PD ISO/TS 16976-4:2019

BSI Standards Publication

Respiratory protective devices — Human factors

Part 4: Work of breathing and breathing resistance: Physiologically based limits

bsi.

National foreword

This Published Document is the UK implementation of ISO/TS 16976-4:2019.

The UK participation in its preparation was entrusted to Technical Committee PH/4, Respiratory protection.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Published by BSI Standards Limited 2019

ISBN 978 0 580 51450 0

ICS 13.340.30

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 April 2019.

Amendments/corrigenda issued since publication

Date	Text affected

PD ISO/TS 16976-4:2019

TECHNICAL SPECIFICATION

ISO/TS 16976-4

Second edition
2019-03-22

Respiratory protective devices — Human factors —

Part 4: Physiologically based limits

Appareils de protection respiratoire — Facteurs humains —

Partie 4: Travail de respiration et de résistance à la respiration: limites physiologiques

Reference number
ISO/TS 16976-4:2019(E)

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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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Personal protective equipment*, Subcommittee SC 15, *Respiratory protective devices*.

This second edition cancels and replaces the first edition (ISO/TS 16976-4:2012), which has been technically revised. The main changes compared to the previous edition are as follows:

a) adjustment of key-points in Figures 3, 4 and 7 to correspond with the 50 %-reference line;

b) adjustment of keys in Figures 3, 4, 7 and 8;

c) adjustment of Figures 3, 4 and 6;

d) clarification on flow resistance and elastic load given in 7.4.

A list of all parts in the ISO/TS 16976 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

A respiratory protective device (RPD) is designed to offer protection from the inhalation of hazardous substances. However, this protection requires extra effort by the respiratory muscles as they need to generate higher pressures to overcome the associated respiratory loads imposed by the RPD.

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Respiratory protective devices — Human factors —

Part 4: Work of breathing and breathing resistance: Physiologically based limits

1 Scope

This document describes how to calculate the work performed by a person's respiratory muscles with and without the external respiratory impediments that are imposed by RPD of all kinds, except diving equipment. This Document describes how much additional impediment people can tolerate and contains values that can be used to judge the acceptability of an RPD.

NOTE These calculations are explained in some textbooks on respiratory physiology (in the absence of an RPD), but most omit them or are incomplete in their explanations.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 16972, *Respiratory protective devices — Definitions of terms pictograms*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
body temperature pressure saturated
BTPS
standard condition for the expression of ventilation parameters

Note 1 to entry: Body temperature (37 °C), ambient pressure and water vapour pressure (6,27 kPa) in saturated air.

3.2
compliance
change in volume of the human lung that results from a change in pressure

Note 1 to entry: The compliance is measured in l/kPa.

Note 2 to entry: This term is the typical term for the elastic behaviour of the lungs and chest. Compliance is the inverse of elastance.