INTERNATIONAL STANDARD

**ISO 16602**

First edition
2007-12-15

**AMENDMENT 1**
2012-09-15

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

## AMENDMENT 1

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

*AMENDEMENT 1*

Reference number
ISO 16602:2007/Amd.1:2012(E)

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Published in Switzerland

# Foreword

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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.

Amendment 1 to ISO 16602:2007 was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*.

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

# AMENDMENT 1

*Page v, Introduction*

Add the following after the last paragraph:

Changes introduced by Amendment 1:

— Experimental work has shown that the test method to assess flammability of chemical protective clothing materials was not suitable for some materials used for this purpose. Since it was not possible to reach a good reproducibility of test results, it was decided to remove this test requirement from this International Standard.

— The references to ISO 17491:2002 have been replaced by references to four new parts of ISO 17491.

— Some editorial changes have been made in 5.10, A.1, A.3, G.3 and G.6 in order to achieve a better, unambiguous understanding of the requirements in these clauses.

— In 6.5.1 and 6.5.2 the specifications for the reporting of test results has been improved.

— Errors in 6.6, 6.14, 7.5.2, 7.6.5 and G.6 have been corrected.

*Page 2, Normative references*

Delete:

EN 13274-4:2001, *Respiratory protective devices — Methods of test — Part 4: Flame tests*

ISO 17491:2002, *Protective clothing — Protection against gaseous and liquid chemicals — Determination of resistance of protective clothing to penetration by liquids and gases*

Add:

ISO 17491-1:2012, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 1: Determination of resistance to outward leakage of gases (internal pressure test)*

ISO 17491-2:2012, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 2: Determination of resistance to inward leakage of aerosols and gases (inward leakage test)*

ISO 17491-3:2008, *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 17491-4:2008, *Protective clothing — Test methods for clothing providing protection against chemicals — Part 4: Determination of resistance to penetration by a spray of liquid (spray test)*

*Page 7, 5.4 Leak tightness*

Replace the existing subclause with the following:

When tested in accordance with ISO 17491-1:2012, Method 2, Type 1a, Type 1b and Type 1c chemical protective suits shall not have a pressure drop of more than 20 % after the pressure/inflation period. Leak tightness testing shall be performed on two chemical protective suits.

*Page 7, 5.5 Inward leakage*

Replace the existing subclause with the following:

When tested for inward leakage as specified in ISO 17491-2:2012, Method 1 or 2, Type 1c and Type 2 chemical protective suits shall not have an inward leakage greater than 0,05 %. Type 1b chemical protective suits shall be tested for inward leakage when the facemask is not permanently joined to the suit, and shall not have an inward leakage greater than 0,05 % in the ocular cavity of the mask. Inward leakage testing shall be performed on two sample clothing items. A separate test subject shall be used for each test.

*Page 7, 5.6 Liquid penetration resistance (jet test)*

Replace the existing subclause with the following:

Type 3 chemical protective clothing shall be conditioned by wearing according to Procedure C of Annex A and, when subsequently tested for liquid penetration resistance using a jet test in accordance with ISO 17491-3:2008, shall show no penetration greater than three times the total calibrated stain area. Liquid penetration resistance testing shall be performed on two sample clothing items using a separate test subject for each test.

*Page 7, 5.7 Liquid penetration resistance (spray test)*

Replace the existing subclause with the following:

Type 4 chemical protective clothing shall be conditioned by wearing according to Procedure C of Annex A and, when subsequently tested for liquid penetration resistance using a spray test in accordance with ISO 17491-4:2008, Method B, shall show no penetration greater than three times the total calibrated stain area. Liquid penetration resistance testing shall be performed on two sample clothing items using a separate test subject for each test.

*Page 8, 5.9 Limited liquid penetration resistance (modified spray test)*

Replace the existing subclause with the following:

Type 6 chemical protective clothing shall be conditioned by wearing according to Procedure C of Annex A and, when subsequently tested for limited liquid penetration resistance using a modified spray test in accordance with ISO 17491-4:2008, Method A, using a 1 min exposure, shall show no penetration greater than three times the total calibrated stain area. Liquid penetration resistance testing shall be performed on two sample clothing items using a separate test subject for each test.

*Page 8, 5.10 Practical performance*

Replace the text of list item b) with the following:

During the practical performance test, the test subject shall be asked to read a sign with the dimensions of 100 mm high and 200 mm wide at a distance of 6 m; on the sign there shall be four randomly selected letters of proportional font so that they fill the sign. For chemical protective clothing with hoods that are not at a fixed distance from the wearer's eyes, the hood/visor shall be worn in the typical wearing position.

*Page 9, 5.11 Face piece*

Replace the third paragraph with the following:

If the face piece is attached to a Type 1b chemical protective suit in a non-permanent manner, the sealing mechanism shall be tested for liquid penetration resistance using a jet test in accordance with ISO 17491-3:2008, and shall show no penetration greater than three times the calibrated stain area. Two samples of face piece to suit joints shall be tested after temperature conditioning (see 5.2).

*Page 13, Table 3*

Delete the reference to subclause 6.16 as follows:

| Sub-clause | Specific requirement | Type of chemical protective clothing | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ~~6.16~~ | ~~Resistance to flame~~ | ~~X~~ | ~~X~~ | ~~X~~ | ~~X~~ | ~~X~~ | ~~X~~ | ~~—~~ | ~~X~~ |

*Page 14, 6.5.1 General*

Replace the second paragraph with the following:

Materials used in Types 1, 2 and 3 chemical protective clothing shall achieve at least Class 3 performance against at least one of the chemicals listed in ISO 6529:2001, Annex A. The results shall be reported in the manufacturer's product technical information as specified in 10.3, together with a statement indicating whether the results have been obtained by closed loop testing or open loop testing.

*Page 14, 6.5.1 General*

Replace the fifth paragraph with the following:

Materials used in Type 4 chemical protective clothing – unless tested and classified according to 6.6 for resistance to penetration by liquid under pressure – shall achieve at least permeation resistance Class 1 performance against the specific chemicals indicated by the manufacturer. The results shall be reported in the manufacturer's product technical information as specified in 10.3, together with a statement indicating whether the results have been obtained by closed loop testing or open loop testing.

*Page 14, 6.5.2 Classification of permeation resistance by breakthrough time (optional)*

Replace the first paragraph with the following:

In addition to classifying the permeation resistance of the chemical protective clothing material according to average time to reach a cumulative permeation of 150 µg/cm$^2$, the option of classifying the material according to the normalized breakthrough time using a permeation rate of 0,1 µg/cm$^2$min, or the normalized breakthrough time using a permeation rate of 1,0 µg/cm$^2$min, or both normalized breakthrough times, may be chosen. The chemical protective clothing material average normalized breakthrough times shall be classified according to the levels of performance provided in Table 5. The results shall be reported in the manufacturer's product technical information as specified in 10.3, together with a statement indicating whether the results have been obtained by closed loop testing or open loop testing.

*Page 15, 6.6 Resistance to penetration by liquid under pressure*

In the first line, replace “ISO 13994:2005, Method E” with “ISO 13994:2005, Procedure D”.

*Page 19, 6.14 Abrasion resistance*

Replace the first paragraph with the following:

> When tested in accordance with ISO 12947-2 in the inverted mode, i.e. a test specimen of at least 140mm diameter placed on the abradant table and an abradant of at least 30mm diameter mounted in the test piece holder, using abrasive paper specified in Annex F and with an applied pressure of 9 kPa, the chemical protective clothing material abrasion resistance shall be classified using the number of abrasion cycles which cause damage to the material according to the levels of performance provided in Table 14. Four specimens shall be tested and the performance classified according to the lowest single result.

*Page 21, 6.16 Resistance to flame*

Delete the entire subclause.

*Page 23, 7.5.2 Seam strength*

Renumber the existing Table 18 as Table 17.

*Page 24, 7.6.5 Resistance to ignition*

Delete the entire subclause.

*Page 27, 10.4 Other test information*

Add the following after the first paragraph:

> If the garment is flame retardant, this shall be shown by test results obtained with a suitable test method. If the garment is not claimed to be flame retardant, the product information shall contain the warning: “Flammable. Keep away from fire.”
>
> NOTE For example, ISO 14116 specifies the performance requirements for the limited flame spread properties of materials, material assemblies and protective clothing in order to reduce the possibility of the clothing burning and thereby itself constituting a hazard. The classification system is based on testing according to ISO 15025:2000. Previous, less severe minimum requirements for resistance to ignition or resistance to flame of clothing materials, visors, etc., were based on test results in EN 13274-4, Method 3, which however has been found unsuitable for assessing flame retardance.

*Page 28, A.1 Procedure A*

Replace list item d) with the following:

> Stand erect with the arms down at the side of the body. Raise extended arms in the lateral direction on either side of the body upwards until the arms are vertical. Then bend the arms at elbows so that the upper arm is still vertical while the lower arm is horizontal, with the wrists backwards above the head. Repeat exercise four times. Then stand again erect with the arms down at the side of the body. Raise extended arms forward upwards until the arms are vertical. Then bend the arms at the elbows so that the upper

arm is still vertical while the lower arm is horizontal, with the wrists backwards above the head. Repeat exercise four times.

*Page 29, A.3 Procedure C*

Replace the seventh bullet with the following:

— **movement 7**: kneel as in movement 4, left arm hanging loosely at side; raise left arm fully overhead; repeat movement with alternate posture by alternating arms.

*Page 38, G.3 Test apparatus*

Replace the first sentence with the following:

The apparatus with rectangular cross-section shown in Figure G.1 shall typically be used to measure leakage through the specimen after flex cracking. For damage assessment after abrasion, a similar apparatus shall be used, but of appropriate round shape and dimensions for holding the test specimen.

*Page 39, G.6 Test report*

Replace the title of Figure G.1 with the following:

**Figure G.1 — Example of apparatus to test for sample damage after materials testing (rectangular test pot)**

*Page 40, Bibliography*

Add:

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

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

EN 13274-4:2001, *Respiratory protective devices — Methods of test — Part 4: Flame tests*

**ICS 13.340.10**

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