

**Protective clothing
against liquid
chemicals —
Performance
requirements for
clothing with liquid-tight
(Type 3) or spray-tight
(Type 4) connections,
including items
providing protection to
parts of the body only
(Types PB [3] and PB [4])**

The European Standard EN 14605:2005 has the status of a
British Standard

ICS 13.340.10

National foreword

This British Standard is the official English language version of EN 14605:2005. It supersedes BS EN 465:1995, BS EN 466-1:1995 and BS EN 467:1995 which are withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PH/3, Protective clothing, to Subcommittee PH/3/3, Clothing for protection from chemicals and radioactive contamination, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Cross-references

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Protective clothing against liquid chemicals - Performance requirements for clothing with liquid-tight (Type 3) or spray-tight (Type 4) connections, including items providing protection to parts of the body only (Types PB [3] and PB [4])

Vêtements de protection contre les produits chimiques liquides - Exigences relatives aux vêtements dont les éléments de liaison sont étanches au liquide (Type 3) ou aux pulvérisations (Type 4), y compris les articles d'habillement qui protègent seulement certaines parties du corps (Types PB (3) et PB (4))

Schutzkleidung gegen flüssige Chemikalien - Leistungsanforderungen an Chemikalienschutzanzüge mit flüssigkeitsdichten (Typ 3) oder spraydichten (Typ 4) Verbindungen zwischen den Teilen der Kleidung, einschließlich der Kleidungsstücke, die nur einen Schutz für Teile des Körpers gewähren (Typen PB [3] und PB [4])

This European Standard was approved by CEN on 14 February 2005.

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Foreword

This document (EN 14605:2005) 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 September 2005, and conflicting national standards shall be withdrawn at the latest by September 2005.

This document supersedes EN 465:1995, EN 466:1995 and EN 467:1995.

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 89/686/EEC.

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This document includes a Bibliography.

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1 Scope

This document specifies the minimum requirements for the following types of limited use and reusable chemical protective clothing:

- Full-body protective clothing with liquid-tight connections between different parts of the clothing (Type 3: liquid-tight clothing) and, if applicable, with liquid-tight connections to component parts, such as hoods, gloves, boots, visors or respiratory protective equipment, which may be specified in other European Standards.
Examples of such clothing are one-piece coveralls or two-piece suits, with or without hood or visors, with or without boot-socks or over-boots, with or without gloves;
- Full-body protective clothing with spray-tight connections between different parts of the clothing (Type 4: spray-tight clothing) and, if applicable, spray-tight connections to component parts, such as hoods, gloves, boots, visors or respiratory protective equipment, which may be specified in other European Standards.
Examples of such clothing are one-piece coveralls or two-piece suits, with or without hood or visors, with or without boot-socks or over-boots, with or without gloves;
- Partial body protection garments offering protection to specific parts of the body against permeation of chemical liquids.
Examples of such garments are e.g. laboratory coats, jackets, trousers, aprons, sleeves, hoods (not air-supplied) etc. As partial body protection leaves some parts of the body unprotected this document specifies only the performance requirements for the clothing material and the seams.

NOTE Partial body chemical protective garments which offer only protection against penetration of chemical liquids are within the scope of EN 13034 (Type PB [6] clothing).

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 340:2003, *Protective clothing — General requirements*.

EN 463, *Protective clothing - Protection against liquid chemicals - Test method: Determination of resistance to penetration by a jet of liquid (Jet Test)*.

EN 468, *Protective clothing - Protection against liquid chemicals - Test method: Determination of resistance to penetration by spray (Spray Test)*.

EN 12941:1998, *Respiratory protective devices - Powered filtering devices incorporating a helmet or a hood - Requirements, testing, marking*.

EN 14325:2003, *Protective clothing against chemicals — Test methods and performance classification of chemical protective clothing materials, seams, joins and assemblages*.

EN 23758, *Textiles - Care labelling code using symbols (ISO 3758:1991)*.

EN 31092, *Textiles — Determination of physiological properties — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded - hotplate test) (ISO 11092:1993)*.

CEN ISO/TR 11610:2004, *Protective clothing - Vocabulary (ISO/TR 11610:2004)*.

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN ISO/TR 11610:2004 apply.

4 Requirements

4.1 Materials

Chemical protective clothing materials shall be tested according to the requirements of Table 1 and in accordance with the test methods specified in EN 14325. A performance level of at least 1 shall be obtained for all requirements.

Chemical protective clothing materials shall not be known to cause skin irritation or have any adverse effect to health (see also EN 340:2003, 4.2).

Prior to testing, all chemical protective clothing materials shall be cleaned, if the manufacturer's instructions indicate that cleaning is allowed. Manufacturer's instructions with regard to number of cleaning cycles, cleaning procedures and possible reapplication of treatments shall be observed. If no maximum number of cleaning cycles is indicated, materials shall undergo five cycles.

All test specimens shall be conditioned at (20 ± 2) °C and (65 ± 5) % relative humidity for at least 24 h and testing shall start within 5 min after removing the specimen from the conditioning atmosphere.

Table 1 — Test requirements for Type 3, Type 4, Type PB [3] and Type PB [4] clothing

Clause in EN 14325:2003	Performance requirement
4.4	abrasion resistance
4.5	flex cracking resistance
4.6 ^a	flex cracking resistance at -30 °C
4.7	tear resistance (trapezoidal)
4.9	tensile strength
4.10	puncture resistance
4.11	resistance to permeation of liquids
4.14	resistance to ignition
^a Only applicable to clothing intended for use at very low temperatures.	

NOTE 1 Chemical protective clothing material, for which a test method in Table 1 does not provide a clear measurement end-point, should be marked "not applicable" in the test report and in the instructions for use. The reason why the test could not be completed should be indicated, e.g. where the elasticity of the specimen prevents to determine an end-point in the puncture resistance test.

NOTE 2 Materials should be as light and as flexible as possible in order to ensure wearer comfort as well as providing effective protection. Material properties are only one element for the determination of wearer comfort of protective clothing. Design features of the clothing may even have a more important influence on wearer comfort than material properties.

4.2 Seams, joins and assemblages

Seams, joins and assemblages shall be tested and classified according to the requirements of Table 2 and the corresponding clauses of EN 14325.

Table 2 — Requirements for seams, joins and assemblages of Type 3, Type 4, Type PB [3]^a and Type PB [4] clothing

Performance requirement	Reference
resistance to permeation of liquids ^b	EN 14325:2003, 4.11
resistance to penetration by liquids ^c	EN 463 or EN 468
seam strength	EN 14325:2003, 5.5
^a Seams, joins and assemblages of Type PB [3] clothing shall be tested to the jet test (EN 463). ^b Applicable only to seams which are exposed in use. For partial body protection items only seams relevant to the construction shall be considered and a performance level of at least 1 shall be obtained. ^c To be tested by whole suit tests, i.e. EN 463 (jet test) for Type 3 clothing and EN 468 (high level spray test) for Type 4 clothing.	

4.3 Performance requirements for whole suits (Types 3 and 4)

4.3.1 General

Chemical protective clothing shall fulfil the relevant requirements of EN 340. The clothing shall be made so that the wearer has freedom of movement and is as comfortable as possible, consistent with the protection afforded by the garment, as can be verified by the "seven movements" test, described in 4.3.4.1.

NOTE 1 Wearer comfort can be judged in wear trials of the suit with test persons experienced in the type of work and environments for which the suits are intended as protective clothing.

Chemical protective clothing Type 3 and Type 4 shall fulfil the requirements specified in 4.3.4 (Table 3), when combined with additional protective equipment, i.e. for protection of hands, feet, face, head and/or respiratory tract, according to the manufacturer's instructions and when tested as a complete suit.

The requirements of this clause apply to the garment as a whole including component parts (e.g. gloves, boots, hoods or respirators) that are not integral to the garment. The joins and assemblages attaching these components are included within the scope of this document, whereas criteria for the components are given in other European Standards.

NOTE 2 Partial body protection covers only specific areas of the body, leaving others exposed to the hazard. Because of this only limited testing of this type of clothing is appropriate and this product standard is defined accordingly.

4.3.2 Pre-conditioning

Prior to testing, the chemical protective clothing shall be cleaned, if the manufacturer's instructions indicate that cleaning is allowed. Manufacturer's instructions with regard to number of cleaning cycles, cleaning procedures and possible reapplication of treatments shall be observed. If no maximum number of cleaning cycles is indicated, the clothing shall undergo five cleaning cycles.

4.3.3 Conditioning

All chemical protective clothing shall be conditioned for at least 24 h at the same conditions as used for the test.

4.3.4 Resistance to penetration by liquids

4.3.4.1 General and preliminary testing

Type 3 chemical protective clothing shall be tested against penetration by liquids by means of a jet test in accordance with 4.3.4.3.

Type 4 chemical protective clothing shall be tested against penetration by liquids by means of a spray test in accordance with 4.3.4.2.

Partial body protection items Type PB [4] shall not be tested against these criteria. Seams, joins and assemblages of Type PB [3] clothing shall be tested to the jet test (EN 463) (see also Table 2, footnote a)).

Prior to testing each suit in accordance with EN 463 or EN 468, a practical test shall be carried out by a human test subject. If more than one size of chemical protective suit is manufactured, the test subject will be asked to select the appropriate size according to the manufacturer's information leaflet. If applicable, the test subject shall also wear additional personal protective equipment, as specified in the manufacturer's instructions.

The test shall comprise three repetitions, at moderate speed, of the "seven movements" sequence described below.

Starting from a standing position in each case, carry out the following movement sequence:

- movement 1: kneel on both knees, lean forward and place both hands on the floor (45 ± 5) cm in front of the knees; crawl forward and backwards on hands and knees for a distance of three metres in each direction;
- movement 2: climb a vertical ladder at least four steps, rungs to be as encountered on a typical ladder;
- movement 3: position hands at chest level, palms out; reach directly overhead, interlock thumbs, extend arms fully upwards;
- movement 4: kneel on right knee, place left foot on floor with left knee bent (90 ± 10) °; touch thumb of right hand to toe of left shoe. Repeat movement with alternate posture, i.e. by kneeling on left knee and placing the right foot on the floor with knee bent at 90°;
- movement 5: extend arms fully in front of body, lock thumbs together, twist upper body (90 ± 10) ° left and right;
- movement 6: stand with feet shoulder width apart, arms at side; raise arms until they are parallel to the floor in front of the body; squat down as far as possible;
- movement 7: kneel as in movement 4, left arm hanging loosely at side; raise arm fully overhead. Repeat movement with alternate posture by alternating arms.

If the test subject is not able to perform one or several movements due to the hindrance of the suit or if the movements result in substantial damage to the suit, the suit shall be considered to have failed.

Suits equipped with a visor shall also pass the tests specified in 4.4 before further testing. Failure will result in a disqualification for further testing and the suit shall be considered to have failed.

4.3.4.2 Resistance to penetration by liquids (spray test)

Three new suits, pre-conditioned in accordance with 4.3.2, shall be tested in accordance with EN 468. If applicable, the suits shall be worn with the additional personal protective equipment specified in the manufacturer's instructions.

All suits shall pass the test, i.e. the total stain area on any one undergarment of each suit shall be less than or equal to three times the total calibrated stain area.

4.3.4.3 Resistance to penetration by liquids (jet test)

Three new suits, pre-conditioned in accordance with 4.3.2, shall be tested in accordance with EN 463. If applicable, the suits shall be worn with the additional personal protective equipment specified in the manufacturer's instructions.

All suits shall pass the test, i.e. the total stain area on any one undergarment of each suit shall be less than or equal to three times the total calibrated stain area.

4.4 Visor

4.4.1 General

Where a visor is fitted as part of the suit, as distinct from a respiratory protective device joined to the suit, the visor shall comply with the requirements of 4.4.1 to 4.4.4.

Where anti-fogging compounds are used or specified in the information supplied by the manufacturer, they shall not have an adverse effect on the health of the wearer, or on the properties of the protective garment.

NOTE If a visor is integrated in a hood, adequate respiratory protection should be provided. The respiratory protective device should meet the requirements of the relevant product standard and the compatibility between respiratory protective device and hood should be checked.

4.4.2 Mechanical strength of visor

The visor shall not be visibly damaged in such a way as to be likely to affect the performance of the complete device, when tested in accordance with 7.5 of EN 12941:1998. This test shall be followed by a spray test (EN 468), or jet test (EN 463), as appropriate.

4.4.3 Field of vision

When carrying out the seven movements prior to the start of the spray test, or the jet test as appropriate, (see 4.3.4.1 or 4.3.4.2), the field of vision shall be judged satisfactory by the test subject(s).

4.4.4 Distortion of vision

The test subject(s) shall be able to read a sign with letters of 100 mm high and a proportional width from a distance of 6 m.

5 Marking

The chemical protective clothing shall be marked with at least the following information. The marking shall be clearly visible and as durable as adequate for the life of the clothing.

- a) the name, trade mark or other means of identification of the manufacturer;
- b) the type of the chemical protective clothing, i.e. Type 3 or Type 4 for full-body protective clothing, or PB [3] or PB [4] for partial body protection;
- c) the number and date of publication of this document;
- d) the year of manufacture, and also the month of manufacture if the expected shelf-life of the clothing is less than 24 months. This information may be marked on every commercial packaging unit instead of being marked on every item of clothing;

- e) the manufacturer's type, identification or model number;
- f) the size range as defined in EN 340;
- g) a pictogram showing that the clothing is intended to protect against chemicals (ISO 7000, see EN 340) and a pictogram inviting to read the instructions for use and any other information supplied by the manufacturer (ISO 7000, see EN 340);
- h) for reusable clothing: care pictograms according to IEN 23758; for limited use clothing, a warning sentence: "do not re-use".

NOTE Consideration should be given to suitable additional marking

6 Information supplied by the manufacturer

This information shall accompany every item of chemical protective clothing or at least every commercial packaging unit. The purpose is to guarantee that the wearer is confronted with these instructions.

The information shall be at least in the official language(s) of the country or region of destination. They shall be clear, legible, unambiguous and, if helpful, illustrations, part numbers, marking etc. shall be added. If appropriate, warnings shall be given against problems likely to be encountered.

The instructions together with the information on the marking shall contain at least the following information:

- a) the name, trademark or other means of identification of the manufacturer and/or his authorised representative established in the European Union or the country where the product is placed on the market;
- b) the reference number of this document and the identification as "Type 3" or "Type 4" limited use or reusable full-body chemical protective clothing, or as Type PB [3] or PB [4] for partial body protection;
- c) if applicable, a statement to specify additional personal protective equipment with which the suit shall be worn, and how to attach or connect them, to achieve the claimed performance classification. This statement shall be precise enough to help the user to select the appropriate equipment, e.g. a hood model YY or equivalent, or respiratory protection including a full face mask, etc...;
- d) the manufacturer's type, identification or model number;
- e) the size range (as defined in EN 340);
- f) a list of chemicals and chemical products (including the names and approximate concentrations of the components) to which the protective clothing has been tested and the performance levels obtained in permeation and/or penetration testing.
In principle the use of the clothing shall be restricted to the chemicals listed, but if the list represents only a selection of the available information, then this shall be clearly stated and the reference to where additional information can be obtained shall be mentioned, e.g. a separate brochure, the manufacturer's telephone or fax number, a web site on the internet etc..;
- g) all other test performance levels, preferably in a table; explanations on the meaning of these performance levels;
- h) care pictograms according to EN 23758, the explanation of these pictograms and all other relevant additional information on cleaning and disinfection, e.g. cleaning procedures, disinfecting agents to be used, maximum number of cleaning cycles, re-application of treatments, etc...(see also EN 340:2003, 5.4);
- i) the expected shelf-life of the garment if ageing can occur;

- j) information necessary for trained persons on:
- application, limitations of use (temperature range etc.),
 - tests to be carried out by the wearer before use (if applicable),
 - fitting,
 - use,
 - removal,
 - maintenance and cleaning procedures (including guidance for decontamination and disinfection),
 - storage,
 - if applicable, disposal (contaminated chemical protective clothing may be harmful and should be disposed of as hazardous waste in accordance with national regulations),
 - special attention to potential problems which may be caused by deterioration of special treatments and the correct way of regenerating these treatments;
- k) a statement to advise that the wearing of chemical protective clothing may cause heat stress and, if applicable, information on comfort-related parameters, e.g. the R_{et} value according to EN 31092.

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Annex ZA (informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 89/686/EEC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 89/686/EEC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA — Correspondence between this European Standard and Directive 89/686/EEC

Clause(s) of this standard	Clause(s) of EU Directive 89/686/EEC, Annex II
4.1	1.2.1.1 Suitable constituent materials
4.1	1.3.2 Lightness and design strength
4.1	3.10.2 Protection against dangerous substances and infective agents - Protection against cutaneous and ocular contact
4.2	1.3.2 Lightness and design strength
4.2	3.10.2 Protection against dangerous substances and infective agents - Protection against cutaneous and ocular contact
4.3.1	1.2.1 Absence of risks and other nuisance factors
4.3.1	1.2.1.3 Maximum permissible user impediment
4.3.2	2.4 PPE subject to ageing
4.3.4.1	1.1.1 Ergonomics
4.3.4.1	1.2.1.3 Maximum permissible user impediment
4.3.4.1	1.3.3 Compatibility of different classes of PPE designed for simultaneous use
4.3.4.2	3.10.2 Protection against dangerous substances and infective agents - Protection against cutaneous and ocular contact
4.3.4.3	3.10.2 Protection against dangerous substances and infective agents - Protection against cutaneous and ocular contact
4.4	2.3 PPE for the face, eyes and respiratory tract
5	2.12 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety
6	1.3.3 Compatibility of different classes of PPE designed for simultaneous use
6	2.4 PPE subject to ageing
6	2.12 PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

- [1] EN 13034:2004, *Protective clothing against liquid chemicals — Performance requirements for chemical protective clothing offering limited protective performance against liquid chemicals (Type 6 and Type PB[6] equipment)*

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