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Workplace atmospheres — Short term detector tube measurement systems — Requirements and test methods

Air des lieux de travail — Systèmes de mesurage par tube détecteur à court terme — Exigences et méthodes d'essai

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Contents

Page

Foreword ..... **v**

Introduction ..... **vi**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Requirements **3**
4.1 General 3
4.2 Detector tubes 3
4.2.1 Specified measuring range 3
4.2.2 Scale 3
4.2.3 Evaluation of the stain 4
4.2.4 Shelf life 4
4.2.5 Mechanical strength 4
4.2.6 Transportation temperature stability 4
4.2.7 Packing of the detector tubes 4
4.2.8 Interferences 4
4.2.9 Overloading 4
4.2.10 Environmental influences 4
4.2.11 Instruction for use for detector tubes 5
4.3 Detector tube pump 5
4.3.1 General 5
4.3.2 Stroke volume 5
4.3.3 Leakage 5
4.3.4 Mechanical strength 5
4.3.5 Mechanical durability 5
4.3.6 Explosion hazard 6
4.3.7 Instructions for use for detector tube pumps 6

5 Test conditions **6**
5.1 General 6
5.2 Reagents 6
5.3 Apparatus 6
5.4 Independent method 6
5.5 Generation of test gas mixtures 6
5.6 Test conditions for detector tubes 7
5.7 Test conditions for detector tube pumps 7

6 Test methods **7**
6.1 Detector tubes 7
6.1.1 Visual checks 7
6.1.2 Test procedures 8
6.1.3 Mechanical strength 9
6.2 Detector tube pumps 10
6.2.1 Stroke volume 10
6.2.2 Leakage 11
6.2.3 Mechanical strength 11
6.2.4 Mechanical durability 11
6.2.5 Explosion hazard (electrically driven detector tube pumps only) 11
6.2.6 Instructions for use 11

7 Uncertainty of measurement **11**
7.1 Potential sources of uncertainty 11
7.2 Estimation of the uncertainty components 12
7.2.1 Combined stain component 12
7.2.2 Pump-stroke volume 14

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7.2.3 Effect of temperature 14
7.2.4 Effect of relative humidity 15
7.2.5 Test gas concentration used for evaluation 15
7.2.6 Stain-length reading 16
7.2.7 Analytical phenomena 16
7.2.8 Atmospheric pressure 16
7.2.9 Diffusive leakage into detector tube 16
7.2.10 Non-constant sampling flow 17
7.3 Combined standard uncertainty 17
7.4 Expanded uncertainty 18

8 Test report 18
8.1 Detector tubes 18
8.2 Detector tube pumps 18

9 Marking 19
9.1 Boxes 19
9.2 Detector tubes 19
9.3 Detector tube pumps 19

Annex A (normative) **Test sequence 20**

Annex B (normative) **List of test instruments 21**

Annex C (informative) **Example for calculation of expanded uncertainty 22**

Bibliography 25

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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.

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 146, *Air quality*, Subcommittee SC 2, *Workplaces atmospheres*.

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Introduction

Many short-term detector tube measurement systems consist of a (length-of-stain) detector tube connected to an associated detector tube pump. When workplace air containing a particular chemical agent is drawn through the detector tube, a colour change takes place corresponding to the concentration.

Such short-term detector tube measurement systems have many applications. This International Standard refers to detector tubes used for workplace air monitoring. These detector tubes can be used for measurement tasks such as follows:

— determination of the presence or absence of an analyte;

— finding the approximate range of concentration;

— determination of the efficiency of control measurements;

— determination of emission sources and emission changes in time;

— determination of compliance with ceiling or short-term limit values, as long as the device covers the reference time period and the precision requirements for the measurement.

To cover the possible range of concentration that can be encountered in the workplace, a combination of two or more measurements using detector tubes with restricted but complementary and overlapping measuring ranges can also be used.

This International Standard will enable the manufacturers, test houses, certification bodies, and the users to adopt a consistent approach to the assessment of performance of short-term detector tube measurement systems.

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Workplace atmospheres — Short term detector tube measurement systems — Requirements and test methods

1 Scope

This International Standard specifies requirements and test methods under prescribed laboratory conditions for length-of-stain detector tubes and their associated pump (detector tube measurement system) used for short-term measurements of the concentration of specified chemical agents in workplace air.

This International Standard is not applicable to measurements made to demonstrate compliance with long-term limit values to personal exposure with a reference period of more than 15 min.

2 Normative references

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

ISO 6141, *Gas analysis – Requirements for certificates for calibration gases and gas mixtures*

ISO 6142, *Gas analysis — Preparation of calibration gas mixtures — Gravimetric method*

ISO 6143, *Gas analysis — Comparison methods for determining and checking the composition of calibration gas mixtures*

ISO 6144, *Gas analysis — Preparation of calibration gas mixtures — Static volumetric method*

ISO 6145-1, *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 1: Methods of calibration*

ISO 6145-4, *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 4: Continuous syringe injection method*

ISO 6145-6, *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 6: Critical orifices*

ISO 6145-10, *Gas analysis — Preparation of calibration gas mixtures using dynamic volumetric methods — Part 10: Permeation method*

ISO 9169, *Air quality — Definition and determination of performance characteristics of an automatic measuring system*

IEC 60079-0, *Explosive atmospheres – Part 0: Equipment – General requirements*

3 Terms and definitions

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

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3.1
(length-of-stain) detector tube
transparent tube containing chemical reagents in which a colour change is produced when an air sample is drawn through it

Note 1 to entry: The length of the stain produced, relative to a graduated scale, provides a measure of the concentration of a specific chemical agent in air.

Note 2 to entry: Some detector tubes are designed to work in two stages. In that case, a pre-tube and an analyser tube are used in series to produce one measurement.

[SOURCE: EN 1540:2011, 3.2.4, modified — "glass tube" replaced by "transparent tube" and Note 2 to entry added.]

3.2
short-term detector tube
detector tube category that provides a means of obtaining a rapid measurement of the concentration of a specified chemical agent in air

Note 1 to entry: The averaging period of the measurement can vary from a few seconds up to about 15 min depending on the measurement system and the target concentration of the analyte.

3.3
detector tube pump
device for pulling air through a detector tube

Note 1 to entry: Detector tube pumps can be manually or mechanically driven stroke pumps or piston pumps.

Note 2 to entry: Other types of detector tube pumps which are not dealt with in this International Standard are electrically driven continuous pumps, which can emulate stroke pumps.

3.4
detector tube measurement system
complete measurement system consisting of a detector tube and a detector tube pump

3.5
chemical agent
chemical element or compound on its own or admixed as it occurs in the natural state or as produced, used, or released, including release as waste, by any work activity, whether or not produced intentionally and whether or not placed on the market

[SOURCE: EN 1540:2011, 2.1.2]

3.6
(detector tube) measuring range
scale of concentration which is marked on the detector tube

Note 1 to entry: By increasing or decreasing the number of sampling strokes, the measuring range can be shifted lower or higher.

3.7
specified (detector tube) measuring range
concentration range for which the measurement uncertainty of the detector tube is below a given value

3.8
interferent
constituent of the (air) sample having an adverse effect on the accuracy of the measurement

[SOURCE: EN 1540:2011, 4.5]

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