



SLOVENSKI STANDARD

SIST ISO 10396:2012

01-april-2012

Nadomešča:
SIST ISO 10396:1996

Emisije nepremičnih virov - Vzorčenje za avtomatsko določevanje koncentracij emisij plinov pri trajno vgrajenih/nameščenih sistemih monitoringa

Stationary source emissions - Sampling for the automated determination of gas emission concentrations for permanently-installed monitoring systems

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Émissions de sources fixes - Échantillonnage pour la détermination automatisée des concentrations d'émission de gaz pour des systèmes fixes de surveillance

<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>

Ta slovenski standard je istoveten z: ISO 10396:2007

ICS:

13.040.40 Emisije nepremičnih virov Stationary source emissions

SIST ISO 10396:2012

en,fr

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 10396:2012

<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>

INTERNATIONAL STANDARD

**ISO
10396**

Second edition
2007-02-01

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

*Émissions de sources fixes — Échantillonnage pour la détermination
automatisée des concentrations d'émission de gaz pour des systèmes
fixes de surveillance*

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 10396:2012

<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>



Reference number
ISO 10396:2007(E)

© ISO 2007

ISO 10396:2007(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST ISO 10396:2012](https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012)

<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>

© ISO 2007

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword.....	iv
Introduction	v
1 Scope	1
1.1 General.....	1
1.2 Limitations	1
2 Normative references	1
3 Terms and definitions.....	2
4 Principle	2
4.1 General.....	2
4.2 Extractive sampling	3
4.3 Non-extractive sampling	3
5 Representative sampling — Factors to be considered.....	3
5.1 Nature of the source	3
5.2 Location	4
5.3 Other factors	5
6 Apparatus and equipment	5
6.1 Construction materials.....	5
6.2 Components of extractive sampling equipment	5
6.3 Components of non-extractive equipment.....	8
7 System operation.....	10
7.1 Checking for leaks	10
7.2 Calibration, function and set-up.....	10
7.3 Maintenance of sampling systems	11
8 Documentation	11
Annex A (informative) Recommended construction materials.....	19
Bibliography	24

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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10396 was prepared by Technical Committee ISO/TC 146, *Air quality*, Subcommittee SC 1, *Stationary source emissions*.

This second edition cancels and replaces the first edition (ISO 10396:1993), which has been technically revised.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
SIST ISO 10396:2012
<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>

Introduction

This International Standard describes the use of methodologies for the sampling of stack gases for the determination of pollutants by automated measuring systems (AMS). The methodology applies to the sampling of oxygen (O₂), carbon dioxide (CO₂), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen monoxide (NO) and nitrogen dioxide (NO₂), or the sum of NO and NO₂ as nitrogen oxides.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST ISO 10396:2012](https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012)

<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST ISO 10396:2012

<https://standards.iteh.ai/catalog/standards/sist/c5ddc918-05bf-4c65-a77b-3b78cbb91538/sist-iso-10396-2012>

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

1 Scope

1.1 General

This International Standard specifies procedures and equipment that will permit, within certain limits, representative sampling for the automated determination of gas concentrations of effluent gas streams. The application is limited to the determination of oxygen (O₂), carbon dioxide (CO₂), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen monoxide (NO) and nitrogen dioxide (NO₂), or the sum of NO and NO₂ as nitrogen oxides.

1.2 Limitations

It is recognized that there are some combustion processes and situations that may limit the applicability of this International Standard. Where such conditions exist, caution and competent technical judgment are required, especially when dealing with any of the following:

- a) corrosive or highly reactive components such as ammonia, hydrogen chloride and sulfuric acid;
- b) high vacuum, high pressure or high temperature gas streams;
- c) wet flue gases;
- d) fluctuations in velocity, temperature or concentration due to uncontrollable variation in the process;
- e) gas stratification due to the non-mixing of gas streams;
- f) measurements made using environmental control devices;
- g) relatively low levels of gas concentrations.

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 10780:1994, *Stationary source emissions — Measurement of velocity and volume flowrate of gas streams in ducts*

ISO 10396:2007(E)

3 Terms and definitions

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

3.1

condensate

material that is condensed in the sample conditioning equipment

3.2

corrosiveness

tendency of an enclosed gas stream to attack sampling equipment components or other exposed surfaces under sampling conditions

3.3

mass concentration

mass of a particular gas per unit volume of dry gas in the enclosed gas stream, unless otherwise stated

NOTE If expressed by volume concentration, these concentrations could be standardized by using a reference excess air level (for example, 3 % oxygen).

3.4

highly reactive component

contaminant in the gas stream that could react to form other chemical components

3.5

wet flue gas

gas stream that is at or below the saturation point and may contain droplets of water

3.6

sample integrity

maintenance of the representativeness of the sample by the elimination of leaks or physical and chemical reactions in the sample gas between the sample inlet and the measuring instrument

3.7

gas stratification

gas stream that forms a laminar layer without turbulence or a condition where the concentration at any point differs from the average concentration over the cross-section by more than 10 %

3.8

***in situ* sampling system**

non-extractive system that measures the gas concentration directly

NOTE *In situ* systems measure either across the stack or duct or at a point within the duct or stack.

3.9

calibration gas mixture

gas of known, reliable and stable composition that may be used to check the response of the AMS and should be used for the calibration of the AMS

4 Principle

4.1 General

This International Standard provides guidance for representative sampling of gases in a duct and includes both extractive and non-extractive methods. In extractive sampling, these gases are conditioned to remove aerosols, particulate matter and other interfering substances before being conveyed to the instruments. In non-extractive sampling, the measurements are made *in situ*; therefore, no sample conditioning other than filtering of filterable materials at the probe tip is required.

4.2 Extractive sampling

Extractive sampling includes extraction of the sample, removal of interfering materials and maintenance of a representative gas concentration throughout the sampling system for subsequent analysis by appropriate instrumentation (see Figure 1).

4.3 Non-extractive sampling

Non-extractive sampling does not involve removal of a sample, and sampling is confined to the gas stream in the duct (see Figures 2 to 4).

5 Representative sampling — Factors to be considered

5.1 Nature of the source

5.1.1 Important factors

To ensure the gaseous concentration in the sample gas stream is representative of that in the flue gas, several factors shall be considered:

- a) the heterogeneity of the process stream, such as variations in concentration, temperature, or velocity across the duct caused by moisture or gas stratification;
- b) gas leakage or air infiltration and continuous gas reactions;
- c) random errors due to the finite nature of the sample and the sampling procedure adopted to obtain a representative sample.

5.1.2 Problem areas in representative sampling

Obtaining a representative sample may be difficult to achieve for the following reasons:

- a) the operation of the source is not stable;
- b) the concentration level of the gas to be determined is either too low or too high;
- c) the size of the stack or duct is too large;
- d) the configuration of the duct network where samples are to be extracted is convoluted.

Where there are difficulties due to the nature of the source as noted in 5.1.1, the concentration profile shall be established for each operating condition in order to determine the best sampling location.

Some sources may have more variability in process (i.e. cyclic variation) and, consequently, any time-dependent measurement may be less representative of the average concentration if a full cycle of variability is not sampled.

5.1.3 Source characteristics

Before any measurements are carried out, it is necessary to become familiar with the pertinent operating characteristics of the process from which emissions are to be sampled and determined. These operating characteristics shall include, but are not necessarily limited to, the following:

- a) mode of process operation (cyclic, batch charging, or continuous);
- b) process feed rates and composition;
- c) fuel feed rates and composition;

ISO 10396:2007(E)

- d) normal operating gas temperatures and pressures;
- e) operating and removal efficiency of the pollution control equipment;
- f) configuration of the ducts to be sampled that might lead to gas stratification or flow disturbances;
- g) volumetric gas flow rates;
- h) expected gas composition and likely interfering substances.

CAUTION — Exercise caution if the duct to be sampled is under pressure or vacuum, or at a high temperature.

5.2 Location

5.2.1 Inspection parameters

An inspection of the physical characteristics of the test site shall be carried out in order to evaluate factors such as:

- a) safety of the personnel;
- b) location of the flow disturbances;
- c) accessibility of the sampling port;
- d) available space for the sampling equipment, analyser and possible sampling platform requirements;
- e) availability of suitable electrical power, compressed air, water, steam, etc.;
- f) sampling port locations.

SAFETY PRECAUTIONS — The electrical equipment used shall be in accordance with the local safety requirements. Where a potentially explosive or hazardous atmosphere is suspected, particular attention is required and precautions shall be taken to ensure the safety of the operations.

5.2.2 Sampling site location

Before any sampling is undertaken, it is necessary to determine any spatial or temporal fluctuations in the gas concentrations, and to carry out a preliminary survey of the gas concentration, temperature and velocity. [When the mass flow rates of gases have to be determined, detailed velocity measurements (ISO 10780) are required.] Measure the concentration, temperature and velocity at the sampling points several times to obtain their spatial and temporal profiles. Conduct this survey when the plant is operating under conditions that will be adhered to during the test, in order to determine whether the selected sampling position is suitable and whether the conditions in the duct are satisfactory (see 5.1.2).

This survey may not be needed if the spatial or temporal fluctuations in the duct can be determined from the owner's investigation, a previous investigation or the process characteristics in advance of the survey. In this case, the information relating to previous procedures for the determination of the sampling point and the adoption of one point sampling shall be described in the report.

It is necessary to ensure that the gas concentrations measured are representative of the average conditions inside the duct or stack. The requirements for the extractive sampling of gas may not be as stringent as those for particulate material. It is important that the sampling point is not located near any obstructions that could seriously disturb the gas flow in the duct or stack. The pollutant may have cross-sectional variation. The concentration at various points of the cross-section shall first be checked in order to examine the presence of gas stratification or air infiltration indicating that the gas to be measured is stratified, and if an alternative acceptable location is not available, multipoint sampling is then required.