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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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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 16602-5

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

Part 5: Garment test methods, classification and requirements

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

*Partie 5: Méthodes d'essai des vêtements, 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 describes:

- A range of garment tests to be carried out on general, industrial or Emergency Team (ET) chemical protective clothing
- Practical performance tests (mandatory and optional)
- Performance classifications or pass/fail criteria
- Where not described elsewhere, reporting requirements.

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 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, regarding the garment tests, is based on the existing test methods found in ISO 16602, ISO 17723-1, ISO 17491 series, in EN 1073 series or practical performance tests in other product standards. This series of documents is intended to provide a new modular approach 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 5: Garment test methods, classification and requirements

1 Scope

This document specifies minimum garment performance test methods and classification requirements for protective clothing designed to provide chemical protection (including solids, airborne particles, aerosols, liquids, and gases (including radioactive contamination)). This also includes a range of practical performance tests. Protective clothing against chemicals including solids, airborne particles, aerosols, liquids, and gases are addressed by this document.

Protective clothing items covered by this document include full body and partial body.

This document does not specifically address protection against biological, thermal (flame, heat or cold), and ionizing radiation hazards as specific requirements are covered by other relevant standards.

To assist the users of products covered under this document, this document provides descriptions of referenced test methods. It is not the intent of this document to address all possible situations.

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 10582, *Resilient floor coverings — Heterogeneous poly(vinyl chloride) floor covering — Specifications*

ISO 10874:2009, *Resilient, textile and laminate floor coverings — Classification*

ISO 11610:2023, *Protective clothing — Vocabulary*

ISO 13506-1, *Protective clothing against heat and flame — Part 1: Test method for complete garments — Measurement of transferred energy using an instrumented manikin*

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*

ISO 16905, *Resilient floor coverings — Specification for rubber floor covering — Tile/Plank*

ISO 17491-1, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 1: Determination of resistance to outward leakage of gases (internal pressure test)*

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

ISO 17491-3, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 3: Determination of resistance to penetration by a jet of liquid (jet test)*

ISO 17491-4:2024, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 4: Determination of resistance to penetration by a spray of liquid (spray test)*

ISO 17491-5, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 5: Determination of resistance to penetration by a spray of liquid (manikin spray test)*

ISO 26986, *Resilient floor coverings — Expanded (cushioned) poly(vinyl chloride) floor covering — Specification*
EN 651, *Resilient floor coverings — Polyvinyl chloride floor coverings with foam layer — Specification*

EN 1817, *Resilient floor coverings — Specification for homogeneous and heterogeneous smooth rubber floor coverings*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 11610 and the following apply:

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

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

compressed air line ventilated protective garment

chemical protective garment which is continuously supplied from a source of compressed breathable air ensuring internal ventilation and overpressure

3.2

escape device

emergency breathing facility

system, either integrally combined with the clothing, or intended for simultaneous use with the clothing, providing the wearer with respiratory protection in the event of the failure of the primary air supply to the suit, while (s)he makes his/her escape from the contaminated environment

3.3

garment test

test procedure with the test subject/manikin wearing the PPE garment moving under specified conditions to evaluate the integrity of the garment to penetration of gases, liquids or particulates

3.4

inward leakage

L_i

ingress of test particles from the outside of the chemical protective garment to the inside

[SOURCE: ISO 11610:2023, 7.57]

3.5

total inward leakage

$L_{i,tot}$

ratio of the concentration of the test particles inside the suit to the challenge concentration of test particles inside the test chamber

Note 1 to entry: The total inward leakage, $L_{i,tot}$, is expressed as percentage.

Note 2 to entry: The challenge concentration corresponds to 100 %.

[SOURCE: ISO 11610:2023, 7.5.8]

3.6

low temperature use

temperature of use where working temperatures reach below freezing temperature

3.7

maximum air flow rate

maximum air flow rate with the device operating at the manufacturer's maximum pressure and any user's control valve set to the maximum

3.8

minimum air flow rate

minimum air flow rate with the device operating at the manufacturer's minimum pressure and any user's control valve set to the minimum

3.9

nominal protection factor (100:Li)

ratio of the concentration of the contaminant in the ambient atmosphere to the concentration of contaminant inside the suit

[SOURCE: ISO 11610:2023, 7.5.10]

3.10

particulate radioactive contamination

contamination by radioactive or radioactively contaminated solid particles

[SOURCE: ISO 11610:2023, 7.4.2]

3.11

protective garment against solid airborne particles including radioactive contamination

chemical protective garment intended to provide protection to the skin and if required to the respiratory tract against radioactive contamination and solid airborne particles

4 Pre-treatment

4.1 Pre-treatment by cleaning and disinfection

Prior to testing, specimens shall undergo pre-treatment according to ISO/DIS 16602-1:— (4.3.1).

4.2 Testing temperature

Specimens shall be conditioned and tested according to the requirements defined in ISO/DIS 16602-1:— (4.3.2 and 4.3.3).

4.3 Optional extreme storage conditions

If claimed in the manufacturer's instructions (IFU) (ISO/DIS 16602-1:— (11.1b)), conditioning at extreme storage conditions shall be applied according to ISO/DIS 16602-1:— (4.3.4).

5 Practical performance

5.1 General

Different practical performance tests are appropriate for different tasks and PPE.

Conditioning by wearing is required for all chemical protective clothing, including partial body, undergoing any garment test in this document. The purpose of the practical performance test is to evaluate:

— Any inhibition of the wearer's movement,

- Wearer discomfort,
- The interferences between separate items comprising an ensemble,
- The potential for loss of integrity, and
- Manufacturers' sizing charts.

prior to one of more of the garment tests described in this document.

Some of the practical performance tests are required for all garment tests, such as those described in [5.2](#) and [5.3](#). Others shall only be used when applicable, for example in the case of integral glove ([5.7](#)) or visors ([5.8](#)). Some tests are optional such as in [5.4](#), [5.5](#), [5.7](#) or [5.9](#) depending on intended use. The number of samples and number of different test subjects needed to carry out are specified in the garment test in [clause 6](#) or specified in the optional tests. The optional tests are not intended to be carried out prior to all garment tests.

The test subject shall be dressed according to both the garment test and following the directions in the manufacturer's instructions. Subjects shall also don any other items of protection specified in the manufacturer's instructions. If the manufacturer's instructions do not require or indicate that any interfaces between different components of an ensemble should be taped (such as at wrists and ankles) then tape shall not be applied.

These tests shall be carried out also for partial body protection garments, taking into account the design and area of intended protection. For example, the size of the partial body protection garment shall not create any hindrance as used by the test subject. This shall be checked by visual inspection (e.g. an apron being so long that it would create a tripping hazard).

All chemical protective clothing shall be conditioned as follows, unless indicated differently in this document:

- For single or limited use: take out of packaging and wrapping, and proceed with the test.
- For reusables: test according to the two following conditions:
 - take out of packaging and wrapping and proceed with the test (no pre-conditioning if stored in ambient temperatures), and
 - pre-condition according to [4.1](#) and [4.2](#) based on the manufacturer's instructions and then proceed with testing.

NOTE These practical performance test can also be performed by users to assess the protective clothing and its fitness for purpose.

5.2 "Fit" practical performance test

5.2.1 General

The purpose of this subjective test is to assess whether the sizing information for the garment matches an informed wearer's expectation.

The test shall be carried out by a number of test subjects and for the number of samples indicated in [clause 6](#). The test temperature and humidity shall be recorded. The test subjects shall be familiar with using such or similar protective clothing. The persons will be drawn from those people certified as fit to do so by an appropriate medical officer according to local regulations. The necessity of a medical examination before or supervision during the tests shall be at the testing officer's discretion. Two suits shall be tested, each being tested on a different test person. Carry out the movements, 3, 6 and 7 of [Annex A](#).

Prior to the test, there shall be an examination that the suit is in working condition and that it can be used without danger.

If more than one size of a given item of clothing is manufactured, the subjects are asked to select the appropriate size, depending on what is worn underneath the test garment. A minimum of two sizes shall be tested with two test subjects fitted for the different sizes.

After donning the suit, each test subject is asked "Does the suit fit?" If the answer is "Yes" the subject shall proceed with the test in [5.3](#).

If the answer is "No", report the fact and either replace the suit or the test subject. The test subject is then asked again "Does the suit fit?" If the answer is "Yes", the subject shall proceed with the remaining movements in [5.3](#). If the answer is "No", or if the suit does not fit any test subject within the given size range, the sizing table shall be reported as incorrect and the suit test shall be reported as a failure. This shall also mean that the garment fails the requirements of ISO/DIS 16602-1.

The following are examples of obvious reasons for concluding that a protective clothing product is unacceptable and not fit for use:

- 1) The selected garment size based on the subject's size does not fit in a way to provide safe use due to sizing or design;
- 2) It does not stay closed or it will not stay in place;
- 3) It compromises a vital function such as breathing;
- 4) Simple tasks to be performed wearing it are impossible. For example:
 - Reading off a measuring device (e.g. an electronic device with a display);
 - Securing and using fastenings and couplings;
 - Accessing controls, warning devices and pressure gauge (if fitted);
- 5) The subject refuses to continue this assessment due to pain;
- 6) It prevents the wearing of other essential PPE.

The result shall be reported along with:

- the size dimensions of the test person including any undergarments worn underneath the test garment;
- any observations such as ease of donning and doffing the garment according to IFU.

5.2.2 Garment size determination

The test subject shall be dressed in the absorbent overall or other undergarment for the garment test (for example for [6.4](#) Liquid performance tests), in accordance with the IFU (ISO/DIS 16602-1:—, 11.1b), as well as any other items of protection.

NOTE 1 When using for example an absorbent overall, the sizing of this overall should not inhibit the practical performance test.

The body dimensions of the test subject, in particular the chest measurements, shall be measured including all garments underneath the test garment (e.g. underwear, undergarments, any garment worn to protect the test subject, absorbent overall). The test garment size shall be based on the range indicated on the size label of the suit to be tested using the above measurements.

NOTE 2 Garment fit: Although the test subjects should be selected as close as possible to the upper limit of the size range, the garment should not be too tight before the practical performance test as this may stretch the seams. If garments are too big, leakages may not be detected because there is no contact between the test garment and the absorbent overall. Overall, a garment that is too tight is worse than one that is slightly too loose. Contact between the absorbent overall and the inside of the garment are important for the garment test. Care should be taken to ensure that garment size selection for both the absorbent overall and the test garment can achieve contact given the test subject's body dimensions.