SLOVENSKI STANDARD
SIST EN 1093-3:1998

01-februar-1998

Varnost strojev - Ovrednotenje emisije nevarnih snovi, ki jih prenaġa zrak - 3. del: Stopnja emisije doloį enih onesnaġevalnih snovi - Naprava za preskuġanje po metodi uporabe realnih onesnaġevalnih snovi

Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 3: Emission rate of a specified pollutant - Bench test method using the real pollutant

Sicherheit von Maschinen - Bewertung der Emission von luftgetragenen Gefahrstoffen - Teil 3: Emissionsrate eines festgelegten luftverunreinigenden Stoffes - Prüfstandverfahren unter Verwendung des realen luftverunreinigenden Stoffes

Sécurité des machines - Evaluation de l'émission de substances dangereuses véhiculées par l'air - Partie 3: Débit d'émission d'un polluant donné - Méthode sur banc d'essai utilisant le polluant réel

Ta slovenski standard je istoveten z: EN 1093-3:1996

ICS:

13.040.40	Emisije nepremiį nih virov	Stationary source emissions
13.110	Varnost strojev	Safety of machinery

SIST EN 1093-3:1998 **en**

EUROPEAN STANDARD

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ICS 13.040.40; 13.110

Descriptors: safety of machines, air pollution, accident prevention, emission, dangerous materials, polluant gases, measurements, rates : per unit time, test benches

English version

Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 3: Emission rate of a specified pollutant - Bench test method using the real pollutant

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CEN

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

Central Secretariat: rue de Stassart,36 B-1050 Brussels

Contents list

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publication of an identical text or by endorsement, at the latest by September 1996, and conflicting standards shall be withdrawn at the latest by September 1996.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 bench test method for the measurement of the emission rate of a specified airborne hazardous substance from machines using a test rig under specified operating conditions of the machine.

This standard does not specify any value for the air velocity of the inhalable particles [1]).

The measurement of the emission rates of a specified pollutant emitted from machines can serve for:

a) the evaluation of the performance of a machine;

b) the evaluation of the improvement of the machine;

c) the comparison of machines within groups of machines with the same intended use (groups are defined by the function and materials processed);

d) the ranking of machines from the same group according to their emission rates;

e) the determination of the state of the art of machines with respect to their emission rates.

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.

[1]) The terms "inhalable" and "respirable" are defined in EN 481

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

EN 481 Workplace atmospheres - Size fraction definitions for measurement of airborne particles

3 Definitions

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

3.1 uncontrolled emission rate of a specified pollutant $\dot{m}_u$: Mass of pollutant emitted from the machine into the space around the machine per unit of time. Any measures to reduce the air pollution around the machine (e. g. capture devices, containment equipment, wetting process) are not in use or activated.

3.2 controlled emission rate of a specified 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.

4 Principle

The principle of the measurement method is to operate machines under controlled conditions under a uniform air flow in a test rig and to collect a representative part of the airborne emissions in that air flow.

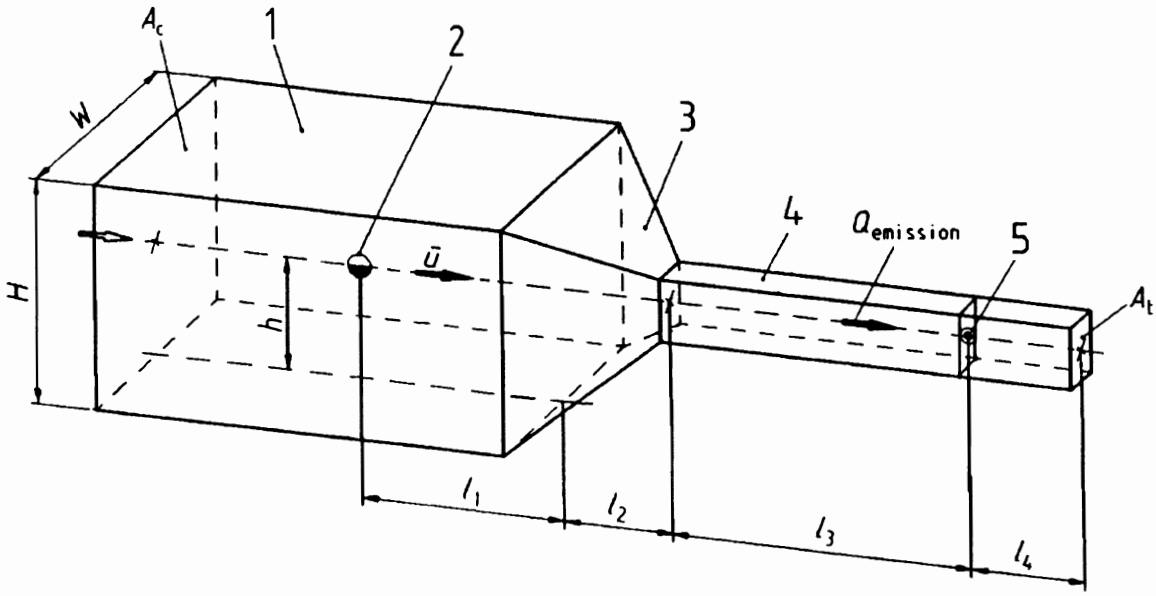
5 Description of the test rig

The test rig consists generally of a cabin with a funnel and a duct, of rectangular or circular cross section followed by a fan (see figure 1). It is the responsibility of the type C standard committees to select parameters within the ranges given in figure 1.

The fan produces an air flow in the test cabin from the inlet towards the funnel. The cabin should be equipped with a permeable inlet (e. g. macroporous filter material, perforated plastic foil or plate) in order to obtain a uniform air flow across the inlet.

The selected average air velocity, $\dot{u}$, in the cabin between the source and the funnel (see figure 1) is determined by the air volume flow rate, $\dot{Q}$, in the duct. The system requires controls to ensure that a constant flow rate is maintained during a test. This air flow rate does not include the air flow rate caused by the operation of the capture device (where used) of the machine under test. The cross section of the cabin (form and dimensions) is chosen according to the size of the test object. The maximum cross sectional area of the test object shall not exceed a fifth of the cross sectional area of the cabin, A_c.

The cabin shall be long enough to accommodate the machine and the operator with the emission sources as close as practicable to the location specified in figure 1.



A_c	cross section of the cabin;	1	test cabin
A_t	cross section of the duct;	2	source [2])
H	height of the cabin;	3	funnel
h	height of the emission source;	4	duct
ū	average air velocity in the cabin;	5	measurement plane
W	width of the cabin.		

W/H	≥ 0,66	l_2	≥ $0,5\sqrt{A_c}$ ≤ $\sqrt{A_c}$	A_t	≤ 0,1 A_c	(mi = measuring instrument)
	≤ 1,5				≥ $5A_{mi}$	
h	≤ 0,66H	l_3	≥ $5\sqrt{A_t}$ ≤ $10\sqrt{A_t}$	ū	≥ 0,1 ms^{-1}	for respirable particles [1]), gases, vapours [3])
l_1	≤ 2,0 m ≤ 2H	l_4	≥ $3\sqrt{A_t}$			

Figure 1: Test rig (schematic layout)

6 Test method

6.1 Position of the machine

To ensure that all the pollutant will be carried to the sampling plane, as far as possible, the machine should be positioned in the cabin in such a way, that

- the source of the hazardous substance emitted from the machine is in the area of the transverse plane to the longitudinal axis of the cabin at a distance of l_1 from the beginning of the funnel.

- the operator and additional equipment (e. g. exhaust, separation or wetting devices) are not between the source and the sampling plane.

6.2 Operation of the machine

The machine shall be operated according to its intended use. The stipulation of working procedures, the tools used and the materials to be processed with specified categories of machines will be defined in type C standards.

If the cleaned air from a separator linked to the machine according to the intended use is recirculated, the outlet of the separator shall be located in the cabin in such a way as to ensure that the pollutant from this secondary

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[2]) Generally the source cannot be considered as a point, but as a zone including several sources.

[3]) Under some circumstances it may be necessary to use other velocities, e.g. to measure respirable fibres with a velocity of 0,05 ms^{-1} may be more suitable because of the limitation of present measuring methods.

source reaches the measurement funnel.

The machine shall be operated taking into account the instructions of the manufacturer. When the machine is provided with pollution control equipment this shall be adjusted according to these instructions.

Tests shall not be carried out without manufacturers specifications for operating the pollution control equipment.

As least three tests shall be performed.

6.3 Sampling plane and measurement procedures

The concentrations of the airborne pollutants are measured at the sampling plane in the duct (see figure 1) for the period of the test. The procedure used for concentration and flow rate measurements shall comply with appropriate international or European standards if available. The measurement of particles shall take into account the size fraction of interest.

The measurement time shall be sufficient to collect concentration data representative of the normal operational cycles of the machines. It is in the responsibility of the type C-standard committees to specify how the concentration data is to be processed for the determination of the emission rates (average values, peak values).

The measurement shall continue beyond the end of pollution generation for sufficient time to collect the remaining airborne pollutants.

7 Expression of results

The emission rates are calculated by the formulae:

$$\dot{m}_u = \frac{1}{t_2 - t_1} Q \int_{t_1}^{t_3} C_u \, dt \qquad \ldots (1)$$

$$\dot{m}_K = \frac{1}{t_2 - t_1} Q \int_{t_1}^{t_3} C_k \, dt \qquad \ldots (2)$$

where:

C_u denotes the pollution concentration measured in the air flow in the duct with the pollution control equipment not in use or activated;

C_k denotes the pollution concentration measured in the air flow in the duct with the pollution control equipment in use or activated;

Q is the measured air volume flow rate in the duct;

t_1 is the starting point of the test;

t_2 is the end of the pollutant generation;

t_3 is the end of sampling.

The uncontrolled respectively the controlled emission rate are the mean value of the results of several tests.

8 Test report

The test report shall include at least the following information:

a) reference to this standard and appropriate type-C standards;

b) description of the machine tested (e. g. manufacturer, model, type, version, design, size, year of manufacture, serial number) for the machine itself and for each additional piece of equipment;

c) operational data during tests including tools used with the machine and material processed on the machine;

d) description of the pollution control equipment (e. g. type, design, operational data);

e) description of the measurement procedures and pollutant measured;

f) measuring instruments used and their most recent calibration date;

g) test results;

h) test laboratory;

i) number of tests performed;

j) environmental data (temperature, humidity, atmosphere pressure);

k) description of procedures used (e. g. list of standards) for concentration and flow rate measurements;

l) name of the test person responsible;

m) date of testing;

n) comments on deviations from any relevant standards;

o) additional comments, if necessary.