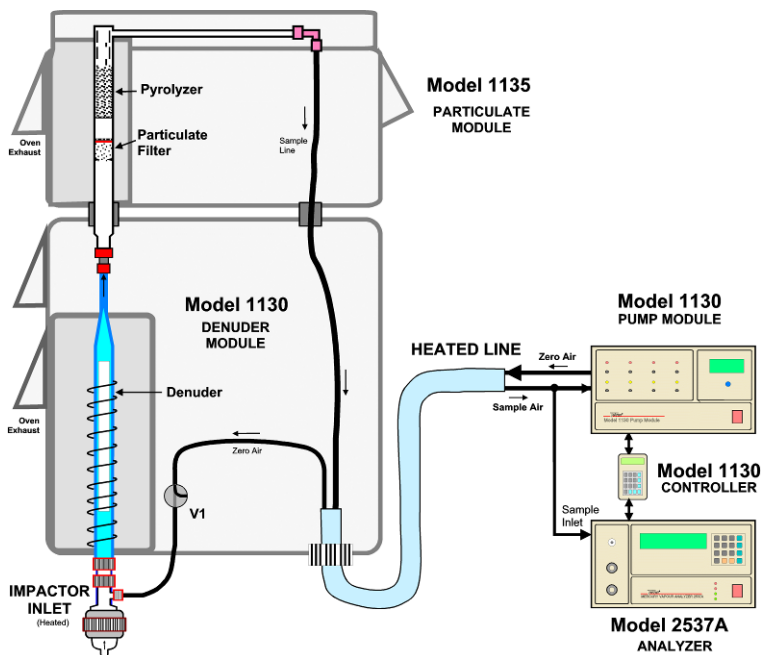
Shown installed
with Model 1130

Principles of Operation

Sampling Phase

During sampling, the coarse particle fraction (> 2.5 µm) is captured in a heated impactor so that they do not enter the system. Reactive gaseous mercury species in the atmosphere are then captured in the **Model 1130 Denuder Module**. The fine fraction particulate bound mercury species are then trapped onto a unique quartz regenerable filter located within the **Model 1135**. Elemental mercury passes through both units and is continuously analyzed by the **Model 2537**.

The sampling period and flow rate are programmable, and are usually set to be in the range 30 minutes to 3 hours at 10 L/m. These long sampling times and large flow rates are required to accumulate enough material for analysis.



Analysis Phase

The various sensing elements are sequentially desorbed during the analysis phase. The analytical cycle consists of the following steps.

1 - Zero Flush

The sampling system is flooded with zero air. This zero air acts as a carrier gas during subsequent analysis steps.

2 - Pyrolyzer Preheat

The pyrolyzer is heated. This will convert to elemental form any mercury compounds that are eluted during subsequent steps.

3 - Particulate Trap Desorption

The regenerable particulate trap is heated. This desorbs the particulate bound mercury captured on the trap. The Model 2537 quantitates the mercury released during this step. The heating process also reconditions the trap for subsequent cycles.

4 - Annular Denuder Desorption

The denuder is then heated, releasing the RGM that was trapped during the previous sampling period. The pyrolyzer and particulate trap continue to be heated during this step, allowing the eluted mercury to pass through without losses.

4 - Zero / Cool Down

The sensing elements are cooled and post-analysis zero levels are determined.

Data Handling

Tekran provides a Windows® based application, **Combine** with every **Model 2537**. This program provides proper time alignment for any set of data readings, inserting appropriate gaps during periods of no data and combining results from several capture files. **Combine** also separates data based on the status of the speciation system. Readings for RGM, Hg^P and Hg⁰ can be placed into separate columns, making subsequent processing by spreadsheet or database programs straightforward. The system gives a true *simultaneous* determination of the three species.