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Date: 02 July 2025

Origin: European

Latest date for receipt of comments: 25 August 2025

Project No. 2024/02782

Responsible committee: PH/3/13

Interested committees:

Title: Draft BS EN ISO 16602-1 Protective clothing for protection against chemicals — Classification, labelling and performance requirements. Part 1: General requirements.

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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.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

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- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

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 16602-1

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

Part 1: General requirements

ICS: 13.340.10

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING

Reference number
ISO/DIS 16602-1:2025(en)

Full document details: 25/30501032 DC

ISO/TC **94**/SC **13**

Secretariat: **SNV**

Voting begins on:
2025-07-02

Voting terminates on:
2025-09-24

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Published in Switzerland

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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, with 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 range of industrial chemical protective clothing by designating specific design types and providing classification of clothing, material, and component performance. This document is intended to provide comprehensive requirements for the performance classification and labelling of chemical protective clothing.

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 series of documents is intended to provide a modular approach to design and specification for chemical protective clothing accommodating the variety and severity of risks 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 Type 1 through Type 6 garments were originally created to differentiate garment performance through a specific garment test(s): These "Type" garments could not be placed in an intrinsic hierarchy, although the fabric barrier performances (intrinsic properties of the fabric and seams) created an indirect hierarchy in certain cases. For example, Type 1 is in general more protective than Type 2, Type 5 and Type 6; and Type 3 is, in general, more protective than Type 4 and Type 6. Although the Type 1-Type 6 system has been superseded by the modular approach, a correlation table will be available in ISO/DIS 16602-6.

In the previous ISO 16602 (and EN equivalents EN 13034, EN 14605, EN 943 series, EN 1073 series, and EN 14325), there is a link between the garment tests, the Type (Type 1 through Type 6), and the physical and chemical requirements of materials and components. This revision of the ISO 16602 series (intended to be an EN ISO standard), applies a modular approach that breaks that link. Nevertheless, the existing test methods from ISO 16602 and in other European standards (e.g. EN 14325:2018) have been used as the basis for this revision.

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 1: General requirements

1 Scope

This document specifies minimum performance classification and labelling requirements for protective clothing designed to provide protection against:

- specified chemicals in the workplace, and
- unidentified chemicals in emergency situations.

Protective clothing against chemicals including solids, airborne particles, aerosols, liquids, and gases (including radioactive contamination) is addressed by this document. Whether for chemicals or radioactive contaminants in the form of solids, airborne particles, aerosols, liquids, or gases, their protection is assessed using the garment test. This document shall be used in conjunction with the following standards: ISO/DIS 16602-2, ISO/DIS 16602-3, ISO/DIS 16602-4 and ISO/DIS 16602-5.

Protective clothing items covered by this document include full body and partial body. The area of protection is denoted in the marking requirements. The ISO 16602 series allows for a modular approach for increasing the minimum chemical protection. This document sets the general requirements and the rules for applying the modular approach. The additional protective properties are indicated in the marking and the instructions for use. The other documents in this series focus on requirements and classification from design, chemical, physical properties and garment testing perspectives.

The seams, joins and assemblages attaching the components (including accessories) are included within the scope of this series of standards. ISO/DIS 16602-6 provides a Selection, Care and Maintenance guide to help the end-user selection process and also gives a thorough overview of the ISO 16602 series.

Chemicals such as violently air sensitive reagents, unstable explosives and cryogenic liquids have not been considered since protection against these additional hazards is beyond the scope of this standard. Particulate protection is limited to physical penetration of the particulates only; permeation of solids is not considered.

This document does not address components such as gloves, boots, eye/face protection devices and respiratory protective devices as their performance criteria are specified in other standards. However, when these components are an integral part of the protective clothing ensemble or are tested as part of an ensemble, supplementary requirements may be provided in this standard.

This document does not specifically address non-chemical hazards, such as biological and infective agents, thermal (flame, heat or cold) hazards, explosive hazards, and ionizing radiation hazards (other than radioactive contamination) as specific requirements are covered by other relevant standards. The type of equipment specified in this series of standards is not intended for protection against total immersion in liquids. However, additional protection may be integrated as a specific module based on the respective standard (e.g. meeting both ISO/DIS 16602-1 & ISO 11612 in a multi-risk suit).

It is not the intent of this series of documents to be exhaustive and address all possible scenarios.

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 3758, *Textiles — Care labelling code using symbols*

ISO 6529, *Protective clothing — Protection against chemicals — Determination of resistance of protective clothing materials to permeation by liquids and gases*

ISO 6530, *Protective clothing — Protection against liquid chemicals — Test method for resistance of materials to penetration by liquids*

ISO 8690, *Measurement of radioactivity — Gamma ray and beta emitting radionuclides — Test method to assess the ease of decontamination of surface materials*

ISO 9271, *Decontamination of radioactively contaminated surfaces — Testing of decontamination agents for textiles*

ISO 11092, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*

ISO 11610:2023, *Protective clothing — Vocabulary*

ISO 11612, *Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements*

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 13688, *Protective clothing — General requirements*

ISO 13994, *Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure*

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

ISO 14116, *Protective clothing — Protection against flame — Limited flame spread materials, material assemblies and clothing requirements*

ISO 15025:2016, *Protective clothing — Protection against flame — Method of test for limited flame spread*

ISO/DIS 16602-2:—¹⁾, *Protective clothing for protection against chemicals — Classification, labelling and performance requirements — Part 2: Physical test methods, classification and requirements*

ISO/DIS 16602-3:—²⁾, *Protective clothing for protection against chemicals — Classification, labelling and performance requirements — Part 3: Chemical test methods, classification and requirements*

ISO/DIS 16602-4:—³⁾, *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/DIS 16602-5:—⁴⁾, *Protective clothing for protection against chemicals — Classification, labelling and performance requirements — Part 5: Garment test methods, classification and requirements*

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

2) Under preparation. Stage at the time of publication: ISO/DIS 16602-3:2025

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

4) Under preparation. Stage at the time of publication: ISO/DIS 16602-5:2025

ISO 16900-1:2019, *Respiratory protective devices — Methods of test and test equipment — Part 1: Determination of inward leakage*

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)*

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 20345:2021, *Personal protective equipment — Safety footwear*

ISO 20471, *High visibility clothing — Test methods and requirements*

ISO/DIS 22615:—⁵⁾, *Protective clothing — Performance requirements and tests methods for protective clothing against infective and biological agents*

EN 1149-5, *Protective clothing — Electrostatic properties — Part 5: Material performance and design requirements*

EN 16350, *Protective gloves — Electrostatic properties*

EN 17528, *Clothing — physiological effects — Measurement of water vapour resistance by means of a sweating manikin*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11610, Annex A as well as 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

accessory

subordinate or supplementary part, object, or the like of a garment (4.1.2) used mainly for convenience, safety, etc.

Note 1 to entry: Accessory (4.3.25) may be permanently attached or removable.

[SOURCE: ISO 11610:2023, 4.3.25]

3.2

body protection

protection of the full body or parts thereof

3.2.1

full body

protection of the body that includes at least the torso, arms and legs, not necessarily head, feet and hands

EXAMPLE encapsulating suits, one or more piece suits (e.g. coveralls, jackets and trousers).

5) Under preparation. Stage at the time of publication: ISO/DIS 22615:2025

3.2.2

partial body

protection of the body that includes only one or more of the elements of the body (torso, arm(s), leg(s), head, feet)

Examples of partial body would include: aprons, smocks, hoods, sleeves, and shoe and boot covers

3.3

chemical protective footwear/chemical safety footwear

footwear, whether integral to the garment or not, incorporating safety features to protect the wearer from injuries that could arise through accidents

3.3.1

chemical protective overshoe/overboot

footwear, not integral to the garment, incorporating safety features to protect the wearer and worn over the sock/bootie

3.3.2

chemical protective sock/bootie

sock like extension of the chemical protective suit. Sock or bootie are an integral part of the chemical protective garment.

Note 1 to entry: The bootie may or may not be made of the same material used in the construction of the chemical protective suit.

3.4

chemical protective garment

single article of protective clothing, worn to provide protection to the skin against exposure to or contact with chemicals, which covers or replaces personal garment(s)

3.4.1

re-usable chemical protective garment

chemical protective garment that is constructed from materials which allow the garment to be cleaned after repeated chemical exposures such that it remains suitable for continued use

[SOURCE: ISO 11610:2023, 5.2.2]

3.4.2

limited use chemical protective garment

chemical protective garment for limited duration of use, i.e. to be worn until hygienic cleaning becomes necessary or chemical contamination has occurred and disposal is required.

Note 1 to entry: This includes protective garments for single use and for limited re-use according to the information supplied by the manufacturer.

[SOURCE: ISO 11610:2023, 7.2.8]

3.5

chemical protective suit

garment worn to protect against chemicals that covers the whole, or greater part of the body

Note 1 to entry: A chemical protective suit may comprise of garments combined together to provide protection to the body. A suit may also have various types of additional protection such as hood or helmet, boots and gloves joined with it.

[SOURCE: ISO 11610:2023, 7.2.2]

3.6

component

part or sub-assembly of a protective item necessary for it to meet its respective requirements

4 General requirements

4.1 General

Any garment and its component shall meet all the requirements of ISO 13688 in addition to the requirements set in this document and as defined in ISO/DIS 16602-2, ISO/DIS 16602-3, ISO/DIS 16602-4, and ISO/DIS 16602-5.

This ISO/DIS 16602-1 to ISO/DIS 16602-5 series is intended to provide a modular approach to design and specification for chemical protective clothing accommodating the variety and severity of risk found, and activities carried out in the workplace.

NOTE ISO/DIS 16602-6 does not have any requirements, but provides an explanation for how some of the requirements may be used by the user or purchaser to define their criteria and needs for selection, use, care and maintenance. ISO 16602 is also intended to reconcile the differences with the previous ISO and EN standards.

This document requires that materials of construction and components of the suit be tested for resistance to the chemical and mode of ingress. In cases where more than one chemical is tested, each component and material of construction shall be tested against each chemical.

4.2 Chemical compatibility between suits and components

The levels of chemical protection afforded by the suit materials, and various components and accessories are unlikely to be identical.

The chemical protective performance of each suit material, accessory and component that is part of the chemical protective envelope around the wearer shall be reported in the manufacturer's instructions (IFU). The chemical protection performance shall be defined by the results obtained from the test methods in this document. The manufacturer shall also define which components are required in order to provide that performance.

EXAMPLE An ensemble has a defined protection against 20 chemicals. The ensemble includes a single suit and allows for 5 different attachable gloves. Between the five gloves, they provide protection against all the 20 chemicals. Each glove separately protects against 6 chemicals. The IFU of the ensemble will have the chemical protection performance of the suit and the chemical protection performance for the five different gloves that must as minimum provide a chemical protection that is equivalent or better than the rating that is achieved by the suit for the defined 20 chemicals. The user will then be able to choose the appropriate glove for the protection required based on the 20 chemicals.

4.3 Requirements for pre-treatment and conditioning for testing

4.3.1 Cleaning

Before each test, all chemical protective clothing material samples, with the exception of limited-use chemical protective clothing, shall undergo pre-treatment by cleaning and disinfection.

For materials, which require pre-treatment by cleaning and disinfection, the performance classification shall be based on the lowest/worst performance classification obtained on testing as new (not pre-treated) and pre-treated materials. If insufficient documented evidence (i.e. previous test data) is available to determine whether the test shall be performed as new or pre-treated, the test shall be performed in both conditions.

If the manufacturer's instructions indicate that cleaning or disinfection is not allowed, i.e. limited use garments, then testing shall be carried out on new material or a new garment.

Where applicable according to manufacturer's instructions, the hygienic cleaning and disinfection shall be in line with the manufacturer's instructions, on the basis of standardized procedures. If the number of cleaning and disinfection cycles is not specified, the tests shall be carried out after 5 cycles of cleaning. Each cycle shall consist of one wash cycle, one dry cycle and one disinfection cycle carried out as indicated by the manufacturer's instructions.

Manufacturer's instructions with regard to number of cleaning cycles, cleaning procedures and possible reapplication of treatments (e.g. repellency) shall be observed, potentially including sterilisation.

NOTE Cleaning is not the same as decontamination. Decontamination is not part of pre-conditioning or pre-treatment.

4.3.2 Conditioning

All samples shall be conditioned by storage at $(23 \pm 3) ^\circ\text{C}$ and $(60 \pm 10) \%$ relative humidity for at least 24 h. Testing of samples shall commence within 10 min of removing the sample from the conditioning atmosphere, unless otherwise indicated in the test method standard.

This conditioning requirement takes priority over any conflicting conditioning requirements in the individual test method standards.

Conditioning may be omitted or aligned with the conditions of [4.3.3](#), if it can be shown that test results are not affected by the foreseeable changes of temperature and relative humidity.

4.3.3 Testing temperature

Unless otherwise specified in this series of standards, all testing shall be conducted at the same conditions used for conditioning specified in [4.3.2](#).

Chemical permeation testing shall be conducted at $(23 \pm 1) ^\circ\text{C}$.

This testing temperature requirement takes priority over any conflicting temperature requirements in the individual test method standards.

4.3.4 Simulation of extreme storage conditions

Foreseen or normal storage conditions are provided according to the IFU ([11.2](#) b); if extreme storage conditions are applicable these shall also be included in the IFU.

Extreme storage conditions are defined as temperature $\geq 60 ^\circ\text{C}$ and $\leq -30 ^\circ\text{C}$.

If the manufacturer claims extreme storage conditions in the IFU, two garments shall be exposed, in the original packaging. For a period of no less than 24 h, the garments shall be exposed to the highest claimed temperature and at $(95 \pm 5) \%$ relative humidity. After being allowed to return to ambient temperature, the garments shall be exposed for no less than 24 h to the lowest claimed temperature.

After the extreme storage exposure, the garments shall be allowed to return to ambient temperature. The garments shall be tested according to [4.3.3](#) using the minimum practical performance test defined in [7.5](#) and in ISO/DIS 16602-5: — (5).

A visual inspection shall be carried out prior to subsequent testing. Any changes to the garment's appearance or characteristic (compared to normal conditioning in [4.3.3](#) or as received) shall be noted in the test report.

4.3.5 Deterioration of repellency by cleaning

Where the finishing, applied to improve or maintain the liquid repellency performance of the garment, can be deteriorated by the cleaning procedures indicated by the manufacturer, the manufacturer shall indicate the maximum number of cleaning cycles that can be carried out before the garment needs to be re-treated or re-impregnated to restore its performance.

Testing according to ISO/DIS 16602-3 clause 7 shall be carried out before the cleaning cycle for which the manufacturer guarantees the performance.

For example, if the instructions state "re-impregnation during each third cleaning cycle", tests shall be performed after the second cleaning cycle, i.e. before re-impregnation. Then after reimpregnation is applied, the test should be performed again in order to demonstrate meeting the requirement.

If the instructions state “re-impregnation after each cleaning cycle”, the tests shall be performed on new items. Later, the item shall be cleaned, reimpregnation is applied and testing repeated again in order to demonstrate meeting the requirement.

In all cases, cleaning shall be performed according to [4.3.1](#).

5 Physical requirements

Chemical protective clothing materials shall be tested and classified according to the physical requirements of ISO/DIS 16602-2, unless specified differently in ISO/DIS 16602-4.

To meet the minimum requirements of this document, unless specified differently in ISO/DIS 16602-4, a class 1 for each of the core physical requirements, as defined in [Table 1](#), shall be met. Classification shall be according to the classification of ISO/DIS 16602-2.

Table 1 — Core physical requirements

Core Physical Requirements
Abrasion resistance
Flex cracking resistance
Tear resistance
Tensile strength
Puncture resistance
Seam strength

The garment physical average properties shall also be marked with the symbol in [Figures B.3.1](#) and [B.3.2](#) according to the requirements of this document (see Annex [B.3](#)).

This marking will be used in conjunction with a number in the upper right-hand side that provides the average of the classes of core physical requirements as defined by this clause. This number will be rounded down to the integer. The individual results of the mechanical tests shall be mentioned in the instructions for use.

Table 2 — Example of physical property calculation

Mechanical	Result	Class
Abrasion	>10	1
Flex cracking	>1 000	1
Tear	>40	3
Tensile	>60	2
Puncture	>5	1
Seam	>50	2
Average of the classes		1,67
Integer part		1

In this example of [Table 2](#), the digit would be “1” rather than “2” (i.e. the integer part of the calculated average of the classes), thus giving the marking in [figure B.3.1](#) (upper right-hand corner), in [Annex B](#).

6 Chemical ingress requirements

As a minimum, a garment shall meet the garment design requirements of ISO/DIS 16602-4, the corresponding garment test of ISO/DIS 16602-5 and the minimum chemical ingress requirements in ISO/DIS 16602-3.

NOTE For example, a gas tight suit would need to at least meet the design requirement of the pressure tight design, meet the garment test of ISO 17491-1 according to ISO/DIS 16602-5, and the fabrics, seams, etc. need to meet at least the minimum requirement of ISO/DIS 16602-3 for permeation (barrier Class A).