TECHNICAL SPECIFICATION

ISO/TS 16976-2

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Respiratory protective devices — Human factors —

Part 2: Anthropometrics

Appareils de protection respiratoire — Facteurs humains — Partie 2: Anthropométrie

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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).

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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*.

This second edition cancels and replaces the first edition (ISO/TS 16976-2:2010), which has been technically revised. It also incorporates the Technical Corrigendum ISO 16976-2 Corr.1:2011.

The major technical changes are:

a) Inclusion of ISO/TS 16976-2 TECHNICAL CORRIGENDUM 1:2011

b) Change of values for W_5 and W_6 in 8.3.

ISO/TS 16976 consists of the following parts, under the general title *Respiratory protective devices — Human factors*:

— *Part 1: Metabolic rates and respiratory flow rates* [Technical Specification]

— *Part 2: Anthropometrics* [Technical Specification]

— *Part 3: Physiological responses and limitations of oxygen and limitations of carbon dioxide in the breathing environment* [Technical Specification]

— *Part 4: Work of breathing and breathing resistance: Physiologically based limits* [Technical Specification]

— *Part 5: Thermal effects* [Technical Specification]

— *Part 6: Psycho-physiological effects* [Technical Specification]

— *Part 7: Hearing and speech* [Technical Specification]

— *Part 8: Ergonomic factors* [Technical Specification]

Introduction

For an appropriate design, selection, and use of respiratory protective devices, basic physiological demands of the user must be considered. Type and intensity of work affect the metabolic rate (energy expenditure) of the wearer. Weight and weight distribution of the device on the human body can also influence metabolic rate. Metabolic rate is directly correlated with oxygen consumption, which determines the respiratory demands and flow rates. The work of breathing is influenced by the air flow resistances of the device and the lung airways. The work (or energy cost) of a breath is related to the pressure gradient created by the breathing muscles and the volume that is moved in and out of the lung during the breath. Anthropometric and biomechanical data are required for appropriate design of various components of a respiratory protective device, as well as for the design of relevant test methods.

This Technical Specification forms one part of a series of documents providing basic anthropometric measurement methods and data on humans. It contains information about the description, definition, and diagram of landmarks and dimensions, up-to-date head and face data for various race/ethnic groups, and human test panels.

Respiratory protective devices — Human factors —

Part 2: Anthropometrics

1 Scope

This part of ISO/TS 16976 is one part of a series of Technical Specifications that provide information on factors related to human anthropometry, physiology, ergonomics, and performance for the preparation of standards for design, testing, and use of respiratory protective devices. This part of ISO/TS 16976 contains information related to anthropometry. In particular, information is given for:

— anthropometric measurement methods;

— anthropometric data for head, face, and neck dimensions;

— anthropometric data for torso dimensions;

— human test panels;

— models of headforms.

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.

EN 14143, *Respiratory equipment — Self-contained re-breathing diving apparatus*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in Annexes A and B apply.

4 Anthropometric measurements

4.1 Anthropometric instrument and software

The standard measurement tools which are recommended are the anthropometer, a spreading calliper, a sliding calliper, a pupillometer, and a steel measuring tape. A suitable data entry, editing, and analysis software is described in References [3] and [4].

4.1.1 Anthropometer, a specialized tool for measuring linear distance between points on the body and standard reference surfaces, such as the floor or a seat platform.

4.1.2 Spreading and sliding callipers, used for measuring the breadth and depth of body segments, as well as the distance between reference marks.

4.1.3 Measuring tape, used for measuring the arc and circumference of body segments.

4.1.4 Pupillometer, a standard ophthalmic device used for measuring the interpupillary distance.