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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Submission of Comments

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 16602-2

Protective clothing for protection against chemicals — Classification, labelling and performance requirements —

Part 2: Physical test methods, classification and requirements

*Habillement de protection contre les produits chimiques —
Classification, étiquetage et exigences de performances —*

Partie 2: Méthodes d'essai physique, classification et exigences

ICS: 13.340.10

This document is circulated as received from the committee secretariat.

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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 13, *Protective clothing*.

This second edition cancels and replaces the first edition ISO 16602:2007. The standard has completely been rewritten and split into parts, the most significant changes compared to the previous edition relating to: (1) a new modular approach, (2) marking, (3) chemical protection.

A list of all parts in the ISO 16602 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

This document addresses the physical test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages. This document is intended to provide comprehensive requirements for the performance classification.

This document is part of a series of standards for test methods and requirements for both limited use and reusable chemical protective clothing. ISO 16602 consists of the following parts, under the general title "Protective clothing for the protection against chemicals — Classification, labelling and performance requirements":

- Part 1: General requirements;
- Part 2: Physical test methods, classification and requirements;
- Part 3: Chemical test methods, classification and requirements;
- Part 4: Test methods, classification and requirements for specific designs and ensemble components including gloves, footwear, and respirators;
- Part 5: Garment test methods, classification and requirements;
- Part 6: Guidance on Selection, Use, Care and Maintenance.

This document is based on the existing test methods found in ISO 16602 and upgraded based on latest EN 14325. This series of documents is intended to provide a modular approach to design and specification for chemical protective clothing accommodating the many types and levels of risk found, and activities carried out, in the workplace. This document includes the requirements of ISO 8194 on radiation protection so that it can be withdrawn.

The selection of appropriate chemical protective clothing should be based on a risk assessment. In this assessment the user organization identifies the hazards, and determines:

- the potential for chemical contact with individual workers,
- the consequences of exposure, and
- the type of practices or controls needed to eliminate or minimize exposure.

When it is determined that chemical protective clothing is needed, the risk assessment should identify the chemical protective clothing required in terms of its overall performance requirements from physical characteristics, chemical protection and garment test perspective. ISO/DIS 16602-6:— is intended to assist user organizations with these determinations.

Protective clothing for protection against chemicals — Classification, labelling and performance requirements —

Part 2: Physical test methods, classification and requirements

1 Scope

This document specifies the physical performance classification and test methods for materials used in chemical protective clothing, including gloves and footwear. The gloves and footwear should have the same minimum chemical protective barrier performance requirements as the fabric when an integral part of the clothing. This is a reference standard to which chemical protective clothing performance standards may refer in whole or in part, but this standard is not exhaustive in the sense that other parts of ISO 16602 may well require testing according to test method standards which are not included in this standard.

While these performance levels are intended to relate to the usage to which the chemical protective clothing is to be put, it is essential that the chemical protective clothing manufacturer or supplier indicates the intended use of the protective clothing. It is similarly important that the user (specifier) carries out a risk assessment in order to establish the correct protective performance levels for the intended task.

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 811, *Textiles — Determination of resistance to water penetration — Hydrostatic pressure test*

ISO 6941, *Textiles — Fabrics — Fire properties — Measurement of flame spread properties of vertical test bodies*

ISO 7854:1995, *Rubber- or plastics-coated fabrics — Determination of resistance to damage by flexing*

ISO 9073-4, *Nonwovens — Test methods — Part 4: Determination of tear resistance by the trapezoid procedure*

ISO 11610, *Protective clothing — Vocabulary*

ISO 12947-2, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown*

ISO 13934-1, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*

ISO 13935-2, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method*

ISO 13938-2, *Textiles — Bursting properties of fabrics — Part 2: Pneumatic method for determination of bursting strength and bursting distension*

ISO 13996, *Protective clothing — Mechanical properties — Determination of resistance to puncture*

ISO/DIS 16602-1:—¹⁾, *Protective clothing for protection against chemicals — Classification, labelling and performance requirements — Part 1: General requirements*

ISO/DIS 16602-4:—²⁾, *Protective clothing for protection against chemicals — Classification, labelling and performance requirements — Part 4: Test methods, classification and requirements for specific designs and ensemble components including gloves, footwear, and respirators*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11610 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 <https://www.electropedia.org/>

3.1

abrasion rub

one revolution of the outer drives of the Martindale abrasion tester

[SOURCE: ISO 12947-1:1998]

3.2

abrasion cycle

completion of all the translational abrasion movements tracing a Lissajous figure comprising 16 rubs, i.e. 16 revolutions of the two outer drives and 15 revolutions of the inner drive of the Martindale abrasion tester

[SOURCE: ISO 12947-1:1998]

3.3

direction of textile

3.3.1

cross direction

direction perpendicular to the direction of the film or fiber parallel to its movement in the fabric making direction

3.3.2

machine direction

direction of the film or fiber parallel to its movement in the fabric making direction

3.4

low temperature use

temperature of use where the working temperature reaches below freezing temperature

3.5

material

substances, excluding hardware and labels, of which a garment is made

[SOURCE: ISO 11610:2023, 4.3.5]

1) Under preparation. Stage at the time of publication: ISO/DIS 16602-1:2025

2) Under preparation. Stage at the time of publication: ISO/DIS 16602-4:2025

3.5.1**multilayer material**

material consisting of different layers, which may be either permanently bonded together or intimately combined prior to the garment manufacturing stage, or which can be separated without any damage to each individual layer

Note 1 to entry: By “permanently bonded together” is meant for example by coating, laminating, gluing. By “intimately combined” is meant for example by weaving, quilting.

[SOURCE: ISO 11610:2023, 5.3.6, modified to in “bonded” and “separation” phrases]

3.5.2**multilayer material consisting of separate layers**

multilayer material, where individual layers that are neither permanently bonded together nor intimately combined, can be separated without any damage to the individual layers

3.6**specimen breakdown**

in abrasion resistance or flex cracking resistance testing, the visually observed deterioration in a specimen after exposure to a specified number of abrasion rubs or cycles of flexing

[SOURCE: ISO 12947-2:2016]

4 Performance classification of materials**4.1 Determination of property value for performance classification**

A number of performance classification levels are identified for the various properties of materials to be found in this standard.

The value of each property defined in [4.4](#) to [4.10](#) and which shall be used for performance classification, shall be determined in accordance with [Annex B](#) including the estimates of uncertainty of measurement for all the results.

If not specified otherwise within [4.4](#), [4.5](#), [4.6](#), [4.7](#), [4.9](#) or within the specific test method itself, a material with different behaviour in the machine and cross directions shall be tested for its performance in both directions. The performance classification shall be based on the results obtained for the direction resulting in the lower performance classification when evaluated according to [Annex B](#).

The fabric side that will appear on the outside of the apparel shall be tested for all test methods that are linked to surface performance i.e. [4.4](#), [4.5](#), [4.6](#), [4.10](#) and the performance classification shall be based on the results for this side.

If the chemical protective clothing consists of multiple layers of materials, with or without separable layers, all layers shall be tested together with the chemical protective clothing outer surface being tested for those properties which are linked to surface performance.

4.2 Requirements for pre-treatment

This document shall follow the requirements for conditioning and testing defined in ISO/DIS 16602-1, sub-clause [4.3](#).

4.3 Conditioning and testing temperature and humidity

This document shall follow the requirements for conditioning and testing defined in ISO/DIS 16602-1, sub-clauses 4.3.2 and 4.3.3. This requirement takes precedence over any conflicting requirements in the individual test methods.

4.4 Abrasion resistance

4.4.1 General

A set of four test specimens of a material sample, where each specimen shall consist of all layers, shall be tested in accordance with ISO 12947-2 in the inverted mode, i.e. a test specimen of at least 140 mm diameter placed on the abradant table and an abradant of at least 30 mm diameter mounted in the test piece holder. Abrasive paper specified in [Annex A](#) shall be used with an applied downward pressure of 9 kPa. The abrasion resistance of the chemical protective clothing material shall be classified according to the levels of performance given in [Table 1](#), using the highest number of abrasion rubs, determined according to [4.4.2](#), which does not cause damage to the material.

Table 1 — Classification of abrasion resistance

Class	Number of rubs
6	> 2 000
5	> 1 000
4	> 400
3	> 100
2	> 40
1	> 10

4.4.2 Determination of abrasion resistance performance classification

4.4.2.1 General

To determine the level of performance, the leak tightness of each of the four test specimens of a material sample shall be determined after a number of abrasion rubs. An additional sample will be used to determine the leak tightness prior to abrasion if the hydrostatic head test is applicable.

There are three methods of leak tightness assessment, the pressure pot, the hydrostatic head and visual inspection.

- The pressure pot shall be used for materials holding the pressure according to [4.4.2.2](#).
- The hydrostatic head shall be used for air permeable materials which cannot hold the pressure according to [4.4.2.2](#), but can be tested according to [4.4.2.3](#).

NOTE 1 When evidence is presented that air permeable materials cannot hold the pressure according to [4.4.2.2](#), this does not need to be re-confirmed.

- Visual inspection is permitted when neither of the above requirements in this sub-clause can be met. In this case, this shall be reported in the test report and also in the Instructions for Use indicating that the visual inspection is qualitative and does not provide evidence of liquid tightness after abrasion. If this assessment is performed through visual inspection, the maximum classification that can be claimed is a Class 3.

NOTE 2 When evidence is presented that neither of the above requirements in this sub-clause can be met, these do not need to be re-confirmed.

4.4.2.2 Pressure pot end-point determination

To verify if the use of the pressure pot method is possible, an unabraded reference specimen shall be clamped in the round test pot apparatus, designed according to the specifications given in [Annex D](#) (see [Figure D.1](#)). The diameter of the pot shall be appropriate to hold the test specimen. The pressure in the test pot shall then be reduced by 1 kPa from atmospheric pressure. Preferably the specimen's exterior face of the fabric shall not be exposed to the pressure. However, in the case of fabric with an air permeable inner-surface, leakage may be possible through the structure of this layer. If this is suspected, then the orientation of the fabric