Masinate ohutus. Õhu kaudu levivate kahjulike ainete emissiooni hindamine. Osa 4: Väljalaskesüsteemi efektiivse mõju ulatus. Isotoopindikaatorite meetod

Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 4: Capture efficiency of an exhaust system - Tracer method

EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN 1093-4:1999 sisaldab Euroopa standardi EN 1093-4:1996 ingliskeelset teksti. Käesolev dokument on jõustatud 23.11.1999 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN 1093-4:1999 consists of the English text of the European standard EN 1093-4:1996. This document is endorsed on 23.11.1999 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: Standard kirjeldab seadmele paigaldatud väljalaskesüsteemi efektiivse mõju ulatuse mõõtmismeetodit. See meetod põhineb isotoopindikaatorite tehnikal ja seda võib kasutada mistahes tüüpi keskkonnaalastes testides (stendi-, ruumi- ja välitestidel, vt. ENV 1093-1). See meetod on ainult siis kasutatav, kui isotoopindikaatoril on tegeliku saasteainega võrreldav aerodünaamiline karakteristik.	**Scope:**

ICS 13.040.40

Võtmesõnad: efektiivsus, emissioon, gaasilised saasteained, isotoopindikaatori meetod, kontsentratsioon, mõõtmine, ohtlikud materjalid, seadmete ohutus, väljalaskesüsteemid, õhu saastumine, õnnetuse vältimine

Hinnagrupp E

EUROPEAN STANDARD
NORME EUROPÉENNE
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EN 1093-4

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Descriptors: Hazardous substances, emission, machinery, safety.

English version

Safety of machinery

Evaluation of the emission of airborne hazardous substances

Part 4: Capture efficiency of an exhaust system
Tracer method

Sécurité des machines; évaluation de l'émission de substances dangereuses véhiculées par l'air. Partie 4: Efficacité de captage d'un système d'aspiration; méthode par traçage

Sicherheit von Maschinen; Bewertung der Emission von luftgetragenen Gefahrstoffen. Teil 4: Erfassungsgrad eines Absaugsystems; Tracerverfahren

This European Standard was approved by CEN on 1996-02-10.

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

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

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Ref. No. EN 1093-4:1996 E

Contents

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 114 "Safety of Machinery", 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 September 1996, and conflicting standards shall be withdrawn at the latest by September 1996.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

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.

1 Scope

This standard describes a method for the measurement of the capture efficiency of an exhaust system installed on a machine. This method is based on a tracer technique and may be operated in all types of test environment (bench, room and field, see ENV 1093-1).

This technique is applicable only if the tracer shows aerodynamic behaviour comparable with the real pollutant (see 7.1.1).

The measurement of the capture efficiency of an exhaust system can serve for:

a) the evaluation of the performance of an exhaust system of a machine;

b) the evaluation of the improvement of an exhaust system;

c) the comparison of exhaust systems for machines of similar design;

d) the ranking of exhaust systems according to their capture efficiency;

e) the determination of the air flow rate of an exhaust system to achieve a given level of capture efficiency;

f) the determination of the state of the art of exhaust systems for machines with respect to the capture efficiency.

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 292-1	Safety of machinery - Basic concepts - General principles for design - Part 1: Basic terminology, methodology
EN 292-2	Safety of machinery - Basic concepts - General principles for design - Part 2: Technical principles and specifications
ENV 1093-1	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 1: Selection of test methods
ISO 4053-1	Measurement of gas flow in conduits - Tracer methods - Part 1: General

3 Definitions

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

3.1 capture efficiency of an exhaust system η_c: The ratio of the mass-flowrate of a specified pollutant directly collected by the exhaust system to the uncontrolled mass-flowrate of this pollutant emitted from the machine.

3.2 tracer technique: The use of substances with an aerodynamic behaviour comparable with as the hazardous substance under consideration and which can be reliably measured.

4 Principle

The principle of the measurement method consists of:

a) emitting a tracer simulating the aerodynamic behaviour of the real pollutant, with the tracer flow rate (q_E);

b) measuring the flow rate (q_C) of the tracer collected by the exhaust system.

5 Simplified expression of the capture efficiency

The capture efficiency expressed as a percentage is:

$$\eta_c = \frac{q_C}{q_E} \times 100 \qquad (1)$$

The tracer flow rate (q_E) is determined by emitting the tracer at constant flow rate directly into the exhaust duct and by measuring the average tracer concentration in a cross section of the duct then:

$$q_E = Q(C_2 - C_1) \qquad (2)$$

where:

- Q is the average air flow rate in the duct during the measurement period of (q_E);
- C_1 is the average ambient concentration of the tracer before the measurements (background level);
- C_2 is the average concentration of the tracer in the duct (emission of tracer in the duct).

The tracer flow rate (q_C) is determined by emitting the tracer at constant flow rate (q_E) at a characteristic point or zone of the emission of the real pollutant (e. g. at the furthest locations in the emission zone from the exhaust system) and by measuring the average concentration of tracer in the same points of the duct:

$$q_C = Q'(C_3 - C_1') \qquad (3)$$