EUROPEAN SOLVENTS INDUSTRY GROUP

In collaboration with:

European Safety Federation

ESF

BEST PRACTICE GUIDELINES

Safe use of gloves for the handling of solvents

Foreword

The European Solvents Industry Group (ESIG) provides a single point of contact for information on oxygenated and hydrocarbon solvents in Europe. Through its work with industry and with industry partners, the group promotes best practices in solvent usage, health, safety and environmental protection. Its main aims are to support responsible care in the use of solvents and to provide advocacy on issues affecting the producers of solvents.

DISCLAIMER

The information contained in this paper is intended for guidance only and whilst the information is provided in utmost good faith and has been based on the best information currently available, is to be relied upon at the user's own risk. ESIG will not accept any direct or indirect liability deriving from it. No representations or warranties are made with regards to its completeness or accuracy and no liability will be accepted for damages of any nature whatsoever resulting from the use of or reliance on the information. Each company based on its own decision making process may decide to use the Guidance in full, partially or not, as it suits its needs.

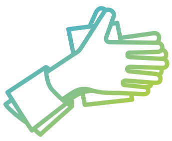
European Solvents Industry Group (ESIG)
www.esig.org

TIPS FOR USING CHEMICAL RESISTANT GLOVES

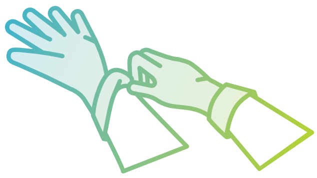
The skin is the first line of defence for the body. Hands can be subjected to a wide range of hazards on a daily basis. Different chemicals can cause various effects on the skin including irritation, allergic reactions, dermatitis and cancer. Some chemicals can also pass through the skin, enter the blood stream, and cause other health problems (e.g. liver or kidney failure or cancers).
The effect of chemicals on the skin may range from local irritation or corrosion to long-term and irreversible internal health damages.

Maintaining your skin in a healthy condition is important. This can be accomplished by using pre-work skin care products before putting on gloves, washing your hands after removing the gloves and using a regenerating product to restore the healthy condition of your skin.
Proper glove removal is important in helping prevent incident contact. Ensure glove users know how to put on and remove gloves.

1 Check the gloves: make sure you are using the right gloves for the job in the right size and that they are not damaged.

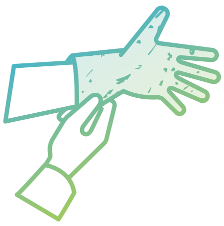


2 Wash and dry your hands before you put on your gloves. Don't put gloves on wet hands.

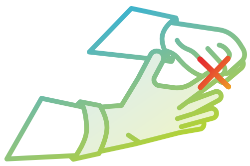


3 Avoid contact with the chemicals as much as possible and make sure to avoid liquids from entering the cuff.

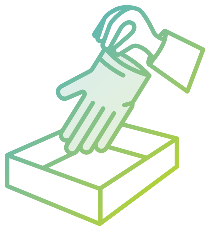
4 Don't exceed breakthrough time for the chemical you are working with.



5 Don't continue to use or re-use gloves showing signs of degradation.



6 Removing gloves: avoid contact with the skin. Remove gloves without touching the outer surface. For loose fitting, reusable gloves, remove the gloves by first pulling on the fingers, making sure not to touch the possibly contaminated outside of the glove with unprotected skin. For tight fitting disposable gloves[1] take the glove at the end of the cuff on the inside when pulling off the glove.



7 Dispose of the gloves in the appropriate receptacle.

8 Wash and dry your hands after you removed your gloves.

9 It may be useful to apply hand cream before and/or after use of the gloves.

10 Seek medical attention immediately if you have any irritation or allergic reaction.

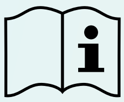
1. Tight fitting disposable gloves are intented to be used in the lab only due to their mechanical weakness and the very short breakthrough times.

10

Information on pictograms and standards

Protective gloves are personal protective equipment (PPE) and thus need to comply with the EU Regulation 2016/425. As the Regulation enters into force in April 2018 and starts with a transition period, products in compliance with the PPE Directive 89/686 will still be available on the market for some time. As the Regulation does not include new technical requirements for gloves protecting against chemicals, the protection levels remain the same.

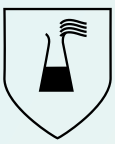
CE nnnn



On the glove and/or packaging you will find next to the CE mark, manufacturer and size, in addition to various pictograms indicating the protection offered by the glove. "nnnn" is the identification number of the Notified Body that is responsible for the quality control follow-up testing of the gloves or for monitoring their production. The pictograms and the performance levels are explained in the user instructions supplied with the gloves.

In order to prove compliance with the PPE legislation, standards have been developed to facilitate the conformity assessment. The standards relevant for gloves used to protect against solvents are:

TYPE
A, B or C

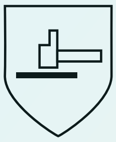
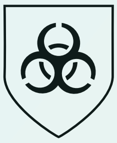
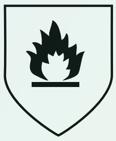
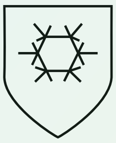


XYZ

EN ISO 374-1:2016: Chemical protective gloves.
Remark : this is an updated version of the standard – gloves compliant with the previous version EN 374-1:2003 are still available on the market and have different markings. Ask your supplier for more information.
Gloves intended to protect against chemicals are classified into three types depending on their breakthrough times: type A, type B or type C. The minimum breakthrough time for a type C glove is >10 min for at least one chemical taken from the list, for type B > 30 min for at least 3 chemicals from the list and for type A > 30 min for at least 6 chemicals from the list. The codes for the chemicals that are tested and for which the requirement is met will be mentioned next or under the chemical pictogram.
For a Type C glove, no code will appear under the chemical pictogram.

A Methanol
B Acetone
C Acetonitrile
D Dichloromethane
E Carbon disulphide
F Toluene
G Diethylamine
H Tetrahydrofurane
I Ethyl acetate
J n-Heptane
K Sodium hydroxide 40%
L Sulphuric acid 96%
M Nitric acid 65%
N Acetic acid 99%
O Ammonium hydroxide 25%
P Hydrogen peroxide 30%
S Hydrofluoric acid 40%
T Formaldehyde 37%

Other standards that can be relevant for additional protection:

	EN 388:2016: Protective gloves against mechanical risks. This pictogram is completed with markings that give performance levels for different tests. See the manufacturer's user instructions for detailed information.
	EN ISO 374-5:2016: Gloves for protection against micro-organisms. Gloves intended to protect against bacteria and fungi are marked with this pictogram. Gloves with virus protection have the word VIRUS stated underneath the pictogram. See the manufacturer's user instructions for detailed information.
	EN 407:2004: Gloves for protection against heat and flame. This pictogram is completed with markings that give performance levels for different tests. See the manufacturer's user instructions for detailed information.
	EN 511:2006: Gloves protecting against cold. This pictogram is completed with markings that give performance levels for different tests. See the manufacturer's user instructions for detailed information.

Chemical Resistant Glove Selection

- It is recommended to check if the gloves and material selection are suitable for the intended use because conditions at the workplace may differ. This should be the result of a risk assessment at the workplace, which needs to be the basis for the selection. Know what chemicals you are working with and the use conditions (e.g. concentration of chemicals, chemical mixtures, short versus extended contact, etc.). A good source of information for glove selection is the Safety Data Sheet (SDS) for the chemical that will be used. Recommendations for PPE such as gloves can be found in Section 8 of the SDS.
- Also take into account other hazards (e.g. mechanical, heat, cold) and aspects such as glove length, grip, comfort and dexterity. In the table below you will find some indication of the performance of materials for several aspects. Inform your supplier about the other risks so they can take them into account in their recommendations.
- It might be recommended to choose longer gloves to make sure there is overlap between gloves and garment.
- Always inspect gloves for any defects or imperfections before use. Do not use a glove if there are doubts about their integrity.
- If any visible signs of degradation, discoloration or elongation are observed, do not use the gloves.
- Markings on the glove or in the user information referring to 'single use' mean that the gloves can only be put on once. They cannot be put on multiple times. They are not intended to be cleaned and re-used.
- Conducting a proper risk assessment is an important part of the glove selection process. Experience from glove manufacturers indicates that gloves used in the workplace (in all industries) may not be appropriate for the risks or the working conditions encountered. This can be due to a poor risk assessment, selection based on price rather than performance or poor training on the characteristics and benefits of the selected gloves.
- A chemical resistant glove does not provide protection from all chemicals or possible use conditions. Do check before using the gloves.
- The following table gives an overview of the pros and cons of commonly used materials for chemical resistant gloves. Some general ideas about the chemical resistance are also included. The indicated pros and cons might be influenced if the material is used on a support (e.g. material coated on a knitted fabric).

	Pro (+)	Con (-)
PE/ PE* Laminate	• Overall excellent chemical resistance for a wide range of chemicals	• Poor mechanical resistance • Poor dexterity (typically needs to be used in combination with another chemical resistant glove because of poor dexterity) • Limited grip
PVA	• High resistance to aliphatics, aromatics, chlorinated solvents, esters and most ketones • Resists snags, punctures and abrasions	• Water soluble (will degrade if exposed to water-based solutions) • Stiff material resulting in poor dexterity
Butyl	• Provides resistance against polar organics (acids, alcohols, aldehydes, ketones), bases, carboxylic acids, glycol ethers and esters • Excellent dexterity and flexibility	• Relatively poor resistance to aliphatic hydrocarbons, aromatic hydrocarbons (xylene, toluene), halogenated hydrocarbons • Fairly expensive • Fairly slippery
Viton®	• Provides resistance against aliphatics, halogenated and aromatic hydrocarbons and concentrated mineral acids	• Very expensive • Quite slippery • Not recommended against polar chemicals such as ketones
Nitrile	• Excellent puncture, abrasion and snag resistance • Protects from bases, oils, aliphatic hydrocarbons solvents, greases, alcohols and animal fats • Excellent dry grip	• Avoid for ketones and aromatic or chlorinated solvents (xylene, toluene, methylene chloride, trichloroethylene) and halogenated hydrocarbons. • Often limited grip on wet or greasy objects
Neoprene or poly-chloroprene	• Resists many oils, inorganic acids, alcohols, caustics and various solvents (phenol, ethyl glycol, aniline, ...) • Good abrasion resistance	• More prone to snags, punctures and cuts compared to other rubber materials such as Nitrile, Butyl or Viton® • Not recommended for aliphatic or aromatic hydrocarbons
PVC or Vinyl	• Good resistance to many acids, caustics, bases and alcohols • Excellent abrasion resistance	• Not recommended for ketones and many solvents • Less resistant to punctures and tears compared to rubber materials • Contains plasticisers that would migrate out of the glove against greasy and oily chemicals, making the glove become porous
Natural Rubber	• Resistance to many acids • Highly flexible • Good grip in both wet and dry conditions	• Allergic reactions may be caused by natural rubber proteins • Not to be used with lubricants, oils or organic hydrocarbon chemicals (e.g. mineral-based solvents)

* for very specific applications laminated materials (PE) can be used.

The table below contains some examples of common solvents and suitable chemical resistance glove material data (excluding single use). This information is generic. A better source of information can be provided by the manufacturer for the glove that you will use.

Glove manufacturers have databases with test results of their gloves against many chemicals, this information is available from your supplier – make sure that you check your specific product and application.

Chemical Identification	PE	PVA	Butyl	Viton ®	Nitrile	Neoprene	PVC	Natural Rubber Latex
ALCOHOLS	R	N	R	R	M	M	N	N
Ethanol								
n-Butanol								
Isopropanol								
ETHERS	R	R	N	M	M	N	N	N
Diethyl ether								
ESTERS	R	R	M	R	M	M	N	N
Ethyl acetate								
Isopropyl acetate								
Butyl acetate								
KETONES	R	M	R	N	N	N	N	N
Acetone								
Methyl ethyl ketone								
Methyl isobutyl ketone								
GLYCOL ETHERS	R	M	R	M	N	M	N	N
1-Methoxy-2-Propanol								
Butyl glycol								
GLYCOL ETHER ESTERS	R	M	R	M	N	M	N	N
Butyl glycol acetate								
1-Methoxy-1-Propylacetate								

Chemical Identification	PE	PVA	Butyl	Viton	Nitrile	Neoprene	PVC	Natural Rubber Latex
AROMATICS	R	R	N	R	N	N	N	N
Xylene								
Toluene								
ALIPHATICS	R	R	N	R	R	N	N	N
Light fractions (e.g. Hexane)								
Dearomatised hydrocarbons								
White spirit								
PARAFFINIC	R	R	N	R	R	N	N	N
n-Paraffins								
Isoparaffins								

< 10	10	30	60	120	240	> 480	Break through time in minutes
Not recommended	Splash protection		Medium		Good protection		

R = recommended / M = mixed results / N = not recommended

Remarks:
- The resistance of the materials will be dependent on the glove thickness, temperature and other environmental factors.
- The recommendations given are based on laboratory testing with pure chemicals. Check with the glove manufacturer for specific applications.

ESIG is campaign partner of

For further information please visit our website at www.esig.org

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A sector group of Cefic
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EU Transparency Register n° 64879142323-90