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Evaluating the performance of continuous air monitors

Part 1: Air monitors based on accumulation sampling techniques

bsi.

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Ref. No. CEN ISO/TR 22930-1:2021 E

Contents

Page

European foreword..... 3

European foreword

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Contents

Page

Foreword ... **iv**

Introduction ... **v**

1 Scope ... **1**

2 Normative references ... **2**

3 Terms and definitions ... **2**

4 Symbols ... **4**

5 Measuring principle ... **6**

6 Fixed-media filter monitor ... **7**
6.1 Preliminary note ... 7
6.2 Study of the dynamic behaviour ... 7
6.2.1 General ... 7
6.2.2 Short half-life model of evaluation of the activity concentration ... 8
6.2.3 Long half-life radionuclide activity concentration model of evaluation ... 11
6.2.4 Intermediate half-life radionuclide activity concentration model of evaluation ... 14
6.2.5 Comparison of the three fixed filter models of evaluation ... 15

7 Moving filter monitor ... **17**
7.1 Preliminary note ... 17
7.2 Study of the dynamic behaviour ... 17
7.3 Activity concentration model of evaluation ... 20

8 Evaluation of the characteristic limits ... **23**
8.1 General ... 23
8.2 Fixed media filter model of evaluation ... 24
8.2.1 General ... 24
8.2.2 Definition of the model ... 24
8.2.3 Standard uncertainty ... 24
8.2.4 Decision threshold ... 25
8.2.5 Detection limit ... 26
8.2.6 Limits of the coverage interval ... 26
8.3 Moving filter model of evaluation ... 28
8.3.1 Definition of the measurand ... 28
8.3.2 Standard uncertainty ... 28
8.3.3 Decision threshold ... 29
8.3.4 Detection limit ... 29
8.3.5 Limits of the coverage interval ... 29

9 Alarms setup, minimum detectable activity concentration and PME ... **29**

Annex A (informative) **Numerical example of gross beta emitting activity concentration measurement on fixed filter** ... **32**

Annex B (informative) **Numerical example of gross alpha emitting activity concentration measurement on moving filter** ... **37**

Annex C (informative) **Numerical example of iodine 131 activity concentration gamma spectrometry measurement on fixed charcoal cartridge** ... **41**

Annex D (informative) **Determination of the detectable activity concentration and its associated response time by the use a linear regression and statistical test method** ... **44**

Bibliography ... **52**

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Foreword

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Introduction

Sampling and monitoring of airborne activity concentration in workplaces are critically important for maintaining worker safety at facilities where dispersible radioactive substances are used.

The first indication of a radioactive substance dispersion event comes, in general, from a continuous air monitor (CAM) and its associated alarm levels. In general, the response of a CAM is delayed in time compared to the actual situation of release.

The knowledge of a few factors is needed to interpret the response of a CAM and to select the appropriate CAM type and its operating parameters.

The role of the radiation protection officer is to select the appropriate CAM, to determine when effective release of radioactive substances occurs, to interpret measurement results and to take corrective action appropriate to the severity of the release.

The objective of ISO/TR 22930 series is to assist radiation protection officer in evaluating the performance of a CAM.

ISO/TR 22930 series describes the factors and operating parameters and how they influence the response of a CAM.

This document deals with monitoring systems based on accumulation sampling techniques.

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TECHNICAL REPORT **ISO/TR 22930-1:2020(E)**

Evaluating the performance of continuous air monitors —

Part 1:
Air monitors based on accumulation sampling techniques

1 Scope

The use of a continuous air monitor (CAM) is mainly motivated by the need to be alerted quickly and in the most accurate way possible with an acceptable false alarm rate when a significant activity concentration value is exceeded, in order to take appropriate measures to reduce exposure of those involved.

The performance of this CAM does not only depend on the metrological aspect characterized by the decision threshold, the limit of detection and the measurement uncertainties but also on its dynamic capacity characterized by its response time as well as on the minimum detectable activity concentration corresponding to an acceptable false alarm rate.

The ideal performance is to have a minimum detectable activity concentration as low as possible associated with a very short response time, but unfortunately these two criteria are in opposition. It is therefore important that the CAM and the choice of the adjustment parameters and the alarm levels be in line with the radiation protection objectives.

The knowledge of a few factors is needed to interpret the response of a CAM and to select the appropriate CAM type and its operating parameters.

Among those factors, it is important to know the half-lives of the radionuclides involved, in order to select the appropriate detection system and its associated model of evaluation.

CAM using filter media accumulation sampling techniques are usually of two types:

a) fixed filter;

b) moving filter.

This document first describes the theory of operation of each CAM type i.e.:

— the different models of evaluation considering short or long radionuclides half-lives values,

— the dynamic behaviour and the determination of the response time.

In most case, CAM is used when radionuclides with important radiotoxicities are involved (small value of ALI). Those radionuclides have usually long half-life values.

Then the determination of the characteristic limits (decision threshold, detection limit, limits of the coverage interval) of a CAM is described by the use of long half-life models of evaluation.

Finally, a possible way to determine the minimum detectable activity concentration and the alarms setup is pointed out.

The annexes of this document show actual examples of CAM data which illustrate how to quantify the CAM performance by determining the response time, the characteristics limits, the minimum detectable activity concentration and the alarms setup.

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