



SLOVENSKI STANDARD

SIST EN 14884:2006

01-maj-2006

Učinkovitost merilnih sistemov za določanje celotne koncentracije živega srebra v zraku iz stacionarnih virov: avtomatizirani merilni sistemi

Air quality - Stationary source emissions - Determination of total mercury: automated measuring systems

Luftbeschaffenheit - Emissionen aus stationären Quellen - Bestimmung der Gesamtquecksilber-Konzentration: Automatische Messeinrichtungen

Qualité de l'air - Emissions de sources fixes - Détermination de la concentration en mercure total : systèmes automatiques de mesure

Ta slovenski standard je istoveten z: EN 14884:2005

ICS:

13.040.40 Stationary source emissions

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EUROPEAN STANDARD

EN 14884

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December 2005

ICS 13.040.40

English Version

Air quality - Stationary source emissions - Determination of total mercury: automated measuring systems

Qualité de l'air - Emissions de sources fixes -
Détermination de la concentration en mercure totale:
systèmes automatiques de mesure

Luftbeschaffenheit - Emissionen aus stationären Quellen -
Bestimmung der Gesamtquecksilber-Konzentration:
Automatische Messeinrichtungen

This European Standard was approved by CEN on 28 November 2005.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This European Standard (EN 14884:2005) has been prepared by Technical Committee CEN/TC 264 “Air quality”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2006, and conflicting national standards shall be withdrawn at the latest by June 2006.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

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Introduction

This European Standard describes the quality assurance procedures related to Automated Measuring Systems (AMS) for the determination of total mercury in flue gas, in order to meet the uncertainty requirements on measured values given by regulations, national or other legislation.

This European Standard is only applicable in conjunction with the general document on quality assurance of AMS described in EN 14181, and provides indications, which are specific to measurements of total mercury.

The calibration and validation of mercury AMS are performed by parallel measurements with the reference manual method described in EN 13211.

The calibration and validation of mercury AMS are performed by parallel measurements with the reference manual method described in EN 13211. The species of mercury (Hg^0 and Hg^{2+}) and the physical occurrence (gaseous, in dust or in droplets) can vary significantly depending on the type of process to be monitored.

A total mercury AMS or a gaseous mercury AMS can be chosen. Whether or not a gaseous mercury AMS can fulfil the requirements for total mercury depends on the process and sampling location.

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1 Scope

This European Standard specifies specific requirements on automated measuring systems (AMS) for monitoring of total mercury. It is derived from EN 14181, which is the general document on the quality assurance of AMS. It is only applicable in conjunction with EN 14181.

This European Standard sets specific requirements for the quality assurance levels and annual surveillance test as specified in EN 14181, for mercury AMS used for proving that the mercury emissions from a source are compliant with emission limits between 0,03 mg/m³ and 0,5 mg/m³ ¹⁾ (standard conditions) in ducted gaseous streams. This European Standard is applicable by direct correlation with the standard reference method (SRM) described in EN 13211.

This European Standard is primarily developed for emissions from waste incinerators. From a technical point of view, it may be applied to other processes, for which measurement at an emission limit is required with defined uncertainty.

2 Normative references

The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13211:2001, *Air quality — Stationary source emissions — Manual method of determination of the concentration of total mercury*

EN 14181:2004, *Stationary source emissions — Quality assurance of automated measuring systems*
<https://standards.iteh.ai/catalog/standards/sist/4a2593eb-9089-48fc-9b71->

EN ISO 14956, *Air quality — Evaluation of the suitability of a measurement procedure by comparison with a required measurement uncertainty (ISO 14956:2002)*

EN ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN 13211:2001 and EN 14181:2004 and the following apply.

3.1

automated measuring system (AMS)

measuring system permanently installed on site for continuous monitoring of emissions

NOTE 1 An AMS is a method, which is traceable to a reference method.

NOTE 2 Apart from the analyser, an AMS includes facilities for taking samples (e.g. sample probe, sample gas lines, flow meters, regulators, delivery pumps) and for sample conditioning (e.g. dust filter, moisture removal devices, converters, diluters). This definition also includes testing and adjusting devices that are required for regular functional checks.

¹⁾ m³ expressed as m³ under dry conditions, normalized to 273 K and 101,3 kPa and 11,0 % (volume fraction) O₂ (unless otherwise stated).

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NOTE 3 For the purpose of this European Standard, AMS means automated mercury measuring system.

3.2**emission limit value**

limit value related to the uncertainty requirement

NOTE For the EU directives [1] and [2] it is the daily emission value that relates to an uncertainty requirement.

3.3**standard conditions**

reference values for a dry gas at a pressure of 101,3 kPa and a temperature of 273 K

3.4**Standard Reference Method (SRM)**

method described and standardised to define an air quality characteristic, temporarily installed on site for verification purposes

3.5

t_{sample}

sample time period of the automated measurement system

3.6

t_{cycle}

time of the total measurement cycle of the monitor

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4 Principle

This European Standard is derived from the general standard on the quality assurance of AMS (EN 14181). It shall be applied in conjunction with that standard. This European Standard only deals with the specific aspects related to mercury monitoring.

According to EN 14181, three different levels of quality assurance are defined, designated as Quality Assurance Levels (QAL). These levels cover the suitability of an AMS for its measuring task (QAL1), the validation of the AMS following its installation (QAL2), the control of the AMS during its ongoing operation on an industrial plant (QAL3). An annual Surveillance Test (AST) is also defined.

5 AMS performance criteria for QAL 1

The performance of the AMS shall be assessed in a suitability test referred to as QAL1. Suitability tests for an AMS are usually carried out within the framework of certification or type approval procedures. The suitability test comprises a separate laboratory test and a three-month field test in a typical application.

NOTE The requirements for values of performance characteristics will be specified in a European Standard on AMS certification.

The manufacturer shall ensure that the delivered AMS has the same characteristics as the tested devices.

It shall be proven by use of EN ISO 14956 that the total uncertainty of the measured results obtained by the AMS meets the specifications for uncertainty stated in the applicable regulations. This total uncertainty is calculated by summing all the relevant uncertainty components arising from the individual performance characteristics in an appropriate manner. The AMS suitability shall be evaluated for the plant specific conditions taking into account the anticipated variations of the physical environment and interferences. Cross sensitivities of interferences in the gas to be measured are to be checked alone and together with mercury and its compounds. If there is any interaction then a restricted use of an AMS at specific emission sources is possible.

6 AMS location

The AMS shall be located in such a way that the gas sample, which is monitored, has a representative content of total mercury.

The location shall be chosen according to the manufacturer recommendations, and may depend on the AMS principle of detection.

The AMS shall be located to ensure that there is minimum interference with the SRM and vice versa.

The working platform(s) for the AMS shall provide an easy and safe access to the AMS in order to allow frequent inspection and quality assurance procedure implementation.

If the particulate mercury amounts to more than 2% of the total mercury the working platform for the SRM shall comply with the requirements of Annex A of EN 13284-1:2001 related to the manual gravimetric method.

7 Calibration and validation of the AMS (QAL2)

7.1 General

The AMS should be serviced just before the calibration according to the manufacturer's recommendations.

NOTE 1 It is recommended to include the service report as an appendix to the calibration report.

The AMS shall be calibrated and validated in accordance with EN 14181.

NOTE 2 Annex A shows an example of a calculation procedure according to QAL2.

7.2 Calibration procedure

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7.2.1 Parallel measurements with SRM

The Standard Reference Method (SRM) used shall be in accordance with EN 13211. The testing laboratory, which performs the SRM measurements, shall have an accredited quality assurance system according to EN ISO/IEC 17025 or shall be approved directly by the competent authority.

Validation test performed during writing of EN 13211 proved, that only a few % of total mercury collected on the sampling equipment may be lost in the extraction cone and tubes up stream of the filter.

However, when dust bounded mercury is sampled isokinetically according to EN 13211 as SRM to calibrate a mercury AMS, rinsing of the extraction tubes shall be carried out as described in EN 13211 after each measurement (SRM-result) and not only after each measurement series. The rinsing solution together with the particulate matter collected in the rinsing process shall be analysed on the mass of total mercury and added to the mass of total mercury collected on the filter and absorbers.

The analytical report shall show separately the amount of mercury collected on the filter, absorbers, and rinsing solution of the extraction system, separately for each filter.

If interfering compounds are present in the waste gas, which are not covered by the method given in EN 13211, this method has to be adapted appropriately.

EN 14884:2005 (E)**7.2.2 Automatic recording of AMS output signals****7.2.2.1 General**

The AMS output signal to be recorded may be analogue and/or digital. The AMS should be configured to have a minimum output signal of at least 5 times the detection limit and an output range, which is large enough to gather readings with sufficient resolution.

The AMS output signal shall be automatically recorded during the parallel measurements in order to be electronically averaged. Data recording intervals and averaging times shall be reported specifically in the calibration report.

If it is proven that calibration curves do not change by switching from one range of the AMS to another, it may be calibrated in one range and used afterwards in another. This shall be documented in the calibration report.

Measures shall be taken to prevent AMS self-checks during SRM sampling.

7.2.2.2 Continuous AMS

The data-sampling interval shall be less than half the AMS intrinsic averaging time.

7.2.2.3 Discontinuous AMS

Discontinuous AMS are characterized by a total measurement cycle of the AMS, t_{cycle} , and a sample time period, t_{sample} . The ratio $t_{\text{sample}} / t_{\text{cycle}}$ should be larger than 90 %.

A ratio $t_{\text{sample}} / t_{\text{cycle}}$ less than 90 % may be used, if the suitability of the AMS for measurements for the purpose of this European Standard is demonstrated and documented within the QAL 1 procedure. Within the QAL 2 procedure the calibration ability of the AMS for the specific application has to be demonstrated. These situations shall be approved by the competent authority.

The SRM measurement shall start at the beginning of a new AMS total measurement cycle and shall be performed for a complete number of measurement cycles.

7.3 Establishing the calibration function

The competent authority may approve the use of calibration procedure specified in 6.4.2 b) in EN 14181:2004, even if the range of the SRM results exceeds 15 % of ELV.

NOTE With mercury AMS, it is advantageous to use the zero point in the calibration in order to avoid an inadequate calibration function.

8 Ongoing quality assurance during operation (QAL 3)

QAL3 shall be performed according to EN 14181. For that, the AMS shall have appropriate zero and span reference materials, which have been assessed as part of QAL1 (see Clause 5).

9 Annual surveillance test (AST)

AST shall be performed according to EN 14181.

Annex A (informative)

Example of calculation of the calibration function and of the variability test

A.1 General

The purpose of QAL2 is to perform a calibration, determine the variability and check for compliance with legal requirements on the measurement uncertainty.

In this example, it is assumed AMS and SRM measurements have been performed at a municipal waste incinerator plant. The plant is equipped with mercury AMS based on wet chemical reduction and continuous spectrophotometric determination (UV), the electrical output of which has been registered during the measurements. SRM measurements have been performed according to EN 13211. Furthermore, the values of reference quantities have been measured with the plant and the SRM equipment as required by EN 14181.

The calibration function has been calculated and the variability been tested on the basis of these measurements according to EN 14181. An uncertainty requirement of 40 % of the ELV (95 % confidence interval) on a single measured result is used as an example.

A.2 Data evaluation

A.2.1 General

Table A.1 lists the measurement methods and requirements used in this example.

Table A.1 — Measurement methods and requirements

Parameter	Total mercury
AMS method	Wet chemical reduction and continuous spectrophotometric determination (UV)
Offset for AMS	4 mA
SRM method	manual, wet chemical – EN 13211
Emission limit value (ELV) for standard conditions (0 °C, 1 013 hPa, dry gas, 11 % O ₂) – half hour average	50 µg/m ³
Demands to percentage related to ELV	40 % ^a
^a This value is used as an example in this annex.	

In this example, 15 parallel measurements have been taken over 3 days, evenly distributed. The results at AMS conditions are given in Table A.2: