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Second edition
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Respiratory protective devices — Human factors —

Part 1: Metabolic rates and respiratory flow rates

Appareils de protection respiratoire — Facteurs humains —

Partie 1: Régimes métaboliques et régimes des débits respiratoires



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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 16976-1:2007), of which it constitutes a major revision with the following technical change:

- [7.3](#) has been added.

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]

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Introduction

For an appropriate design, selection, and use of respiratory protective devices, it is important to consider the basic physiological demands of the user. The type and intensity of work affect the metabolic rate (energy expenditure) of the wearer. The weight and weight distribution of the device on the human body also may 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 the appropriate design of various components of a respiratory protective device, as well as for the design of relevant test methods.

This part of ISO/TS 16976 is the first part of a series of documents providing basic physiological and anthropometric data on humans. It contains information about metabolic rates and respiratory flow rates for various types of physical activity.