

Overview of Main Changes to EN 374: 2016

Protective Gloves against Dangerous Chemicals and Micro-Organisms.

The standard relating to chemical resistant hand protection has been updated. EN 374:2003 has been replaced by EN 374:2016. Here is a summary of the key changes.

Testing Methods

Permeation testing will now be carried out in accordance with EN 16523-1, which replaces EN 374-3.

Gloves will be classed as: Type A, Type B or Type C depending on their performance level and number of chemicals they can protect against.

The obligation to test chemical protective gloves for mechanical properties in accordance with EN 388 has been removed.

Number of Chemicals

The number of chemicals which can be used for testing resistance has increased from 12 to 18.

Degradation

Degradation testing is mandatory for all chemical protective gloves. The results must be shown in the user instructions.

Marking

The gloves' marking will change to enable users to choose the PPE which is most suitable to their situation. Examples are shown below

ONE PICTOGRAM, THREE TYPES OF GLOVE		
Type of gloves	Requirement	Marking
Type A	Penetration resistance (EN 374-2) Minimum breakthrough time is 30 min for at least 6 chemicals in the new list (EN 16523-1)	EN ISO 374-1:2016/type A  UVWXYZ
Type B	Penetration resistance (EN 374-2) Minimum breakthrough time is 30 min for at least 3 chemicals in the new list (EN 16523-1)	EN ISO 374-1:2016/type B  XYZ
Type C	Penetration resistance (EN 374-2) Minimum breakthrough time is 10 min for at least 1 chemical in the new list (EN 16523-1)	EN ISO 374-1:2016/type C  Z

Viruses

Gloves that claim protection from viruses require additional testing and marking.

UNDERSTANDING EN 374: 2016: A Revised Standard for Gloves Giving Protection from Chemical Risks

Background

Many modern industrial processes involve the use of highly concentrated and dangerous chemicals. This fact, combined with the almost daily announcements about potential health effects caused by long- or short-term exposure to chemicals that were once considered to be safe, means there is an ever-increasing need to minimise our contact with any substance that may have an adverse reaction to human health.

Working safely with these hazardous materials requires adherence to strict safety procedures and the use of specially designed protective equipment. In terms of splashes and spills from liquid chemicals, the hands of the worker can be of particular concern. Therefore, specialist gloves have been developed to protect against exposure to chemicals.

The level of protection against chemicals provided by a particular glove depends not only on the construction of the glove (including its length and freedom from holes), but also the choice of materials used to make the glove that prevent chemicals from reaching the inside.

The standard relating to chemical resistant hand protection has been updated. EN 374:2003 has been replaced by EN 374:2016; all testing must be state of the art, and, going forward, all gloves must be tested according to the requirements of the EN374:2016 to be suitable for use in the workplace.

This paper summarises the key changes which will also be applied in conjunction with the changes implemented by the PPE Directive.

EN 374-1: 2016 Terminology and performance requirements for chemical risks.

The standard is based on three overarching test methods:

1. Penetration test in accordance with standard EN 374-2: 2014
2. Permeation test in accordance with standard EN 16523-1: 2015 which replaces standard EN 374-3
3. Degradation test (which is now mandatory) in accordance with standard EN 374-4: 2013.

The requirement for EN 388 mechanical testing has been removed. This is now optional for gloves manufacturers who wish to claim both chemical and physical protection in their product.

Classification

According to the new standard, gloves are classed as: Type A, Type B or Type C depending on their performance level and number of chemicals they can protect against. The table below lists the performance level and number of chemicals required for each type:

Classification	Minimum Performance Level required	Minimum number of Chemicals from the 18 listed
Type A	2 (min 30 minutes breakthrough)	6
Type B	2 (min 30 minutes breakthrough)	3
Type C	1 (min 10 minutes breakthrough)	1

All gloves, as an absolute minimum for all Types, must be resistant to penetration.

Chemicals

6 new chemicals have been added to the list of hazardous compounds, increasing the number of chemicals which can be used for testing resistance from 12 to 18. The applicable chemicals are shown in the table below. The additional chemicals are highlighted in the shaded rows.

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 paraffin
E	Carbon disulphide	75-15-0	Organic compound containing sulphur
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	40 per cent Sodium hydroxide	1310-73-2	Inorganic base
L	96 per cent Sulphuric acid	7664-93-9	Inorganic mineral acid
M	65 per cent nitric acid	7697-37-2	Inorganic mineral acid
N	99 per cent acetic acid	64-19-7	Organic acid
O	25 per cent ammonium hydroxide	1336-21-6	Organic base

Code letter	Chemical	CAS number	Class
P	30 per cent hydrogen peroxide	7722-84-1	Peroxide
S	40 per cent hydrofluoric acid	7664-39-3	Inorganic mineral acid
T	37 per cent formaldehyde	50-00-0	Aldehyde

Marking

There is a new marking requirement.

1. The beaker containing the question mark will no longer be used.
2. All technical gloves will show the fuming flask.
3. The fuming flask icon will state the glove as type A, B or C as an indicator of performance above the pictogram.
4. Users will notice more letters beneath the pictogram to indicate the chemicals the gloves offer protection from.
5. As a minimum, the tested chemicals shall be identified by their code letters under the flask pictogram.

These changes are reflected in the pictograms below:



EN 374-2 Penetration

All chemical protective gloves should meet an acceptable quality level when tested in accordance with EN 374-2. Leakage can occur through imperfections in a glove, such as pinholes or failures in a seam. The EN 374-2 test consists of two parts – air and water leak testing.

EN 16523-1 Permeation (formerly EN 374-3)

Permeation is the process through which chemicals move through a glove at a molecular level. Testing is carried out in accordance with EN 16523-1, which has replaced EN 374-3.

The test method for chemical permeation EN16523-1 is similar to the EN 374-3 method, so products already certified will not need to be re-tested.

For gloves longer than 40 cm, and where the cuff is also claimed to provide protection, another three test specimens are also taken from the cuff. If the glove contains a join or seam in the hand area, this must also be tested.

Test results are reported based upon the normalised breakthrough time achieved. There are six permeation performance levels (see the table overleaf): the highest level of protection being level 6, which shows a breakthrough time of greater than 480 minutes.

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

The standard only requires a permeation level 2 to show the letter beneath the pictogram but there are 6 levels, so it is essential that people take this into account when selecting process. Chemical resistant gloves must still be chosen considering the actual chemical used and the level of protection required.

EN 374-4 Degradation

Degradation is a new mandatory requirement under the BS EN ISO 374-1:2016 for all gloves that claim protection against any chemicals. The results of the degradation test must appear in the information leaflet for each chemical claimed in the marking.

Degradation is the process through which a change to a material occurs – in this case, through contact with a chemical. Indications that degradation has occurred include flaking, swelling, change in appearance, disintegration, embrittlement, colour change, dimensional change, hardening and/or softening of the material tested.

Testing shall be carried out in accordance with EN 374-4. The force required to push a stylus through the glove material is measured, both before and after exposure to the challenge chemical.

If a protective glove is longer than 40 cm in length, and permeation testing has been carried out on both the cuff and the palm, degradation testing shall at least be carried out for the area which achieved the lowest permeation result.

EN 374-5 Protective gloves against micro-organisms

EN 374-5 specifies performance requirements for gloves that protect the end user against microorganisms. Microbiological agents are: bacteria, virus or fungi.

Gloves claiming micro-organism protection must pass the penetration resistance test in accordance with standard EN 374-2: 2014: air-leak and water-leak. The test method has not changed.

Gloves offering protection against viruses shall additionally pass a penetration test according to ISO 16604:2004 (Determination of resistance of protective clothing materials to penetration by blood-borne pathogens).

The markings are shown below.

Marking/Pictograms used for gloves protecting against bacteria and fungi:	Marking/Pictograms used for gloves protecting against virus, bacteria and fungi:
<p style="text-align: center;">ISO 374-5:2016</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div>	<p style="text-align: center;">ISO 374-5:2016</p> <div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p style="text-align: center;">VIRUS</p>

User Instructions

User instructions in accordance with the requirements given in EN 420 must be supplied by the manufacturer.

In addition, chemical glove user instructions shall include the results for penetration, degradation and permeation testing. There should be a list of all the chemicals against which the gloves have been tested, in addition to the performance levels for permeation testing.

There are a number of specific warnings that should be highlighted, including drawing the user's attention to the fact that the level of chemical resistance may be different if the chemical is used in a mixture.

If the gloves are intended to be reused, then instructions must be provided for decontamination. If no information is given regarding decontamination, it must be stated in the user information that the glove is for single use only.