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beproevingmethoden**

*Workplace atmospheres - Pumps for personal sampling of chemical agents - Requirements and test
methods*

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English version

**Workplace atmospheres - Pumps for personal
sampling of chemical agents - Requirements and
test methods**

Air des lieux de travail - Pompes pour
l'échantillonnage individuel des agents
chimiques - Exigences et méthodes d'essai

Arbeitsplatzatmosphäre - Pumpen für die
personenbezogene Probenahme von chemischen
Stoffen - Anforderungen und Prüfverfahren

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 137 "Assessment of workplace exposure", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1997, and conflicting national standards shall be withdrawn at the latest by August 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Many different methods are used to determine the concentration of chemical agents in the workplace atmosphere. One of these methods involves the use of a pump and sampling head connected by a flexible tube. Air is drawn through the sampling head and chemical agents are trapped for example on a filter, sorption tube, long term detector tube or in a gas washing bottle. The pump and sampling head are attached to the worker so as to collect chemical agents in the breathing zone (personal sampling).

The volume of air drawn by the pump during the sampling period is one of the quantities in the calculation of the concentration of the chemical agents. It is essential that the volume of air sampled is determined accurately. As the volume of air sampled is influenced by the performances of the pump, it is essential that they are adequate to meet this requirement.

EN 482, "Workplace atmosphere - General requirements for the performance of procedures for the measurement of chemical agents", specifies general performance criteria for methods for measuring the concentration of chemical agents in workplace air. These performance criteria include maximum values of overall uncertainty (a combination of precision and bias) that are required to be achieved under prescribed laboratory conditions. In addition, the performance criteria should also be met under a wider variety of environmental influences, representative of workplace conditions.

It is essential that the contribution of the sampling pump towards inaccuracies in measurement is to a minimum so that the overall uncertainty in measurement procedures does not exceed that specified by EN 482. The user of a pump, meeting the requirements of prEN 1232, and used in combination with a pumped sorbent tube, meeting the requirements of prEN 1076, can expect that the requirements of EN 482 are met under laboratory conditions.

This standard should enable manufacturers and users of personal sampling pumps to adopt a consistent approach to, and provide a framework for, the assessment of performance criteria specified in EN 482. It is the manufacturer's primary responsibility to ensure that the pump meets the requirements laid down in this European Standard including environmental influences which may be expected to affect performance.

1 Scope

This European Standard specifies performance requirements for battery powered pumps used for personal sampling of chemical agents in the workplace atmosphere. It also specifies the methods of laboratory type testing for determination of the performance characteristics under prescribed laboratory conditions.

This European Standard is applicable to pumps whose nominal volumetric flow rate is within the range 5 ml/min to 5 l/min and which are used together with sampling devices typical for such flow rates for the sampling of gases, vapours, dusts, fumes, mists and fibres.

This European Standard is not applicable to pumps with a flow rate outside this range or for pumps which are used with sampling devices whose flow resistance significantly exceeds the values for back pressure listed in 4.6 and 4.7.

This European Standard is equally applicable to pumps with a constant flow rate and to stroke pumps with a constant stroke volume.

Sampling pumps are classified according to their intended use:

- Type P: pumps for personal sampling of particulate matter;
- Type G: pumps for personal sampling of gases and vapours.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

- EN 141:1990 Respiratory protective devices - Gas filters and combined filters - Requirements, testing, marking
- EN 50 014 Electrical apparatus for potentially explosive atmospheres - General requirements
- EN 50081-1 Electromagnetic compatibility - Generic emission standard - Part 1: Residential, commercial and light industry

EN 50082-1 Electromagnetic compatibility - Generic immunity standard, commercial and light industry - Part 1: Residential

3 Definitions

For the purpose of this European Standard the following definitions apply:

- 3.1 personal sampling:** The process of air sampling carried out using a personal sampler.
- 3.2 personal sampler:** A device attached to a person that samples air in his or her immediate vicinity so that his or her exposure to pollutants may be determined.
- 3.3 back pressure:** The difference in pressure between the inlet and the outlet of the pump, for a constant volumetric flow rate setting, when the inlet is connected to a flow resistance.
- 3.4 nominal range of volumetric flow rates:** The range of volumetric flow rate values, adjustable at the pump, at which the manufacturer claims that the pump can operate at a constant flow rate up to the maximum value of the required back pressure range for the operating time.
- 3.5 operating time:** The period during which the pump can be operated at specified flow rate and back pressure without recharging or replacing the battery.
- 3.6 volumetric flow rate under operating conditions:** The volumetric flow rate of the pump at ambient temperature and pressure occurring during operation.
- 3.7 pulsation:** The pulsation P indicates, at a given flow rate, the degree of variation in volumetric flow rate. By recording the time curve of the flow rate, this is calculated using equation (1):

$$P = \frac{\sqrt{\frac{1}{T} \int_0^T [f(t) - \bar{f}(t)]^2 dt}}{\bar{f}(t)} \quad (1)$$

where

- $f(t)$ is the volumetric flow rate with respect to time t in litre per minute;
- $\bar{f}(t)$ is the mean volumetric flow rate over time T in litre per minute;
- t is the time in seconds;
- T is the time period of pulsation in seconds.

4 Requirements

NOTE: The corresponding test methods are given in clause 6.

4.1 Features

The pump shall have as a minimum the following features:

- a holder to secure the pump on a person (integrated or available as an accessory);
- either a malfunction indicator which, following completion of sampling, indicates that the air flow has been reduced or interrupted during sampling or an automatic cut-out which stops the pump if the flow rate is reduced or interrupted.
- a fuse or current limiting switch which interrupts or limits the current in the electrical circuit of the pump in the case of short circuit.
- the facility for the adjustment of flow rate shall be such that it can only be actuated with the aid of a tool (e.g. screw driver) or requires special knowledge for operation (e.g. via software) so that inadvertent readjustment of the flow rate is precluded during use.