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Stationary source emissions — Measurement of velocity and volume flowrate of gas streams in ducts

Émissions de sources fixes — Mesurage de la vitesse et du débit-volume des courants gazeux dans des conduites

Reference number
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Contents

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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.

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 10780 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 1, *Stationary source emissions*.

Annexes A and B form an integral part of this International Standard. Annexes C and D are for information only.

Introduction

ISO/TC 146/SC 1 prepares International Standards for the determination of concentrations of pollutants in stationary source emissions. For the calculation of the emission rate, the volume flow of a gas stream has to be measured. This International Standard specifies methods for the determination of the velocity and the volume flowrate of gas streams in ducts and chimneys. It is based largely on ISO 3966:1977, ISO 4006:1977 and ISO 9096:1990. ISO 3966 and ISO 4006 specify methods for measuring the flow of process streams in closed conduits using type L Pitot static tubes. ISO 9096 specifies ways to measure velocity and mass flow when sampling for particles in gas streams in ducts and chimneys. This International Standard differs from ISO 3966 and ISO 4006 in allowing the use of the type S Pitot tube (a device not mentioned in ISO 3966) as well as the type L. It differs from ISO 9096 in that it provides considerably more information concerning the construction and use of the Pitot tubes commonly used to measure the velocity and volume flowrate of gas streams in ducts and chimneys.

Stationary source emissions — Measurement of velocity and volume flowrate of gas streams in ducts

1 Scope

This International Standard specifies manual methods for determining the velocity and volume flowrate of gas streams in ducts, stacks and chimneys vented to the atmosphere. It specifies the use of two types of Pitot tubes, type L and type S, for determining the velocity and the volume flowrate, and recommends sampling conditions for which each type of Pitot tube is preferred.

The use of other types of Pitot tubes is permitted in acordance with this International Standard providing they meet the accuracy requirements in clause 10.

This International Standard applies to gas streams with essentially constant density, temperature, flowrate and pressure at the sampling points. It applies to situations where the Reynolds number of the gas stream as it flows around the Pitot tube is greater than 1,2, the pressure differential across the Pitot tube orifices (ports) is greater than 5 Pa and the cross-sectional area of the duct at the sampling point is at least 0,07 m^2. It specifies the technology and maintenance of Pitot tubes, the calculation of local velocities from measured differential pressures and the computation of volume flowrate by velocity integration. This International Standard assumes that the measurements are taken either at the same time that a pollutant sample is being collected or independently of actual sample collection; in the latter case, the purpose of the test might be to select the sampling location for collecting a pollutant sample or to calibrate an automated flow measuring instrument installed in the duct. Thus, this International Standard should be suitable as both a primary measurement (velocity and volume flowrate) and as an ancillary measurement (selection of sampling rate for pollutant sampling, calculation of pollutant emission rate, etc.).

If any of the requirements of this International Standard are not fulfilled, this method may still be applied in special cases, but the uncertainty in the velocity and volume flowrate may be larger.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3966:1977, *Measurement of fluid flow in closed conduits — Velocity area method using Pitot static tubes.*

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

3 Definitions and symbols

For the purposes of this International Standard, the definitions and symbols given in ISO 9096 apply. For the user's convenience, these symbols are defined in this International Standard at the point where they are first used.

4 Principle

The average velocity of the gas stream is determined using a Pitot tube to determine the velocity head, v, at selected points in the cross-section of the duct. The volume flowrate, q_V, is calculated by multiplying the cross-sectional area by the average velocity of the gas stream at that cross-section.