SLOVENSKI STANDARD
SIST ISO 12039:2002

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Emisije nepremiļ nih virov ï Doloļ evanje ogljikovega monoksida, ogljikovega dioksida in kisika ï Delovne karakteristike in kalibracija avtomatskih merilnih sistemov

Stationary source emissions -- Determination of carbon monoxide, carbon dioxide and oxygen -- Performance characteristics and calibration of automated measuring systems

Émissions de sources fixes -- Détermination de la concentration de monoxyde de carbone, de dioxyde de carbone et d'oxygène -- Caractéristiques de fonctionnement et étalonnage de systèmes automatiques de mesure

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INTERNATIONAL STANDARD

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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 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.

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

International Standard ISO 12039 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.

Introduction

Carbon dioxide, carbon monoxide and oxygen are gases found in the exhaust gases of combustion processes. Determination of the concentration of these gases may assist the operator in the optimization of the combustion process. The determination of O_2 and CO_2 is also necessary to normalize the measured concentration of other gases and dusts to defined conditions. There are a number of ways to measure concentrations of CO_2, CO and O_2 in ducts. This International Standard describes methods and equipment for the measurement of concentrations of these gases.

Stationary source emissions — Determination of carbon monoxide, carbon dioxide and oxygen — Performance characteristics and calibration of automated measuring systems

1 Scope

This International Standard specifies the principles, the essential performance characteristics and the calibration of automated systems for measuring carbon dioxide, carbon monoxide and oxygen in the flues of stationary sources.

This International Standard specifies extractive and non-extractive systems in connection with several types of instrumental analyser. The following techniques have provided the basis for practical instrumentation:

— paramagnetism (O_2);

— magnetic wind (O_2);

— differential pressure (Quinke) (O_2);

— magnetodynamics;

— zirconium oxide (O_2);

— electrochemical cell (O_2 and CO);

— infrared absorption (CO and CO_2).

Other equivalent instrumental methods may be used provided they meet the minimum requirements proposed in this International Standard.

The measuring system may be calibrated with certified gases, in accordance with this International Standard, or comparable methods.

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 6145-2:—[1)], *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 2: Volumetric pumps*

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

ISO 10396:1993, *Stationary source emissions — Sampling for the automated determination of gas concentrations*

ISO 10849, *Stationary source emissions — Determination of the mass concentration of nitrogen oxides — Performance characteristics 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
air point
value obtained for O_2 when air is passed through the AMS

3.2
Automated Measuring System
AMS
system that can be attached to a duct to continuously measure and record the mass concentrations of CO, CO_2, O_2 passing through the duct

3.3
analyser
analytical part in an extractive or *in situ* AMS

3.4
calibration gas
gas of known and reliable composition that can be used to check the response of the AMS and should be used for the calibration of the AMS

3.4.1
span gas
gas used to adjust and check a specific point on a calibration curve

3.4.2
zero gas
gas or gas mixture used to establish the zero point on a calibration curve within a given concentration range

3.5
calibration
setting and checking of the AMS with a secondary or a working gas before determining the performance characteristics and before beginning any measurement of gases

NOTE This procedure should be carried out at every calibration interval.

3.6
calibration interval
period of time during which the AMS would normally be used between calibrations, respecting the indication given in periods of unattended operation

3.7
comparative measurements
measurements taken on the same duct in the same sampling plane for the same period of time with the AMS under test and with the comparative method at points a short distance from each other, providing pairs of measured values

3.8
comparative method
defined test method for obtaining comparative measurements of stationary source emissions containing CO, CO_2 and O_2

NOTE This can be a manual method or an AMS with a different measuring principle.

3.9
duct
stack chimney or final exit duct on a stationary process used for the dispersion of residual process gases

3.10
mass concentration
ρ
concentration of a substance in an emitted waste gas expressed as mass per volume

NOTE 1 Mass concentration is usually expressed as milligrams per cubic metre (mg/m^3).

NOTE 2 The conversion of data in ppm to mg/m^3 can be carried out as follows:

$$\rho \left(\text{mg/m}^3\right) = \rho \left(\text{ppm}\right) \cdot \frac{M_\text{r}}{22{,}4} \cdot \frac{273}{T} \cdot \frac{p}{101{,}3}$$

where

M_r is the molecular mass;

T is the actual temperature, in kelvins;

p is the actual pressure, in pascals.

3.11
lag time
time taken from a sudden change in concentration at the sampling point until the instrument reads 10 % of the corresponding change in the instrument response

3.12
linearity
maximum deviation of the measured concentration from a linear calibration line

3.13
live zero
output signal of a device, which is capable of positive and negative adjustment around the zero value, that is equivalent to the minimum input signal

EXAMPLE 0 % to 10 % oxygen input to the analyser with an output of 4 mA to 20 mA capable of zero adjustment of 3,2 mA up to 5 mA when 0 % oxygen is applied to the instrument.

3.14
period of unattended operation
period for which given values of performance characteristics of an instrument can be guaranteed to remain within 95 % probability without servicing or adjustment

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

3.15
response time
time taken to reach 90 % of the total change in instrument response

NOTE It is the combination of lag time and rise/fall time.

3.16
rise time (fall time)
time taken to pass from 10 % to 90 % (90 % to 10 %) of the total change in instrument response

NOTE For instruments where transient oscillations occur in the approach to the final reading, the latter should be replaced by the time taken for the oscillations to fall to less than 10 % of the total change in instrument reading.

3.17
verified AMS
AMS previously verified against International Standard ISO 12039