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Respiratory protective devices — Methods of test and test equipment —

Part 7: Practical performance test methods

Appareils de protection respiratoire — Méthodes d'essai et équipement d'essai —

Partie 7: Méthodes d'essai pratique de performance

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information.

The committee responsible for this document is ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 15, *Respiratory protective devices*.

ISO 16900 consists of the following parts, under the general title *Respiratory protective devices — Methods of test and test equipment*:

— *Part 1: Determination of inward leakage*

— *Part 2: Determination of breathing resistance*

— *Part 3: Determination of particle filter penetration*

— *Part 4: Determination of gas filter capacity and migration, desorption and carbon monoxide dynamic testing*

— *Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools and verification tools*

— *Part 6: Mechanical resistance/strength of components and connections*

— *Part 7: Practical performance tests methods*

— *Part 8: Measurement of RPD air flow rates of assisted filtering RPD*

— *Part 9: Determination of carbon dioxide content of the inhaled air*

— *Part 10: Resistance to ignition, flame, radiant heat and heat*

— *Part 11: Determination of field of vision*

— *Part 12: Determination of volume-averaged work of breathing and peak respiratory pressures*

— *Part 13: RPD using regenerated breathable gas and special application mining escape RPD: Consolidated test for gas concentration, temperature, humidity, work of breathing, breathing resistance, elastance and duration*

— *Part 14: Measurement of sound level*

Introduction

This part of ISO 16900 is intended as a supplement to the respiratory protective devices (RPD) performance standards. Test methods are specified for complete devices or parts of devices. If deviations from the test method given in this part of ISO 16900 are necessary, these deviations will be specified in the performance standards.

The following definitions apply in understanding how to implement an ISO International Standard and other normative ISO deliverables (TS, PAS, IWA):

— "shall" indicates a requirement;

— "should" indicates a recommendation;

— "may" is used to indicate that something is permitted;

— "can" is used to indicate that something is possible, for example, that an organization or individual is able to do something.

3.3.1 of the ISO/IEC Directives, Part 2 (sixth edition, 2011) defines a requirement as an "expression in the content of a document conveying criteria to be fulfilled if compliance with the document is to be claimed and from which no deviation is permitted."

3.3.2 of the ISO/IEC Directives, Part 2 (sixth edition, 2011) defines a recommendation as an "expression in the content of a document conveying that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited."

Respiratory protective devices — Methods of test and test equipment —

Part 7: Practical performance test methods

1 Scope

This part of ISO 16900 specifies practical performance tests for respiratory protective devices (RPD). The purpose of these tests is to subjectively assess certain properties, characteristics, and functions of the RPD when worn by test subjects in simulated practical use, which cannot be assessed by tests described in other standards.

2 Normative references

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

ISO 16972, *Respiratory protective devices — Terms, definitions, graphical symbols and units of measurement*

ISO/TS 16976-2, *Respiratory protective devices — Human factors — Part 2: Anthropometrics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16972 apply.

4 Prerequisites

In order to implement this part of ISO 16900, at least the following parameters need to be specified in the performance standards:

— identification of relevant practical performance regime;

— any prior conditioning and testing;

— temperature and humidity for the test;

— the number and selection of test subjects.

5 General test requirements

Unless otherwise specified, the values stated in this part of ISO 16900 are expressed as nominal values. Except for temperature limits, values which are not stated as maxima or minima shall be subject to a tolerance of ±5 %. Unless otherwise specified, the ambient conditions for testing shall be between 16 °C and 32 °C and (50 ± 30) % relative humidity. Any temperature limits specified shall be subject to an accuracy of ±1 °C.

Where the assessment of the pass/fail criterion depends on a measurement, an uncertainty of measurement as specified in Annex A shall be reported.

6 Procedure

6.1 Principle

Test subjects donning and wearing the RPD in accordance with the information supplied by the manufacturer perform activities in simulation of practical use. They are then asked to assess the RPD subjectively and comment accordingly.

6.2 Test subjects

Before performing any tests involving human subjects, account shall be taken of any national regulations concerning the medical history medical examination or supervision of the test subjects. Test subjects who have been trained in the correct use and fitting of the type of RPD being tested, and who satisfy the target population as specified by the manufacturer shall be selected. The medical and physical condition of the subjects shall be satisfactory for the tasks involved. The test subjects shall be able to demonstrate that they are able to complete all the exercise activities when not wearing RPD. This includes the ability to see and hear even when using individual eye correction and/or hearing aids (specifically, exercises g and h in Annex B). The necessity for a medical examination before the tests and for medical supervision during them is at the discretion of the appropriate responsible person of the test house.

Prior to the tests, the following data shall be recorded for each test subject, but not reported:

— identification;

— age;

— gender;

— height;

— weight;

— whether or not the individual used eye correction and/or hearing aids during the tests;

— neck circumference, where applicable.

The information recorded shall comply with any national regulations on the storage of personal data.

For each subject, record the Principal Component Analysis (PCA) cell according to ISO/TS 16976-2 which defines the subject within the general population.

6.3 Preparation of test samples

Before testing, examine the RPD to verify that it is in good working condition and that it can be used without hazard. Practical performance tests shall only be performed following satisfactory RPD performance during laboratory tests specified in relevant clauses of the performance standard(s).

6.4 Test conditions

The actual conditions of temperature, humidity, and background noise level shall be recorded.

6.5 Activities

Each subject shall wear clothing for use with the RPD under test as specified by the manufacturer. If not specified, clothing appropriate to the test conditions and the activities to be performed shall be worn.

If the manufacturer identifies that other items of PPE shall be worn in conjunction with the RPD, these items shall be worn during the exercises.

For respiratory interface classes c, d, and e, one test subject shall wear the corrective eyewear specified by the manufacturer. Uncorrected lenses may be used. One test subject shall not wear corrective eyewear other than contact lenses.

Ask the test subjects to read and follow the information supplied by the manufacturer to don the RPD. The test subject shall comment on whether the information supplied by the manufacturer was understandable and could be followed.

Ask the test subject to don the RPD, selecting the correct size if appropriate according to the information supplied by the manufacturer.

If it was not possible for the test subject to don the RPD correctly by following the information supplied by the manufacturer, the test subject can be shown how to don the RPD correctly in accordance with the information supplied. This observation shall be reported.

The test subject shall perform all the pre-use checks specified in the information supplied by the manufacturer. Ask each test subject "Does the RPD fit?" If the answer is "Yes", start the test. If the answer is "No", then refit the RPD, or select a more appropriate size, where applicable. If a satisfactory fit cannot be obtained after all the appropriate adjustments have been made, then take the test subject off the panel and report the fact.

Before starting the test, check by visual inspection that the RPD has been donned correctly. Re-adjust if necessary and record this finding.

Inform the test subjects that if they wish to adjust the RPD during the test they may do so.

The sequence of activities shall be as specified in Annex B. The activities shall be continuous, without removal of the RPD, unless otherwise specified in the performance standards.

Additional tests related to optional features shall be performed as indicated in Annex C or after the sequence of activities in Annex B, as appropriate.

During the tests, the RPD shall be subjectively assessed by each wearer. After completing the test activities, the subject shall be asked for comments. If the comments received indicate that there might be issues that affect the safe use of the RPD, these shall be confirmed by further observations and testing. It is permitted for the observer to add his own comments.

7 Test report

Report the following:

a) whether all test subjects completed all the assigned sequence of tasks;

b) whether only some of the test subjects completed all of the assigned tasks;

c) which of the assigned tasks were not completed by all of the test subjects;

d) the reason(s) why any of the assigned tasks could not be completed;

e) the PCA segment which defines each test subject within the general population;

f) the actual conditions of temperature, humidity and noise level under which the tests were performed;

g) the number of correct answers reported during exercise h of Annex B;

h) the results of the tests performed in accordance with Annex C, if applicable;

i) whether the information supplied by the manufacturer is understandable and can be followed;

j) any other relevant comments or observations.