Hand Protection

Glove Selection – basic guide

The PPE Directive 89/686/EEC covers the selection of gloves and basically specifies two levels of risk; "minimal" and "mortal" (or "irreversible") risks. A further "intermediate" category covers gloves which fall between these two levels.

When selecting gloves for a particular application you must establish the level of risk involved and select gloves from the appropriate class.

The various standards listed on the following pages should help with selection but it must be understood that these tests were carried out under laboratory conditions and may not truly reflect the actual conditions of use in practice.

It is therefore the responsibility of the user and NOT the supplier to ensure the glove is suitable for the proposed application.

CE CATEGORIES

All gloves described as "PPE" must be CE marked. They will therefore meet the basic requirements, as below:

Category I — **Simple design** – offering protection for Minimal risks Where the risk of injury if not wearing a glove is small and its effects would be easily reversible. In simple terms if the wearer would not come to any harm if he were not wearing gloves then this category is suitable. Manufacturers are permitted to test and certify these gloves themselves.

Category II — **Intermediate design** – offering protection against Reversible risks (injury), gloves certified compliant by a notified body. Use where there is a specific risk which may result in injury. Typical applications would include mechanical protection where there is a risk of cuts or puncture to the skin.

Category III — **Complex design** – offering protection against Irreversible or mortal risk, gloves certified compliant and tested by a notified body whose number is specified Use where serious harm or irreversible side effects could occur. Typical applications would include chemical protection for more aggressive chemicals.

GLOVE SIZING

Glove size further to EN420	Hand (mm) Palm circumference	Hand (mm) Length	Glove (mm) Minimum length
6	152	160	220
7	178	171	230
8	203	182	240
9	229	192	250
10	254	204	260
11	279	215	270

Glove Selection - EN Standards

Harmonised European Standards for Personal Protective Equipment (PPE) have been developed as the preferred means of demonstrating equipment conformity with the basic health and safety requirements (BHSRs) of the EC Personal Protective Equipment Directive (89/686/EEC).

Only equipment which meets these BHSRs is entitled to carry the CE mark and to be sold for use in the EC.

The applicable standards for hand and arm protection are outlined in more detail on pages 2-3.

EN420 : GENERAL REQUIREMENTS FOR PROTECTIVE GLOVES

This standard defines the general requirements for protective gloves in terms of construction, fitness of purpose, safety etc.

The standard includes, amongst others the following:

- The gloves themselves should not impose a risk or cause injury
- The pH of the gloves should be as close as possible to neutral
- Leather gloves should have a pH value between 3.5 - 9.5
- The highest permitted value for chromium is 3mg/kg (chrome VI)
- Specific details of any substance used in the glove which is known to cause allergies
- Sized by reference to an agreed common European hand size, e.g. minimum length (see previous sheet)
- Dexterity performance in range 1 (lowest) to 5 (highest), if required

This symbol indicates that the user must consult the *'Instruction for use'*

Performance level		0	1	2	3	4
a	Convective cold. Thermal insulation ITR in m2 °C/W	**ITR** <0.10	0.10<=**ITR**<0.15	0.15<=**ITR**<0.22	0.22<=**ITR**<0.30	0.30<=**ITR**
b	Contact cold. Thermal resistance R in m2 °C/W	**R**<0.025	0.025<**R**<0.0.50	0.05<**R**<0.10	0.10<**R**<0.15	0.15<**R**
c	Water penetration	FAIL	PASS			

EN388 : MECHANICAL RISKS

This standard defines the protection levels against mechanical hazards usually associated with handling of rough or sharp objects which could cut, abrade or puncture the skin.

These tests are **NOT** applicable to moving machinery or serrated blades. It can be dangerous to wear gloves near to moving machinery or serrated blades and saws as the glove may catch and cause the wearers hand to be dragged into the machinery.

- Abrasion (0 to 4): number of cycles required to abrade through the glove at a constant speed
- Cut (0 to 5): index calculated based on the number of cycles required to cut through the glove at a constant speed
- Tear (0 to 4): force required to tear the glove
- Puncture (0 to 4): force required to puncture the sample with a standard steel punch

Performance level		1	2	3	4	5
a	**Abrasion Cycles**	100	500	2000	8000	n/a
b	**Cutting Index**	1.2	2.5	5	10	20
c	**Tear Force** (N)	10	25	50	75	n/a
d	**Puncture Force** (N)	20	60	100	150	n/a
Gloves should not be used near moving machinery or serrated blades						

EN374-2 : DETERMINATION OF RESISTANCE TO WATER PENETRATION

This is the reference test specified by the European Standard for the assessment of glove quality. Gloves must pass this test in order to prove that they ar an effective barrier against liquids and micro-organisms. Performance levels are assessed according to the acceptable quality levels (AQL) of the gloves.

Gloves must meet at least level 2 of **EN374-2** to be considered micro-organism resistant and will carry the chemical pictogram shown below.

Level	1	2	3
AQL	4.0	1.5	0.65

EN511 : PROTECTION FROM COLD

This standard defines the protection levels against cold hazards but is different from the tests for heat as it references levels of resistance and insulation rather than particular temperatures:

Performance level		0	1	2	3	4
a	Convective cold. Thermal insulation ITR in m2 °C/W	**ITR** <0.10	0.10<=**ITR**<0.15	0.15<=**ITR**<0.22	0.22<=**ITR**<0.30	0.30<=**ITR**
b	Contact cold. Thermal resistance R in m2 °C/W	**R**<0.025	0.025<**R**<0.0.50	0.05<**R**<0.10	0.10<**R**<0.15	0.15<**R**
c	Water penetration	FAIL	PASS			

EN407 : PROTECTION FROM HEAT

This standard defines the protection levels against heat hazards usually associated with handling of hot items or welding. The contact heat indicates how long a typical user could remain in contact with an item at a particular temperature without feeling pain. However this may be influenced by both how hard the item is gripped and also the item shape.

Performance level			1	2	3	4
a	**Burning behaviour**	After flame time	< 20 s	<10 s	< 3 s	< 2 s
		After glow time	Not req'd	< 120 s	< 25s	< 5s
b	**Contact heat**	Contact temperature	100°C	250°C	350°C	500°C
		Threshold time	> 15 s	> 15 s	> 15 s	> 15 s
c	**Convective heat** (heat transfer delay)		> 4 s	> 7 s	> 10 s	> 18 s
d	**229a Radiant heat** (heat transfer delay)		> 7 s	> 20 s	> 50 s	> 95 s
e	**Small drops molten metal** (# drops)		> 10	> 15	> 25	> 35
f	**Large quality molten metal** (mass)		30g	60g	120g	200g
	'X' in any test denotes NOT TESTED					

a, b, c, d, e, f

EN1149-1 : ANTISTATIC PROPERTIES

Two stages a glove manufacturer must go through to ensure that a plastic article is suitable for food contact use:

1. Ensure that the product formulation only contains substances listed in EU Regulation 10/2011. This is a positive list whereby the product concerned can only be made from the materials listed in this directive.

2. Perform either specific or total migration testing or both to ensure that the article in contact with food does not leach anything into the food. This is detailed in the EN1186 series of standards (materials and articles in contact with foodstuffs - plastics).

If both of these criteria are met, the symbol above can be applied to the glove and/or packaging.

EN374 : PROTECTION AGAINST CHEMICALS AND/OR MICRO-ORGANISMS

This standard defines the protection levels against chemicals and/or micro-organisms. The newer **EN374:2003** uses a revised pictogram which includes 3 letters below the pictogram to indicate a breakthrough time of more than 30 minutes (Level 2) for 3 chemicals from a common list of 12 (see below). There is no requirement for a manufacturer to resubmit gloves for testing that have been approved under the older **EN374:1994.** In which case the pictogram is shown without the 3 letters underneath.

Chemical	
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%)

a, b, c

In order to display the pictogram shown above the glove must resist breakthrough by 3 of the chemicals shown above for a minimum of 30 minutes (Level 2)

If the glove fails to achieve the 30 minute (Level 3) breakthrough time it may be classified as offering protection against "Low Chemical Hazards". In this case the pictogram shown here will be used.

Gloves which have been approved to **EN374:2003** will also carry this pictogram to indicate that information is available for the glove in relation to its use and limitations.

Gloves which have achieved Level 2 or better in the penetration test may be marked with this pictogram

Performance level	1	2	3	4	5	6
Convective cold. Thermal insulation ITR in m2 °C/W	>10	>30	>60	>120	>240	>480