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# HgChek Elemental Mercury Passive Sampler
# Cat. No. 520-04
# Operating Instructions

***Note:*** *To sample low levels of mercury, use a sorbent tube.*

## Introduction

The SKC HgChek™ Elemental Mercury Passive Sampler Cat. No. 520-04 is a lightweight, disposable personal sampler designed to be worn in the breathing zone of individuals who are potentially exposed to elemental mercury vapor.

The sample enters the sampler by positive controlled diffusion. The sorbent is analyzed by flameless atomic absorption.

*To see the validation report for this sampler, go to the Knowledge Center at www.skcinc.com.*


*HgChek Passive Sampler*
*Cat. No. 520-04*

### Performance Profile

| | |
|---|---|
| **Shelf-life** | Limited; check expiration date on packaging. |
| **Storage** | Ambient<br>**Caution:** Do not store with food. |
| **Sorbent** | Anasorb® C300, equivalent to Hydrar® and Carulite® |
| **Limit of Detection** | 0.01 µg† |
| **Limit of Quantification** | 0.04 µg† |
| **Capacity** | > 30 µg mercury per capsule |
| **Breakthrough Volume** | > 150 liters of air |
| **Overall Coefficient of Variation** | 5.5% |
| **Sampling Rate** | 0.021 L/min (21 ml/min) at 20 C and 760 torr (*see Interpreting Results*) |

*† Limits may vary with analysis and instrumentation.*

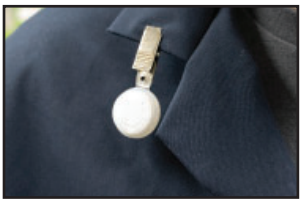
## Sampling

1. Remove the sampler from the sealed pouch. **Do not discard the pouch as it is used to protect the sampler during shipment.**

2. Write the date, start time, and sampler ID number (found on the sampler) on the label on the pouch.

3. Remove the cap on the front of the sampler and set aside. **Do <u>NOT</u> remove the plastic plug on the back of the sampler. Removing this plug will VOID the sample.**

4. Clip the sampler to the worker's clothing in the breathing zone. Ensure small holes are facing out. **Ensure holes are not covered in any way. Do not expose to rain/spray or splashing chemicals. Do not handle with dirty fingers/ gloves.**



5. At the end of the desired sampling period, unclip the sampler from the worker's clothing. Replace the cap on the front of the sampler.

6. Write the stop time on the label on the pouch. ***Important:*** *Measure and record ambient temperature and atmospheric pressure. Include in information sent to the laboratory.*

7. Carefully package the sampler in the pouch and send it, blanks, and pertinent information to an AIHA-accredited laboratory for analysis.

## Transporting Sampler for Analysis

1. Place the sampler in the provided ziploc bag.
2. Mail or transport the sampler and at least one field blank to a qualified laboratory for analysis. The sorbent should be analyzed within 14 days of sampling.

***Notes:***

- *Do not store any parts of the sampler in areas where they may become contaminated with mercury.*
- *Store the exposed sampler in the provided ziploc bag after the sampling period.*

- *This sampler only samples elemental mercury (Hg) in the vapor phase and does not sample organic mercury compounds or particulate matter.*
- *Take precautions when sampling for mercuric chloride. It can collect on the face of the badge and interfere with sampling.*

## Interferences During Sampling

**Ambient Temperature**
The sampling rate will vary with ambient temperature changes, which affect the diffusion coefficient. This effect is small but may be significant if sampling at unusually high or low temperatures. The diffusion coefficient (D) is a function of the absolute temperature (T) by the relation $D \propto T^{1.5}$. This factor is taken into account in the calculation used in the OSHA method (*see Interpreting Results*).

**Wind Velocity**
The sampling rate will remain substantially constant over a range of wind velocity from 30 to 300 ft/min. In very still air conditions (below 30 ft/min), the sampling rate will drop by up to 30%. If very high wind velocities (in excess of 750 ft/min) are expected, passive samplers should not be used.

**Ambient Pressure Changes**
The sampling rate varies with ambient pressure changes, which affect the diffusion coefficient. The diffusion coefficient is inversely proportional to the ambient pressure. This factor is taken into account in the calculation used in the OSHA method (*see Interpreting Results*).

**Presence of Other Gases**
The sampling of mercury on the sorbent has been shown to be unaffected by the presence of other gases, including chlorine. Note, however, that complex interactions in the atmosphere may reduce the total free elemental mercury present to be sampled.

## Analysis

**Consult OSHA ID-140 and MDHS 16/2 for detailed analytical procedures.**

**Preparing Samples**
Remove the small plug from the back of the sampler and remove the foam disc with tweezers. Transfer the sorbent to the vial. Tap the sampler lightly to get all sorbent particles out of the sampler. Carefully pour the sorbent into a 50-ml volumetric flask. Add 2.5 ml of concentrated nitric acid followed by 2.5 ml of concentrated hydrochloric acid. Gently swirl the sample occasionally for approximately 1 hour. Add approximately 45 ml of distilled water to bring total liquid quantity up to 50 ml.

**When Anasorb C300 is dissolved, a milky suspension results. This is an insoluble residue and must be removed by filtration or centrifugation before analysis.**

Take aliquots from this solution and analyze at 253.7 nm by cold vapor atomic absorption.

Prepare several “blanks” by dissolving fresh, unexposed capsules of the same lot number as the test specimen. These “blank” values represent the background level of mercury in the sorbent and should be subtracted from all readings.

**Mercury Desorption**
The basic mechanism of desorption consists of adding an excess of stannous chloride to the aliquot of sample solution. This causes the mercury to be released as elemental mercury, which is swept into the analyzer by an air or nitrogen stream.

**Calibration**
The complete analytical system can be calibrated by injecting aliquots from standard solutions (either from liquid or sorbent solution standards or both). It is recommended that three different concentrations be checked to ensure linearity of the equipment over the likely range.

It is further recommended that standards and blank values be interspersed between samples to check for any variations in response. Take particular care to avoid buildup of mercury on the internal surfaces of the equipment; this will cause an increase in readings. A buildup of mercury can be detected by a gradual apparent increase in the blank values during use. If this occurs, run several aliquots of mercury-free solutions through the equipment until the analyzer indication drops to zero. Retest the "blank" solution as an additional precaution before proceeding.

Report all results as nanograms or micrograms of mercury on the capsule by direct comparison with the known standards. Relate the aliquot size to the total 50 ml of liquid solution.

**Consult OSHA ID-140 and MDHS 16/2 for detailed analytical procedures.**

**Interpreting Results**
The lab result will indicate the total mass of mercury collected on the sorbent capsule in either nanograms ($10^{-9}$ gram) or micrograms ($10^{-6}$ gram). The airborne concentration of mercury is determined as follows:

1. Convert reported mass of mercury into micrograms ($10^{-6}$ gram).
2. Convert sampling period into minutes.
3. Sample Volume (L) =
   Sampling Period x Sampling Rate x Temperature/Pressure
   (min) (L/min) Correction Factor

   **Where:**
   Sampling rate = 0.021 L/min at 20 C and 760 torr
   Temperature/Pressure Correction Factor = $(T_1/T_2)^{1.5}$ x $(P_2/P_1)$
   $T_1$ = Sampling Site Temperature (K)
   $T_2$ = 293 K
   $P_1$ = Sampling Site Pressure (torr)
   $P_2$ = 760 torr
4. Mercury $mg/m^3$ = $\frac{\text{Mercury Mass (µg) - Mercury Blank (µg)}}{\text{Sample Volume (L)}}$

***Note:*** *This is the calculation of mercury concentration as given in OSHA ID-140 (Revised June 1991), page 11.*