International Standard

ISO 374-1

Second edition
2024-07

Protective gloves against dangerous chemicals and micro-organisms —

Part 1: Terminology and performance requirements for chemical risks

Gants de protection contre les produits chimiques dangereux et les micro-organismes —

Partie 1: Terminologie et exigences de performance pour les risques chimiques

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

Reference number
ISO 374-1:2024(en)

© ISO 2024

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

COPYRIGHT PROTECTED DOCUMENT

© ISO 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

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 on 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 the following URL: 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,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 374-1:2016), which has been technically revised. It also incorporates the Amendment ISO 374-1:2016/Amd 1:2018.

The main changes are as follows:

— reference to new standard, ISO 21420:2020 + Amd 1:2022;

— new requirement for penetration;

— new Figure 2, changes in Figures 4, 5, 6;

— new expression of permeation results 5.4.1.2;

— new Annex A with reference to ISO 6529;

A list of all parts in the ISO 374 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.

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

Protective gloves against dangerous chemicals and micro-organisms —

Part 1:
Terminology and performance requirements for chemical risks

1 Scope

This document specifies the requirements for protective gloves intended to protect the user against dangerous chemicals and defines terms to be used.

NOTE If other protection features are covered, e.g., mechanical risks, thermal risks, electrostatic dissipation etc., the appropriate specific performance standard is used in addition. Further information on protective gloves standards can be found in the ISO 21420.

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 374-2:2019, *Protective gloves against dangerous chemicals and micro-organisms — Part 2: Determination of resistance to penetration*

ISO 374-4:2019, *Protective gloves against dangerous chemicals and micro-organisms — Part 4: Determination of resistance to degradation by chemicals*

ISO 6529:2013, *Protective clothing — Protection against chemicals — Determination of resistance of protective clothing materials to permeation by liquids and gases*

ISO 21420:2020, *Protective gloves — General requirements and test methods*

ISO 21420:2020/Amd 1:2022, *Protective gloves — General requirements and test methods — Amendment 1*

EN 16523-1:2015+Amd 1:2018, *Determination of material resistance to permeation by chemicals — Part 1: Permeation by liquid chemical under conditions of continuous contact*

3 Terms and definitions

For the purposes of this document, the terms and definitions in EN 16523-1:2015+Amd 1:2018 and the following apply.

ISO and IEC maintain terminology 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
dangerous chemicals
chemical substance potentially hazardous for the health (carcinogenic, mutagenic, reprotoxic, toxic, harmful, corrosive, irritant, sensitizing), as defined in any national regulation

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

3.2
degradation
deleterious change in one or more properties of a *protective glove material* (3.6) due to contact with a chemical

Note 1 to entry: Indications of degradation may include flaking, swelling, disintegration, embrittlement, colour change, dimensional change, appearance, hardening, softening, etc.

3.3
penetration
movement of a chemical through materials, seams, pinholes, or other imperfections in a *protective glove material* (3.6) on a non-molecular level

3.4
permeation
process by which a chemical moves through a *protective glove material* (3.6) on a molecular level

Note 1 to entry: Permeation involves the following:

— absorption of molecules of the chemical into the contacted (outside) surface of a material;

— diffusion of the absorbed molecules in the material;

— desorption of the molecules from the opposite (inside) surface of the material.

3.5
protective gloves against dangerous chemical
protective gloves which form a protective barrier to *dangerous chemicals* (3.1)

3.6
protective glove material
any material or combination of materials used in a protective glove for the purpose of isolating the hands or hands and arms from direct contact with a dangerous chemical

3.7
test chemical
chemical substance, or mixture of chemical substances, potentially hazardous to the health that is used under laboratory test conditions to determine the breakthrough time

4 Sampling

4.1 Sampling for permeation

Each protective glove material specimen to be tested shall conform to the requirement in EN 16523-1:2015+Amd 1:2018, Clause 7, so that the protective glove material can be sealed inside the test cell.

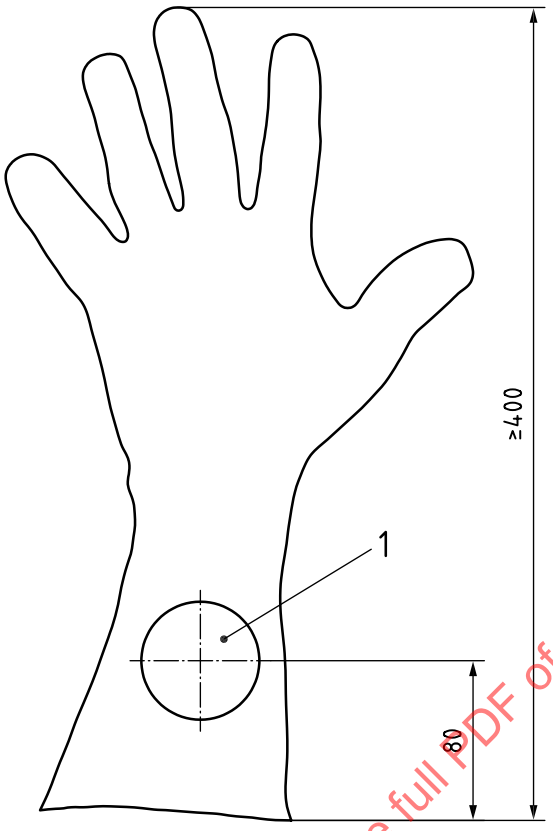
Three test specimens shall be taken from the palm area. If the glove is longer than or equal to 400 mm and if the cuff is claimed to protect against chemical risks, three additional test specimens shall be taken where the centre is approximately at 80 mm from the end of the cuff (see Figure 1).

Other parts of the glove can be tested on request. In the case of seams in the hand area, this area shall be tested. For multilayer protective gloves against chemicals, in the case of layers not bonded to the protective layer against chemical, the layers not claiming any effect on the chemical protection can be removed, i.e. thermal insulation layer.

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

Dimensions in millimetres



Key

1 sample

Figure 1 — Additional sample location for gloves longer than 400 mm

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

4.2 Sampling for penetration testing

The sampling for penetrations shall be done according to ISO 374-2:2019, Clause 5.

4.3 Sampling for degradation testing

The sampling for degradation shall be done according to 4.1 and ISO 374-4:2019, 5.1.

5 Performance requirement

5.1 General requirements

Protective gloves against dangerous chemicals hazards shall comply with the requirements given in ISO 21420:2020 and ISO 21420:2020/Amd 1:2022, Clause 4, 5.1 and 5.2.

5.2 Requirement for penetration resistance

The entire protective gloves (fingers, palm, back, and cuff area) shall not leak when tested according to ISO 374-2:2019, 7.2 and 7.3.

5.3 Requirement for degradation resistance

The degradation (DR) shall be determined in accordance with ISO 374-4:2019 for each chemical claimed (see Table 2) in the marking and reported in the user instruction.

© ISO 2024 – All rights reserved

For gloves longer than 400 mm, for each tested chemical

— the degradation corresponding to the lowest permeation results (hand or cuff) shall at least be reported, and

— if the material in the palm and in the cuff are different, both degradation results shall be reported

After the degradation test, the samples shall retain their general appearance and integrity. The protective glove material after degradation must allow the glove to remain functional.

NOTE 1 If the samples become brittle, disintegrate, or soften the glove will not be able to remain functional. A change in colour does not in itself constitute degradation.

NOTE 2 No quantified requirements are defined for the degradation resistance of gloves. However, the degradation results are very important data to give to the users to help them in their chemical risk management.

NOTE 3 The results of the puncture test are not taken into account during the assessment of the degradation and are given as a useful information for the wearer.

5.4 Requirement for permeation resistance

5.4.1 Permeation tests

5.4.1.1 Test method

Each combination of protective glove/test chemical shall be tested according to EN 16523-1:2015 + Amd 1:2018.

It is also possible to use ISO 6529:2013 as an alternative test method to assess the permeation performance of the glove. In this case, the conditions given in Annex A shall be applied and it shall be reported in the test report (information of the use of Annex A).

5.4.1.2 Expression of results

EN 16523-1:2015+Amd 1:2018 is applicable, with the exception of 8.5.1.4 which is replaced as follows. If both sets of 3 test results are not in the ±20 % defined range, the 6 results are reported and the test result is given by the lowest NBT (normalised breakthrough time).

For the glove longer than 400 mm, for which the palm and cuff achieve different performance levels, the lowest performance level shall be claimed in the marking for each chemical.

5.4.1.3 Levels of performance

Each combination of protective glove/test chemical shall be classified according to Table 1, using the results as given in 5.4.1.2 (EN 16523-1:2015+Amd 1:2018) or A.2.2 (ISO 6529:2013) for the normalized breakthrough time obtained when the permeation rate reaches 1 $\mu g \cdot cm^{-2} \cdot min^{-1}$.

The test chemical(s) shall be taken from the list of test chemicals in Table 2. Only chemicals with analytical grade shall be used. In Table 2, if no mass percentage is given, it means that the chemical shall be used pure.

Other test chemicals could be used depending on the application of the gloves.

All the results should be reported in the information supplied by the manufacturer.

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

Table 1 — Permeation performance levels

Measured breakthrough time min	Permeation performance level
>10	1
>30	2
>60	3
>120	4
>240	5
>480	6

Table 2 — List of test chemicals

Code letter	Chemical	CAS number	Class
A	Methanol	67-56-1	Primary alcohol
B	Acetone	67-64-1	Ketone
C	Acetonitrile	75-05-8	Nitrile compound
D	Dichloromethane	75-09-2	Chlorinated hydrocarbon
E	Carbon disulphide	75-15-0	Sulphur containing organic compound
F	Toluene	108-88-3	Aromatic hydrocarbon
G	Diethylamine	109-89-7	Amine
H	Tetrahydrofuran	109-99-9	Heterocyclic and ether compound
I	Ethyl acetate	141-78-6	Ester
J	*n*-Heptane	142-82-5	Saturated hydrocarbon
K	Sodium hydroxide (40 ± 1) %[a]	1310-73-2	Inorganic base
L	Sulphuric acid (95 ± 1) %[a]	7664-93-9	Inorganic mineral acid, oxidizing
M	Nitric acid (65 ± 3) %[a]	7697-37-2	Inorganic mineral acid, oxidizing
N	Acetic acid (99 ± 1) %[a]	64-19-7	Organic acid
O	Ammonium hydroxide (25 ± 1) %[a]	1336-21-6	Organic base
P	Hydrogen peroxide (30 ± 1) %[a]	7722-84-1	Peroxide
S	Hydrofluoric acid (40 ± 1) %[a]	7664-39-3	Inorganic mineral acid
T	Formaldehyde (37 + 1) %[ab]	50-00-0	Aldehyde

[a] Percentage by mass of chemical in water.

[b] Stabilized solution with 10 % ± 5 % methanol.

SAFETY PRECAUTION — Persons using this document shall be familiar with normal laboratory practice. This document does not purport to address all the safety problems, if any, associated with its use. It is the responsibility of the user to apply established Health and Safety practices and to ensure compliance with European or national regulatory conditions.

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

5.4.2 Types of gloves

5.4.2.1 General

According to their permeation performance, chemical protective gloves are classified into three types: type A, type B or type C.

5.4.2.2 Type A

The permeation performance shall be at least level 2 against a minimum of six test chemicals listed in Table 2.

© ISO 2024 – All rights reserved

5.4.2.3 Type B

The permeation performance shall be at least level 2 against a minimum of three test chemicals listed in Table 2.

5.4.2.4 Type C

The permeation performance shall be at least level 1 against a minimum of one test chemical listed in Table 2.

5.5 Requirements for gloves protecting against dangerous chemicals (types A, B and C)

The glove protecting against dangerous chemicals shall be tested and according to the tests results, be classified as Type A or Type B or Type C according to the requirements given in Table 3.

Table 3 — Requirements for the different types of gloves protecting against dangerous chemicals

	5.1	5.2	5.3	5.4.2.2	5.4.2.3	5.4.2.4
Type A	X	X	Each degradation test shall be reported in the instruction given by the manufacturer	X		
Type B	X	X			X	
Type C	X	X				X
X = required.						

6 Marking

6.1 General

Protective gloves against dangerous chemicals shall be marked in accordance with the requirements for protective gloves in ISO 21420, and with one of the following subclauses: 6.2 or 6.3 or 6.4.

The use of the "information" graphical symbol is not mandatory and shall be as in Figure 2 when used.

Figure 2 — Graphical symbol ISO 7000:2019-1641

The use of the "protection against chemicals" graphical symbol is mandatory and shall be as in Figure 3.

Figure 3 — Graphical symbol ISO 7000:2019-2414

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

6.2 Marking of Type A gloves

For protective gloves complying with the type A requirements stated in 5.5, the graphical symbols in Figure 3 shall be used with reference to this document.

The six tested chemicals shall be identified by their code letter which shall be marked under the graphical symbol as shown in Figure 4. If other claimed chemicals not present in Table 2 have been tested, information about the performance levels shall be provided in the information supplied by the manufacturer.

Figure 4 — Marking of Type A gloves

6.3 Marking of Type B gloves

For protective gloves complying with the type B requirements stated in 5.5, the graphical symbols in Figure 3 shall be used with reference to this document.

The three tested chemicals shall be identified by their code letter which shall be marked under the graphical symbol as shown in Figure 5. If other claimed chemicals not present in Table 2 have been tested, information about the performance levels shall be provided in the information supplied by the manufacturer.

Figure 5 — Marking of Type B gloves

6.4 Marking of Type C gloves

For protective gloves complying with the type C requirements stated in 5.5, the graphical symbol in Figure 3 shall be used and the reference to this document.

An example of marking is given in Figure 6

The tested chemical(s) shall be given in the user instructions with information about its performance levels. If other claimed chemicals not present in Table 2 have been tested, information about the performance levels shall be provided in the information supplied by the manufacturer.

Figure 6 — Marking of Type C gloves

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved

7 Information supplied by the manufacturer

The information supplied by the manufacturer shall be in accordance with the requirements for information as defined in ISO 21420:2020+Amd 1:2022, 7.3. It shall also include the results of 5.2, 5.3, 5.4, 5.5 the list of all the chemicals to which the protective gloves have been tested and the performance levels obtained in permeation testing.

The following warnings shall be added in the information supplied by the manufacturer:

— "This information does not reflect the actual duration of protection in the workplace and the differentiation between mixtures and pure chemicals."

— "The chemical resistance has been assessed under laboratory conditions from samples taken from the palm only (except in cases where the glove is equal to or over 400 mm - where the cuff is tested also) and relates only to the chemical tested. It can be different if the chemical is used in a mixture."

— "It is recommended to check that the gloves are suitable for the intended use because the conditions at the workplace may differ from the type test depending on temperature, abrasion and degradation."

— "When used, protective gloves may provide less resistance to the dangerous chemical due to changes in physical properties. Movements, snagging, rubbing, degradation caused by the chemical contact etc. may reduce the actual use time significantly. For corrosive chemicals, degradation can be the most important factor to consider in selection of chemical resistant gloves"

— "Before usage, inspect the gloves for any defect or imperfections."

For reusable gloves, the manufacturer shall provide the relevant instructions for decontamination.

If there is no information about decontamination, then it is intended for single use only and the following warning shall be added: "For single use only".

STANDARDSISO.COM : Click to view the full PDF of ISO 374-1:2024

© ISO 2024 – All rights reserved