SLOVENSKI STANDARD
SIST ISO 14164:1999

01-september-1999

Emisije nepremičnih virov – Določevanje volumskega pretoka plinskih tokov v odvodnikih – Avtomatska metoda

Stationary source emissions -- Determination of the volume flowrate of gas streams in ducts -- Automated method

Émissions de sources fixes -- Détermination du débit-volume des courants gazeux dans des conduites -- Méthode automatisée

Ta slovenski standard je istoveten z: ISO 14164:1999

ICS:

13.040.40	Emisije nepremičnih virov	Stationary source emissions

SIST ISO 14164:1999 **en**

INTERNATIONAL STANDARD

ISO 14164

First edition
1999-04-01

Stationary source emissions — Determination of the volume flowrate of gas streams in ducts — Automated method

Émissions de sources fixes — Détermination du débit-volume des courants gazeux dans des conduites — Méthode automatisée

Reference number
ISO 14164:1999(E)

Contents

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 14164 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 1, *Stationary source emissions.*

Annex A forms a normative part of this International Standard. Annex B is for information only.

Stationary source emissions — Determination of the volume flowrate of gas streams in ducts — Automated method

1 Scope

This International Standard describes the operating principles and the most important performance characteristics of automated flow-measuring systems for determining the volume flowrate in the ducts of stationary sources.

Procedures to determine the performance characteristics of automated volume flow-measuring systems are also contained in this International Standard.

The performance characteristics are general and not limited to specific measurement principles or instrument systems.

NOTE Commercial systems which use the operating principles described and meet the requirements of this International Standard are readily available.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 6879: 1995, *Air quality — Performance characteristics and related concepts for air quality measuring methods*.

ISO 7935:1992, *Air quality — Stationary source emissions — Determination of mass concentration of sulfur dioxide — Performance characteristics of automated measuring methods*.

ISO 9096:1992, *Stationary source emissions — Determination of concentration and mass flow rate of particulate material in gas-carrying ducts — Manual gravimetric method*.

ISO 9169:1994, *Air quality — Determination of performance characteristics of measurement methods.*

ISO 10155:1995, *Stationary source emissions — Automated monitoring of mass concentrations of particles — Performance characteristics, test methods and specifications*.

ISO 10780:1994, *Air quality — Stationary source emissions — Measurement of velocity and volume rate of flow of gas streams in ducts.*

ISO 10849:1996, *Stationary source emissions — Determination of the mass concentration of nitrogen oxides — Performance characteristics and calibration of automated measuring systems*.

ISO 12039: —[1)], *Stationary source emissions — Determination of the volumetric concentration of CO, CO_2 and O_2 — Performance characteristics and calibration of automated measuring systems*.

[1)] To be published.

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
automated flow-measuring system
AMS
system that may be attached to a duct to continuously measure and record the volume flow of a gas

3.2
analyzer
that part of an AMS that measures the parameters used to calculate the volume flow of a gas

3.3
duct
stack, chimney or final exit duct on a stationary process, used for the dispersion of residual process gases

3.4
comparative measurements
measurements of volume gas flow in the duct by the AMS under test (evaluation) and compared to volume flow simultaneously determined in the same duct in accordance with ISO 10780

3.5
comparative method
method for determination of volume gas flow in a duct in accordance with ISO 10780

NOTE Since the purpose of the comparative test is to demonstrate that the AMS under test yields an accurate estimate of the volume flow in the duct, it is necessary for the comparative method to measure the volume flow profile of the entire duct. An AMS cannot be used as the comparative method because all AMS used for measuring volume flow measure the velocity in a small area of the duct and then extrapolate this measurement to obtain the volume flow in the duct.

3.6
standard deviation
s_A
a measure of the working precision of the installed AMS

NOTE 1 It is derived using the differences between the pairs of volume flow values obtained by comparative testing of the AMS against ISO 10780 on the basis that a statistically sufficient number of comparative measurements are taken over the period of unattended operation (see annex A). The value of s_A is expressed as a function of the full-scale range of the AMS and is calculated on the assumption that s_A is an estimate of the precision of a normally distributed set of measurements.

NOTE 2 Whenever possible, the comparative method should measure the same portion of the gas flow as the AMS.

NOTE 3 It is not possible to determine directly the standard deviation of an AMS in a laboratory, because wind tunnels do not normally reproduce all the properties of stack gases and do not replicate all possible measurement conditions. This is the reason the standard deviation is determined after the AMS has been installed in the duct. Applying the comparative method in conjunction with the test for systematic errors (see A.4.2.3) ensures that the AMS has a satisfactory accuracy.

NOTE 4 In addition to random error, s_A contains the effect that local site variables such as changes in the gas steams temperature, fluctuations in the electrical power supplied to the AMS and zero and span drift have on the overall precision of the AMS. It also includes the standard deviation of the comparative method. s_A is an estimate of the upper limiting value for the precision of the AMS.

NOTE 5 The procedure in this International Standard is suitable for finding the uncertainty of the data obtained from the AMS, as long as the standard deviation of the measured values of the comparative method, s_C, is significantly smaller than the standard deviation, s_D, of the difference between the pairs of measured values.

3.7
period of unattended operation
period for which given values of the performance characteristics of an instrument can be guaranteed to remain within 95 % probability without servicing or adjustment

[ISO 6879]

NOTE For long-term monitoring installations, a minimum of seven days of unattended operation is required.

3.8
response time
time it takes the AMS to display 90 % of the high-level calibration value on the data acquisition system, starting from the time of initiation of the high-level calibration cycle

NOTE The response time may be determined either in the laboratory or after the AMS is installed.

3.9
stationary source emission
gas emitted by a stationary plant or process and transported to a duct for dispersion into the atmosphere

3.10
calibration
<of an AMS> the setting and checking of the installed AMS before determining its performance characteristics or before beginning any volume flow measurement

3.11
calibration function
correlation over the span range of the AMS between the volume flowrate of the duct as measured by the installed AMS and as measured in accordance with the reference flowrate

NOTE 1 ISO 10780 is an example of a reference flow standard.

NOTE 2 A nonlinear calibration function is acceptable, provided this nonlinearity is compensated for in the output of the AMS.

3.12
linearity
measure of the degree of agreement between the measurements of the comparative method (ISO 10780) and the AMS when the differences between the AMS and the comparative method across a range of volume flows are subjected to a linear regression

3.13
span
difference between the AMS output (reading) for a known flowrate and a zero flowrate

3.14
zero drift
change in the output of the AMS over a stated time interval when exposed to an unchanging zero flowrate

3.15
span drift
change in the output of the AMS over a stated time interval when exposed to an unchanging flowrate near the span value

3.16
AMS location
point in the duct where the AMS is installed

4 Measuring principles of commercially available AMS

4.1 General

Most commercially available AMS operate on one of the following three principles: pressure differential, rate of heat loss, or change in the speed of a sound wave. A brief description of each common type of AMS and the advantages and disadvantages of each are presented below.