
**Stationary source emissions —
Sampling and determination of
mercury compounds in flue gas using
gold amalgamation trap**

*Émissions de sources fixes — Échantillonnage et détermination de la
teneur en mercure dans les gaz de combustion en utilisant un piège
d'amalgamation de l'or*



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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 1, *Stationary source emissions*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Because mercury is exhausted from stationary sources such as coal combustion plants, cement kilns, non-ferrous metal smelting operations and roasting plants, and waste incineration facilities, the monitoring of the stationary source mercury mass emissions is increasingly important for preventing global environmental pollution and health damage caused by mercury.

This document describes a method for the sampling and determination of mercury concentrations in a flue gas passing through ducts or chimney stacks. Mercury generally exists as elemental (Hg^0) and oxidized (Hg^{2+}) forms, both in vapour and in solid phases in flue gases, this method allows the determination of both total vapour-phase mercury and total solid-phase mercury concentrations in flue gases.

Stationary source emissions — Sampling and determination of mercury compounds in flue gas using gold amalgamation trap

1 Scope

This document describes a method for the sampling and measurement of mercury of both vapour and solid phases on stationary source flue gas streams. Mercury generally exists as elemental (Hg^0) and oxidized (Hg^{2+}) forms, both in the vapour and solid phases in flue gases. The vapour-phase (gaseous) mercury is captured either isokinetically or non-isokinetically with a gold amalgamation trap after removing solid-phase (particulate) mercury with a filter. Because gold amalgamation trap captures only gaseous elemental mercury, the oxidized mercury (Hg^{2+}) in the vapour phase is converted to elemental mercury (Hg^0) prior to the gold amalgamation trap. The concentration of gaseous mercury is determined using atomic absorption spectrometry (AAS) or atomic fluorescence spectrometry (AFS) after releasing mercury by heating the gold amalgamation trap. Separately, particulate mercury is collected isokinetically on a filter and the concentration is determined using cold vapour AAS or cold vapour AFS after dissolving the particulate mercury into solution.

The total concentration of mercury in flue gas is expressed as the sum of both gaseous and particulate mercury concentrations.

The gold amalgamation method is intended for short-term (periodic) measurements of gaseous mercury ranging from $0,01 \mu\text{g}/\text{m}^3$ to $100 \mu\text{g}/\text{m}^3$ with sampling volumes from $0,005 \text{ m}^3$ to $0,1 \text{ m}^3$ and sample gas flow rate between $0,2 \text{ l}/\text{min}$ to $1 \text{ l}/\text{min}$. The measurement range of particulate mercury is typically from $0,01 \mu\text{g}/\text{m}^3$ to $100 \mu\text{g}/\text{m}^3$ with sampling volume from $0,05 \text{ m}^3$ to 1 m^3 .

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 9096, *Stationary source emissions — Manual determination of mass concentration of particulate matter*

ISO 10396, *Stationary source emissions — Sampling for the automated determination of gas emission concentrations for permanently-installed monitoring systems*

ISO 12141, *Stationary source emissions — Determination of mass concentration of particulate matter (dust) at low concentrations — Manual gravimetric method*

ISO 12846:2012, *Water quality — Determination of mercury — Method using atomic absorption spectrometry (AAS) with and without enrichment*

ISO 16911-1, *Stationary source emissions — Manual and automatic determination of velocity and volume flow rate in ducts — Part 1: Manual reference method*

ISO 17852:2006, *Water quality — Determination of mercury — Method using atomic fluorescence spectrometry*

ISO 20988, *Air quality — Guidelines for estimating measurement uncertainty*