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Respiratory protective devices — Methods of test and test equipment —

Part 11: Determination of field of vision

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

Partie 11: Détermination du champ de vision

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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. www.iso.org/directives

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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 11: Determination of field of vision*

The following parts are under preparation:

— *Part 5: Breathing machine/metabolic simulator/RPD headforms/torso, tools and transfer standards*

— *Part 6: Mechanical resistance – Strength of components*

— *Part 7: Practical performance test method*

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

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

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

— *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 and duration*

Introduction

This part of ISO 16900 is intended as a supplement to the respiratory protective devices (RPD) performance standard ISO 17420 (all parts). Test methods are specified for complete devices or parts of devices that are intended to comply with ISO 17420. If deviations from the test method given in this part of ISO 16900 are necessary, these deviations will be specified in ISO 17420.

Respiratory protective devices — Methods of test and test equipment —

Part 11: Determination of field of vision

1 Scope

This part of ISO 16900 specifies the laboratory test method for determining the field of vision for a respiratory protective device (RPD).

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 17420-3, *Respiratory protective devices — Performance requirements — Part 3: Thread connection*

3 Terms and definitions

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

3.1
apertometer
extended hemispherical dome for measuring the angular area of the field of vision (peripheral isopter) of an RPD when mounted on a headform

3.2
peripheral isopter
field of vision while wearing an RPD, indicated by the lighted area, which is measured by a solid line connecting the points

3.3
visual field score
VFS
summation of grid points contained within the peripheral isopter shadow cast onto the apertometer by the RPD

4 Prerequisites

The performance standard shall indicate the conditions of the test. This includes the following:

a) number of specimens;

b) any preconditioning;

c) use of filter simulator, if applicable;

d) any accessories;

e) appropriate size(s) of headforms to be used.

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.

6 Principle

This test quantifies the field of vision of a respiratory protective device (RPD) by measuring the functional visual field score. The RPD is mounted on a headform containing small light sources instead of eyes. The light from the light sources is projected onto the apertometer, creating a light area outlined by a shadow that follows the periphery of the visual obstruction of the RPD system. The light area represents the visual field, or peripheral isopter. A quantitative value for the visual field score is obtained by comparing the peripheral isopter with a visual field score defined for different segments of the unrestricted field of vision.

7 Apparatus

The following apparatus are used for determining the visual field score.

a) Headforms: see Annex B.

b) Apertometer: see Figure 1.

c) Visual field score plotting chart: See Figure 2.

8 Device preparation

Prepare the RPD to the ready for use condition in accordance with the manufacturer's instructions for use. This involves attaching any accessories that may obscure vision, such as demand valve or filter(s), or filter simulator (ISO 16900-5) for devices containing the thread connection in accordance with ISO 17420-3. The headform size(s) appropriate to the size of RPD being tested shall be selected for the test.

8.1 Mounting the device

Mount the RPD on the selected headform in accordance with the manufacturer's donning instructions. Position the RPD symmetrically on the headform. If the RPD has wearer-adjustable head harness straps, tighten the straps to the extent that would be expected when wearing the device as specified by the manufacturer.

NOTE If necessary, apply a friction reducing material talcum powder to the headform to allow the RPD to slide more easily over the headform surface during adjustment.

Position the headform correctly within the apertometer (see Figure 1).

The headform is positioned correctly when the centre of the light source of the illuminated eyes are aligned with the 90 degree meridians on the dome, symmetrically about the centre line of the dome and the horizontal axis of the headform is coincident with the axis of the apertometer.

Dimensions in millimetres

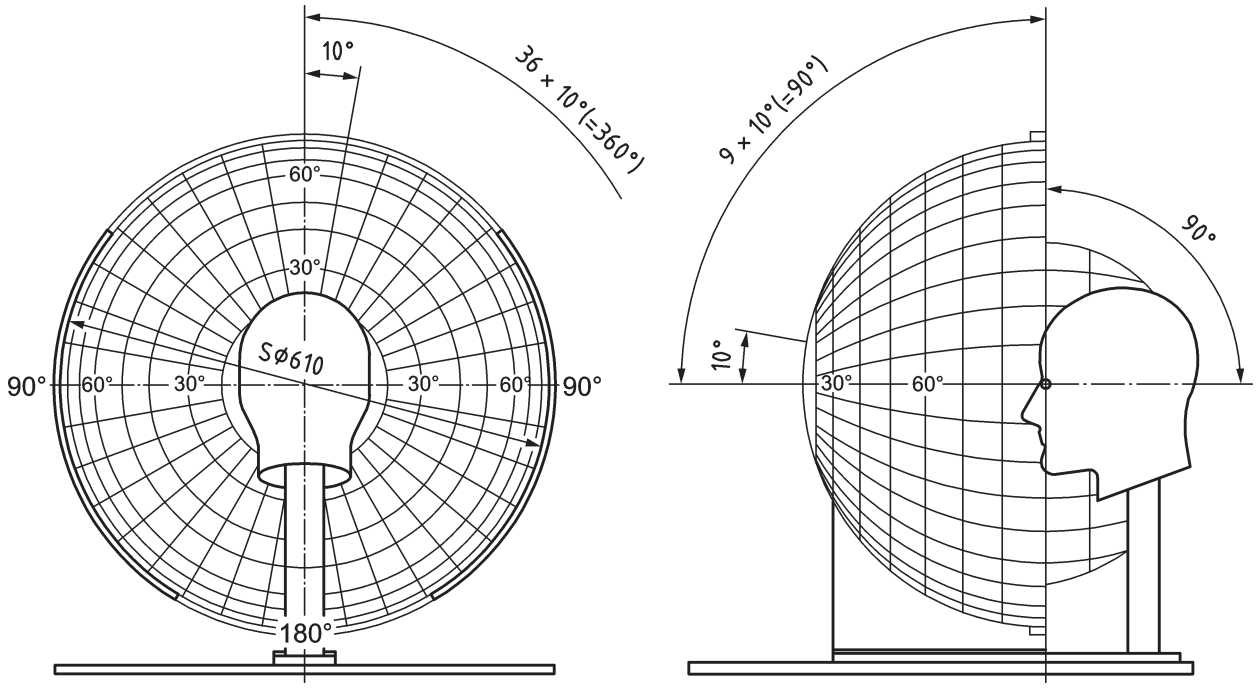

Figure 1 — Position of headform in apertometer

Switch on both illuminated eyes and re-adjust the RPD position on the headform so that the shadow on the apertometer is symmetrical about the vertical centre line such that the point at which the shadow crosses the horizontal centre line on the left and right sides is within 5 degrees of each other.

The RPD shall not be donned on the headform in an inappropriate position in an attempt to maximize the visual field score.

NOTE In the case of RPD with an asymmetric Respiratory Interface design or assembly, this is not possible and the Respiratory Interface shall just be centralised about the vertical centre line.

8.2 Mapping the field of vision

Using the visual field score plotting chart (Figure 2), transfer the outline of the light projected onto the apertometer's surface onto the chart by marking the point at which the light changes to a shadow along each of the 36 meridians within the apertometer. Once the points have been plotted along each meridian, connect the points from one meridian to the next, following the curve of the shadow on the apertometer. The solid line connecting the points represents the peripheral isopter for the RPD.

Remove the RPD and re-fit to the headform for a total of three fittings.

8.3 Calculating the Visual Field Score (VFS)

The VFS plotting chart (Figure 2) assigns 118 dots in total. Fifty dots are assigned to the central area, up to 10° of fixation. The remaining 68 points are assigned to the area beyond 10°. The grid dots are located along 10 meridians (two in each of the upper quadrants, three in each of the lower quadrants) at 25°, 65°, 115°, 155°, 195°, 225°, 255°, 285°, 315°, and 345°.

Outside the central area the dots are distributed along the meridians according to a weighting system that is based on an assessment of the importance of different meridians being within the visual field when wearing RPD. The four peripheral dots which lie on the 25, 155, 195 and 345 meridians are considered of critical importance and therefore called critical dots. (see Figure 2 and Table 1).