SLOVENSKI STANDARD
SIST EN ISO 16911-1:2014

01-julij-2014

Emisije nepremičnih virov - Ročno in avtomatsko določevanje hitrosti in volumenskega pretoka v odvodnikih - 1. del: Ročna referenčna metoda (ISO 16911-1:2013)

Stationary source emissions - Manual and automatic determination of velocity and volume flow rate in ducts - Part 1: Manual reference method (ISO 16911-1:2013)

Emissionen aus stationären Quellen - Manuelle und automatische Bestimmung der Geschwindigkeit und des Volumenstroms in Abgaskanälen - Teil 1: Manuelles Referenzverfahren (ISO 16911-1:2013)

Émissions de sources fixes - Détermination manuelle et automatique de la vitesse et du débit-volume d'écoulement dans les conduits - Partie 1: Méthode de référence manuelle (ISO 16911-1:2013)

Ta slovenski standard je istoveten z: EN ISO 16911-1:2013

ICS:

13.040.40 Emisije nepremičnih virov Stationary source emissions

SIST EN ISO 16911-1:2014 en

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 16911-1

March 2013

ICS 13.040.40

English Version

Stationary source emissions - Manual and automatic determination of velocity and volume flow rate in ducts - Part 1: Manual reference method (ISO 16911-1:2013)

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This European Standard was approved by CEN on 23 February 2013.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN ISO 16911-1:2013: E

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Foreword

This document (EN ISO 16911-1:2013) has been prepared by Technical Committee CEN/TC 264 “Air quality", the secretariat of which is held by DIN, in collaboration with Technical Committee ISO/TC 146 "Air quality".

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of an identical text or by endorsement, at the latest by September 2013, and conflicting national standards shall be withdrawn at the latest by September 2013.

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INTERNATIONAL STANDARD

ISO 16911-1

First edition
2013-03-01

Stationary source emissions — Manual and automatic determination of velocity and volume flow rate in ducts —

Part 1: Manual reference method

Émissions de sources fixes — Détermination manuelle et automatique de la vitesse et du débit-volume d'écoulement dans les conduits — Partie 1: Méthode de référence manuelle

Reference number
ISO 16911-1:2013(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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ISO 16911-1 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee TC 146, *Air quality*, Subcommittee SC 1, *Stationary source emissions*.

ISO 16911 consists of the following parts, under the general title *Stationary source emissions — Manual and automatic determination of velocity and volume flow rate in ducts*:

— *Part 1: Manual reference method*

— *Part 2: Automated measuring systems*

Introduction

EN ISO 16911-1 describes a method for periodic determination of the axial velocity and volume flow rate of gas within emissions ducts and stacks and for the calibration of automated flow monitoring systems permanently installed on a stack.

EN ISO 16911-1 provides a method which uses point measurements of the flow velocity to determine the flow profile and mean and volume flow rates. It also provides for alternative methods based on tracer gas injection, which can also used to provide routine calibration for automated flow-monitoring systems. A method based on calculation from energy consumption is also described. EN ISO 16911-1 provides guidance on when these alternative methods may be used.

Stationary source emissions — Manual and automatic determination of velocity and volume flow rate in ducts —

Part 1: Manual reference method

1 Scope

EN ISO 16911-1 specifies a method for periodic determination of the axial velocity and volume flow rate of gas within emissions ducts and stacks. It is applicable for use in circular or rectangular ducts with measurement locations meeting the requirements of EN 15259. Minimum and maximum duct sizes are driven by practical considerations of the measurement devices described within EN ISO 16911-1.

EN ISO 16911-1 requires all flow measurements to have demonstrable metrological traceability to national or international primary standards.

To be used as a standard reference method, the user is required to demonstrate that the performance characteristics of the method are equal to or better than the performance criteria defined in EN ISO 16911-1 and that the overall uncertainty of the method, expressed with a level of confidence of 95 %, is determined and reported. The results for each method defined in EN ISO 16911-1 have different uncertainties within a range of 1 % to 10 % at flow velocities of 20 m/s.

Methods further to these can be used provided that the user can demonstrate equivalence, based on the principles of CEN/TS 14793.[10]

2 Normative references

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

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

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

EN 14789, *Stationary source emissions — Determination of volume concentration of oxygen (O2) — Reference method — Paramagnetism*

EN 14790, *Stationary source emissions — Determination of the water vapour in ducts*

EN 15259:2007, *Air quality — Measurement of stationary source emissions — Requirements for measurement sections and sites and for the measurement objective, plan and report*

3 Terms and definitions

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

3.1
Pitot tube
device to measure flow velocity at a point, operating on the principle of differential pressure measurement

Note 1 to entry: A number of designs of Pitot tube may be used, including standard L-type, S-type, 2D, and 3D Pitot tubes. Annex A describes a number of Pitot designs currently in use in Europe.

3.2
measurement line
line across the stack, on a measurement plane, along which flow measurements are made to characterize the flow velocity profile or to determine the average flow

3.3
measurement plane
plane normal to the centreline of the duct at the measurement location at which the measurement of flow velocity or volume flow rate is required

3.4
measurement point
sampling point
position in the measurement plane at which the sample stream is extracted or the measurement data are obtained directly

3.5
volume flow rate
volume flow of gas axially along a duct

Note 1 to entry: If not specifically stated, the term may be taken to mean the mean volume flow passing through the measurement plane.

Note 2 to entry: Volume flow rate is expressed in cubic metres per second or cubic metres per hour.

3.6
point flow velocity
local gas velocity at a point in the duct

Note 1 to entry: Unless otherwise specified, the term may be taken to mean the axial velocity at the measurement location.

Note 2 to entry: Point flow velocity is expressed in metres per second.

3.7
average flow velocity
<1> velocity which, when multiplied by the area of the measurement plane of the duct, gives the volume flow rate in that duct
<2> quotient of the volume flow rate in the duct and the area of the measurement plane of the duct

3.8
standard conditions
reference value a pressure 101,325 kPa and a temperature 273,15 K

3.9
uncertainty (of measurement)
parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could reasonably be attributed to the measurand

3.10
uncertainty budget
statement of a measurement uncertainty, of the components of that measurement uncertainty, and of their calculation and combination

Note 1 to entry: For the purposes of EN ISO 16911-1, the sources of uncertainty are according to ISO 14956[5] or ISO/IEC Guide 98-3.

3.11
standard uncertainty
uncertainty of the result of a measurement expressed as a standard deviation

3.12
expanded uncertainty
quantity defining an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand

Note 1 to entry: In EN ISO 16911-1, the expanded uncertainty is calculated with a coverage factor of $k = 2$, and with a level of confidence of 95 %.

3.13
overall uncertainty
expanded combined standard uncertainty attached to the measurement result

Note 1 to entry: The overall uncertainty is calculated according to ISO/IEC Guide 98-3.

3.14
swirl
cyclonic flow
tangential component of the flow vector providing a measure of the non-axial flow at the measurement plane

3.15
automated measuring system
AMS
measuring system permanently installed on site for continuous monitoring of flow

Note 1 to entry: See EN ISO 16911-2.

3.16
metrological traceability
property of a measurement result whereby the result can be related to a reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty

Note 1 to entry: The elements for confirming metrological traceability are an unbroken metrological traceability chain to an international measurement standard or a national measurement standard, a documented measurement uncertainty, documented measurement procedure, accredited technical competence, metrological traceability to the SI, and calibration intervals

4 Symbols and abbreviated terms

4.1 Symbols

A	area of the measurement plane	m^2
A_I	internal area of the measurement section	m^2
A_S	cross-sectional area of stack	ft^2
B	number of component B	