INTERNATIONAL STANDARD

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Safety of machinery — Evaluation of the emission of airborne hazardous substances —

Part 8: Room method for the measurement of the pollutant concentration parameter

Sécurité des machines — Évaluation de l'émission de substances dangereuses véhiculées par l'air —

Partie 8: Méthode en salle d'essai pour le mesurage du paramètre de concentration en polluant

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 29042-8 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*.

ISO 29042 consists of the following parts, under the general title *Safety of machinery — Evaluation of the emission of airborne hazardous substances*:

— *Part 1: Selection of test methods*

— *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: Tracer method for the measurement of the capture efficiency of an exhaust system*

— *Part 5: Test bench method for the measurement of the separation efficiency by mass of air cleaning systems with unducted outlet*

— *Part 6: Test bench method for the measurement of the separation efficiency by mass of air cleaning systems with ducted outlet*

— *Part 7: Test bench method for the measurement of the pollutant concentration parameter*

— *Part 8: Room method for the measurement of the pollutant concentration parameter*

— *Part 9: Decontamination index*

Introduction

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

a) Type-A standards (basic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to all machinery;

b) 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);

c) Type-C standards (machine safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This document is a type-B standard as stated in ISO 12100.

The requirements of this document can be supplemented or modified by a type-C standard.

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

ISO/TC 199 has a mandate in this area to produce type-A and type-B standards, which will allow verification of conformity with the essential safety requirements.

ISO 29042-8 is based on EN 1093-9:1998, amended by Amendment 1:2008, published by the European Committee for Standardization (CEN).

Safety of machinery — Evaluation of the emission of airborne hazardous substances —

Part 8: Room method for the measurement of the pollutant concentration parameter

1 Scope

This part of ISO 29042 specifies a room method for the measurement of the pollutant concentration parameter of a given airborne hazardous substance from machines, located in a test room and operating the machines under defined conditions. This method is applicable only to machines with a local exhaust ventilation with an air flow rate $\geqslant$500 m^3/h and machines without recirculated air.

Measurement of the pollutant concentration parameter of a machine can serve for the:

a) evaluation of the performance of a machine;

b) evaluation of the improvement of the machine;

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

d) ranking of machines from the same group according to their pollutant concentration parameters;

e) determination of the state of the art of a machine with respect to its pollutant concentration parameter.

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.

ISO 2602, *Statistical interpretation of test results — Estimation of the mean — Confidence interval*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

3.1
pollutant concentration parameter of the room
P_{cr}
measured concentration of a given pollutant in defined position(s) near the machine

NOTE For the purposes of this part of ISO 29042, the measurement points are at defined positions around the machine and the pollutant concentration parameter is the mean value of the measured concentrations.

4 Principle

The principle of the measurement method is to operate the machine with strong local exhaust ventilation ($\geqslant$500 m^3/h) under controlled conditions in a test room and to measure pollutant concentrations at defined positions (see 5.2). The average concentration gives an indication of the emission of the machine and the standard deviation gives an indication of the dispersion of the pollutant emitted.

5 Measurement environment

5.1 Test room

The tests are performed in rooms meeting the following criteria:

— no other source of the given pollutant shall be present in the test room;

— air flow from all measurement points shall be directed to the local exhaust ventilation, for which tests shall be carried out, for example, using a smoke cartridge;

— size of the room shall be greater than 200 m^3;

— distances between the machine and the walls and ceiling shall be greater than 2 m;

— there shall be no return air from local exhaust ventilations;

— there shall be a properly designed supply of air to avoid cross-draughts in the zone of the measurement points.

5.2 Location of measurement points

A minimum of four measurement points around the machine is necessary. Empirical techniques shall be used to ensure that the locations chosen are in areas of major emissions. The number and precise positions shall be specified in type-C standards.

6 Procedure

6.1 Operation of the machine

The machine shall be operated according to its intended use. The stipulation of working procedures (e.g. feed rate), the tools used (e.g. type, tool speed) and the materials to be processed (e.g. nature, size) for each category of machine shall be specified in type-C standards.

The machine shall be operated in accordance with the manufacturer's instructions.

6.2 Measurement procedures

The measurement procedures used for the pollutant concentration shall comply with the appropriate International Standard.

The measurement shall take into account the normal operation cycles of the machine.

The measurement time shall be sufficient to collect concentration data representative of the normal operational cycles of the machine.

Detailed procedures shall be specified in the appropriate type-C standard for each type of machine.

The machine should be started up and normal working conditions should be achieved before the measuring instruments are switched on. However, care should be taken not to overlook unusually high emissions that can occur during start up. The exact time or number of cycles shall be specified in the type-C standards.

At each measurement point, at least three measurements shall be made.

7 Expression of results

For each sequential test the mean value, $\bar{x}_t$, and standard deviation of the results for all measuring points shall be calculated. From these mean values the mean value, $\bar{x}_p$, and the one-sided 95 % confidence interval shall be calculated in accordance with ISO 2602.

The pollutant concentration parameter of the room, P_{cr}, is the sum of the mean value, $\bar{x}_p$, and the one-sided 95 % confidence interval.

8 Test report

The test report shall include at least the following information:

a) reference to this part of ISO 29042 (ISO 29042-8:2011) 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) description of the test room, sketch with dimensions, and position of the machine;

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

e) description of the pollutant control equipment (e.g. manufacturer, model, type, version, design, size, year of manufacture, serial number, operational data, air flow rate);

f) description of measurement procedures including the location of the measurement points and pollutant measured;

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

h) environmental data (temperature, humidity, atmospheric pressure);

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

j) number of tests performed;

k) measured concentrations at all specified points;

l) pollutant concentration parameter of the room, P_{cr}, mean value and 95 % confidence interval;

m) comments on deviations from any relevant standards;

n) test laboratory;

o) name of the person responsible for carrying out the test;

p) date(s) of testing;

q) any additional comments.