SLOVENSKI STANDARD
oSIST prEN 1093-1:2007

01-september-2007

Varnost strojev - Vrednotenje emisije nevarnih snovi, ki jih prenaša zrak - 1. del: Izbor preskusnih postopkov

Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 1: Selection of test methods

Sicherheit von Maschinen - Bewertung der Emission von luftgetragenen Gefahrstoffen - Teil 1: Auswahl der Prüfverfahren

Sécurité des machines - Evaluation de l'émission de substances dangereuses véhiculées par l'air - Partie 1 : Choix des méthodes d'essai

Ta slovenski standard je istoveten z: **prEN 1093-1**

ICS:

13.040.40	Emisije nepremiļ nih virov	Stationary source emissions

oSIST prEN 1093-1:2007 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 1093-1

July 2007

ICS

Will supersede EN 1093-1:1998

English Version

Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 1: Selection of test methods

Sécurité des machines - Evaluation de l'émission de substances dangereuses véhiculées par l'air - Partie 1 : Choix des méthodes d'essai

Sicherheit von Maschinen - Bewertung der Emission von luftgetragenen Gefahrstoffen - Teil 1: Auswahl der Prüfverfahren

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 114.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. prEN 1093-1:2007: E

Contents

Page

Foreword

This document (prEN 1093-1:2007) has been prepared by Technical Committee CEN/TC 114 "Safety of machinery", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1093-1:1998.

This document 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).

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

This part 1 of EN 1093 *Safety of machinery - Evaluation of the emission of airborne hazardous substances* belongs to a series of documents, the other parts of which are the following:

— Part 2: Tracer gas method for the measurement of the emission rate of a given pollutant;

— Part 3: Test bench method for the measurement of the emission rate of a given pollutant;

— Part 4: Capture efficiency of an exhaust system, tracer method;

— Part 6: Separation efficiency by mass, unducted outlet;

— Part 7: Separation efficiency by mass, ducted outlet;

— Part 8: Pollutant concentration parameter, test bench method;

— Part 9: Pollutant concentration parameter, room method;

— Part 11: Decontamination index.

Introduction

The structure of safety standards in the field of machinery is as follows:

- **Type-A standards** (basic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to all machinery;
- **Type-B standards** (generic safety standards) dealing with one safety aspect or one type of safeguard that can be used across a wide range of machinery:
  - Type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);
  - Type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure sensitive devices, guards);
- **Type-C standards** (machine safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This European Standard is a type-B standard as stated in EN ISO 12100-1.

The provisions of this European Standard can be supplemented or modified by a type-C standard.

NOTE For machines which are covered by the scope of a type-C standard and which have been designed and built according to the provisions of that standard, the provisions of that type-C standard take precedence over the provisions of this type-B standard.

The concentration level of substances resulting from emission of airborne hazardous substances from machines depends upon factors including:

- the emission rate of airborne hazardous substances ("pollutants") from the machine under examination, depending of the type of process and the production rate of the machine;
- the performance of the pollution control system associated with the machine and, in the case of air recirculation, the performance of the separation system;
- the surrounding conditions, especially the air flow pattern, which can reduce the pollution (efficient general ventilation) or increase it (disturbing air, crossdraughts);
- the worker's location in relation to the machine and its pollution control system, and taking into account the workers movements;
- the quality of maintenance; poor quality has generally an adverse effect on the performance of the pollution control and the separation systems.

This European Standard concerns the first two points in this list and forms only part of a comprehensive risk assessment. It is not for a risk assessment of the work place. Evaluating the parameters defined in this European Standard leads to an evaluation of the performance of the machine and its associated pollution control system.

This European Standard can be used as a part of verification described in EN 626-2.

1 Scope

This European Standard specifies parameters which can be used for the assessment of the emission of pollutants from machines or the performance of the pollution control systems integrated in machines. It gives guidance on the selection of appropriate test methods according to their various fields of applications and types of machines including the effects of measures to reduce exposures to pollutants. The test methods are given in additional parts of this standard (see Table 1 and Annex A).

This European Standard is not applicable for certain types of off-the-road vehicles powered by internal combustion engines which are also subject to the Machinery Directive.

2 Normative references

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

EN ISO 12100-1:2003, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology (ISO 12100-1:2003)*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 12100-1:2003 and the following apply.

3.1
uncontrolled emission rate of a given pollutant
$\dot{m}_u$

mass of pollutant emitted from the machine into the space around the machine per unit of time

NOTE Any measures to reduce the air pollution around the machine (e.g. capture devices, containment equipment, wetting process) should not in used or should be de-activated.

3.2
controlled emission rate of a given pollutant
$\dot{m}_k$

mass of pollutant emitted from the machine into the space around the machine per unit of time, taking into account the effects of measures to reduce the air pollution

NOTE Any measures to reduce the air pollution around the machine (e.g. capture devices, containment equipment, wetting process) should be used or activated.

3.3
capture efficiency
η_c

<pollutant control system> ratio of the mass flow rate of a given pollutant directly collected by the pollutant control system to the uncontrolled mass flow rate of this pollutant emitted from the machine

NOTE 1 The capture efficiency, as a percentage, can be calculated by the following equation:

$$\eta_c = \frac{\dot{m}_u - \dot{m}_k}{\dot{m}_u} \cdot 100 \qquad (1)$$

This equation is applicable only if $\dot{m}_u - \dot{m}_k$ represents the pollutant mass flow rate directly captured. This parameter is not usable when the amount of emission is effected by the control system.

NOTE 2 Where the pollutant control system is an exhaust ventilation system and provided comparable discharge and flow patterns of the real pollutant can be simulated by a tracer technique the equation becomes:

$$\eta_c = \frac{q_C}{q_E} \times 100 \qquad (2)$$

where:

q_C is the flow rate of tracer collected by the exhaust system during operation;

q_E is the flow rate of tracer emitted (measured by emitting the tracer directly into the exhaust system during the first phase.

NOTE 3 For further details see EN 1093-4:1996, Clause 5.

3.4
separation efficiency by mass
η_s

<air cleaning system> ratio of the mass of pollutant retained by the air cleaning system (m_3) to the mass of pollutant entering the air cleaning system (m_1) during a given period

NOTE 1 For special applications the number of fibres or particles is measured instead of the mass.

NOTE 2 The separation efficiency of an air cleaning system, as a percentage, can be calculated by the following equation:

$$\eta_s = \frac{m_3}{m_1} \times 100 \qquad (3)$$

NOTE 3 In certain cases it can be necessary to consider only that part of pollutants (e. g. size of particles) which is actually hazardous for exposed persons; e. g. separation efficiency of a separation system against hazardous dust is measured as a function of particle size – otherwise the results are possibly not be reliable for health and safety purposes.

3.5
pollutant concentration parameter
$\boldsymbol{P_c}$
the measured concentration of a given pollutant in defined position(s) near the machine

3.6
decontamination index
I_A
the average of the ratio, obtained at a number of specified locations in the surroundings, of the ambient air quality improvement to the real pollutant mean concentration with the pollutant control system not in operation

NOTE 1 Corrections can be necessary to take into account air pollution caused by other operations ("the background level").

NOTE 2 The decontamination index can be calculated by the following equation:

$$I_A = \frac{1}{n}\sum_{i=1}^{n} \frac{C_{ai} - C_{mi}}{C_{ai} - C_{fi}} \quad (4)$$

where

- C_{ai} real pollutant concentration measured at a specified location in the surrounding under the following condition: machine in operation, pollutant control system not in operation;
- C_{mi} real pollutant concentration measured at a specified location in the surrounding under the following condition: machine and pollutant control system in operation;
- C_{fi} real pollutant concentration measured at a specified location in the surrounding under the following condition: machine and pollutant control system not in operation ("the background level");
- n number of specified locations.

NOTE 3 When the "background level" is negligible, the decontamination index reduces to:

$$I_A = 1 - \frac{1}{n}\sum_{i=1}^{n} \frac{C_{mi}}{C_{ai}} \quad (5)$$

4 Types of test methods

4.1 General

When particle size distribution is determined at the same time as pollutant concentration, an assessment parameter for each size fraction can be defined. For the determination of each assessment parameter (see Clause 3), different test methods can be considered. The test methods should be selected according to the following criteria:

— the nature of "pollutant" used;

— the nature of the test environment.

4.2 Nature of "pollutant" used

As far as possible the real pollutant should be used for the testing. However, in some cases tracer techniques allow a more convenient testing. The addition of tracer material to the real pollutant requires several conditions to be met, in particular comparable discharge and flow patterns of the real pollutant and the tracer material, respectively.

Depending on the test method, two types of "pollutants" shall be considered:

— the real pollutant which may be particulate, liquid or gas;

— a tracer material simulating the real pollutant.

When determining the emission rate of real pollutant without any air flow measurement, the real pollutant and the tracer material are used simultaneously.

The measurements of concentrations can be carried out:

— in ducts together with air flow rate measurements;

— at locations surrounding the machine under examination.

4.3 Nature of the test environment

4.3.1 General

Two main types of environmental test conditions may be considered, and, in some cases, can lead to different test methods.

4.3.2 Laboratory methods

4.3.2.1 Test bench method

The tests are conducted in a cabin specially designed to these tests or measurements, and of known and limited dimensions.

The cabin contains a single machine in order to avoid any interference from other machines on the pollution around the tested machine and on the air flow rate through the pollutant control system.

The air flow pattern around the machine should be maintained by the provision of specified general ventilation of the cabin.

NOTE In this type of method, the conditions of general ventilation, as well as the operating conditions of the machine, are fixed and, to some extent, arbitrary. Consequently, most of the time they are not representative of the actual situations encountered in practice.

4.3.2.2 Room method

The tests are conducted in a room specially devoted to these tests or measurements, and located in a laboratory or on-site in an industrial setting.

Only one machine should be run at a time. More precise control of the general and local ventilation can be achieved in the field. Since the location of the machine is not fixed, the air flow pattern around the machine shall be checked to determine the influence of crossdraughts.

NOTE In this type of method, the conditions of general ventilation, as well as the operating conditions of the machine, are fixed and, to some extent, arbitrary. Consequently, they are not in general representative of the actual situations encountered in practice.

4.3.3 Field method

Many machines cannot be tested in a cabin (see 4.3.2.1) or a room (see 4.3.2.2) because they are too large, too difficult to handle or have special installation or process requirements. Tests may be performed on machines in the places where they are installed.

Performing field tests on machines in their usual working environment is of particular importance because disturbances occurring in real situations will be taken into account (e. g. crossdraughts).