



BSI Standards Publication

Determination of material resistance to permeation by chemicals

Part 1: Permeation by potentially hazardous liquid chemicals under conditions of continuous contact

This is a preview of "BS EN 16523-1:2015+A...". [Click here to purchase the full version from the ANSI store.](#)

National foreword

This British Standard is the UK implementation of EN 16523-1:2015+A1:2018. It supersedes BS EN 16523-1:2015, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

The UK participation in its preparation was entrusted to Technical Committee PH/3/-/2, UK mirror panel for CEN/TC 162/WG 13.

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

BSI, as a member of CEN, is obliged to publish EN 16523-1:2015+A1:2018 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.

The following opinions regarding this standard and EN 16523-2:2015+A1:2018 have been expressed by the UK committee:

- EN 16523-1:2015+A1:2018 and EN 16523-2:2015+A1:2018 were drafted with the intention of having one test method that can be applied to gloves, footwear and clothing. However, as written, these standards do not align with clause 4.3, Permeation test, from the chemical-protective footwear standard, EN 13832-1:2006.
- The dimensions outlined for the design of the permeation cells in clause 6.1 are unnecessarily restrictive. An inter-laboratory trial carried out during the drafting of EN 16523-1:2015+A1:2018 and EN 16523-2:2015+A1:2018 inadvertently showed that the size of the test cell does not have a significant effect on the result while benefits can be gained by using different sized cells for closed loop and open loop testing, including maximized sensitivity and minimized uncertainty of measurement.
- The test methods described in EN 16523-1:2015+A1:2018 and EN 16523-2:2015+A1:2018 do not consider cumulative permeation. It is increasingly recognized that breakthrough time alone is a poor indicator of chemical protection, especially when considering the latest generation of barrier-laminate materials. ISO 6529:2013 is available for readers to refer to as an alternative standard test method.
- While accurate, the equations used in EN 16523-1:2015+A1:2018 may be confusing to those who are not familiar with the test technique. This could result in breakthrough times which are calculated and reported incorrectly. Attention is again drawn to ISO 6529:2013 which includes practical examples of calculations based on data, which for some may be easier to follow and could help users report their own data correctly.

Further commentary on EN 16523-1:2015+A1:2018 and EN 16523-2:2015+A1:2018 from UK Technical Committee PH/3/-/2 can be found in National Annex NA.

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

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English Version

Determination of material resistance to permeation by chemicals - Part 1: Permeation by potentially hazardous liquid chemicals under conditions of continuous contact

Détermination de la résistance des matériaux à la perméation par des produits chimiques - Partie 1: Perméation par des produits chimiques liquides potentiellement dangereux dans des conditions de contact continu

Bestimmung des Widerstands von Materialien gegen die Permeation von Chemikalien - Teil 1: Permeation durch potentiell gefährliche flüssige Chemikalien unter Dauerkontakt

This European Standard was approved by CEN on 5 December 2014 and includes Amendment 1 approved by CEN on 7 May 2018.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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European foreword

This document (EN 16523-1:2015+A1:2018) has been prepared by Technical Committee CEN/TC 162 "Protective clothing including hand and arm protection and lifejackets", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2019 and conflicting national standards shall be withdrawn at the latest by April 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes A1 EN 16523-1:2015 A1.

In comparison with A1 EN 16523-1:2015 A1, the entire document has been revised.

This document includes Amendment 1 approved by CEN on 7 May 2018.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

A1 Deleted text A1

EN 16523, *Determination of material resistance to permeation by chemicals*, is composed with the following parts:

- *Part 1: Permeation by potentially hazardous liquid chemicals under conditions of continuous contact* [the present document];
- *Part 2: Permeation by gaseous chemical under conditions of continuous contact.*

NOTE CEN/TC 162 WG 13 has foreseen to work on other test methods in the future that will spread in several standard parts:

- *Permeation by solid chemical under conditions of continuous contact;*
- *Permeation by chemical under conditions of intermittent contact;*
- *Permeation by chemical of seams, joins, assemblages and closers;*
- *Permeation by chemical in a form of droplets;*
- *Guide on testing and interpretation.*

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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Introduction

Users involved in the production, use, transportation, and emergency response with liquid chemicals can be exposed to numerous compounds capable of causing harm upon contact with the human body. The harmful effects of these chemicals can range from acute trauma such as skin irritation and burn to chronic degenerative disease, such as cancer. Since engineering controls may not eliminate all possible exposures, attention is often placed on reducing the potential for direct skin contact through the use of personal protective equipment (PPE) that resists permeation, penetration and degradation.

The test method described in this part of EN 16523 is intended to be used to evaluate the barrier effectiveness of materials used for protective clothing, gloves and footwear materials against permeation by liquid chemicals.

This method does not assess the chemical degradation or penetration of the material. Resistance to penetration by liquid chemicals can be determined by using for example ISO 6530 [10] while resistance to penetration by liquid chemicals under pressure can be determined by using for example ISO 13994 [11]. Resistance to chemical degradation can be determined by EN 374-4 [2] for gloves and EN 13832-1:2006, 4.2 [3] for footwear.

This method provides tests results in terms of breakthrough time. This parameter is a key measure of the effectiveness of a material to act as a barrier to the challenge chemical. Such information is used in the comparison of the performances of PPE materials during the process of selecting PPE for protection from hazardous chemicals. Long breakthrough times are characteristic of high permeation resistance. Breakthrough time does not provide a correlation between protection and the toxicity of the chemicals tested, only cumulative permeation can provide this information.

It has been assumed in the drafting of this part of EN 16523 that the execution of its provisions will be entrusted to appropriately qualified and experienced people with a sound understanding of analytical chemistry. Appropriate precautions should be taken when carrying out this type of testing in order to avoid injury to health and contamination of the environment.

A future part of EN 16523 will explain the use of the series of standards EN 16523.

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1 Scope

This European Standard specifies a test method for the determination of the resistance of protective clothing, gloves and footwear materials to permeation by potential hazardous liquid chemicals under the condition of continuous contact.

This test method is applicable to the assessment of protection against liquid chemicals that can be collected only by liquid or gaseous collecting media.

This test method is not A_1 applicable to A_1 the assessment of chemical mixtures, except for aqueous solutions.

This standard is used with the specifications given in the products standards (for example A_1 EN ISO 374-1:2016 A_1 for gloves) where the following information is defined:

- any pre-conditioning;
- precise sampling (place, size, number);
- associated levels of performance.

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.

A_1 EN ISO 374-1:2016, *Protective gloves against dangerous chemicals and micro-organisms — Part 1: Terminology and performance requirements for chemical risks (ISO 374-1:2016)* A_1

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

analytical technique

method of identifying and quantifying the amount of permeated chemical in the collection medium

Note 1 to entry: Such methods are often specific to individual chemical and collection-medium combinations.

EXAMPLE Applicable analytical techniques can include ultraviolet (UV) or infrared (IR) spectrophotometry, mass spectrometry, pH measurement, ion chromatography, conductimetry, colourimetry, atmospheric analytical detector tubes and radionuclide tagging/detection counting. Although liquid and/or gas chromatography are separation techniques rather than detection methods they can be used in conjunction with suitable detectors to quantify the amount of permeated chemical in the collection medium (see Annex C).

3.2

liquid challenge chemical

liquid chemical that is used to challenge the protective clothing, gloves and footwear material specimen

3.3

collecting medium

liquid or gas on the inner "clean" side of the test sample in which any permeated chemical is collected