Ansell summary guide to PPE Standards that govern certified hand and body protection in EMEA

PPE STANDARDS GUIDE

Version 2.0

ansell.com

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About the PPE Legislation

During 1989 and 1990 the European Council of Ministers approved a proposal made by the European Commission to outline a framework for a new Directive on health and safety. The Directive included a specific and important pledge: to improve health and safe conditions for all European workers. This commitment to best practices is part of a legally binding Framework Directive known as 89/391/EEC, which defines broad guidelines for health and safety in the workplace. Directive 89/391/EEC places responsibility on employers to ensure the well being of their company's workforce. In order to comply, employers must prove they are providing their workers with protective gloves for their intended tasks that are of the highest quality, adhere to the Directive, and meet all relevant safety standards.

89/391/EEC is supported by several daughter Directives. Directive 89/656/EEC, otherwise referred to as, "The Use of Personal Protective Equipment Directive" directly governs the use of protective equipment.

Provision of PPE 89/656/EEC

Four articles in the Directive merit particular attention, as they place substantial responsibilities on employers:

Article 3

Article 3 states that Personal Protective Equipment (PPE) shall be used when risks cannot be avoided. Basic risk assessments are required, and must be conducted at all workplaces to identify and evaluate risk levels.

Article 4

Under Article 4, the employer must inform his workers of the evaluated risks in the workplace, supply appropriate and correctly fitting PPE in compliance with EU standards, and give adequate instruction on the use of PPE. Employers must ensure that all PPE is used only for the purpose intended by the manufacturer, and in accordance with the manufacturer's instructions.

Article 5

Article 5 requires the employer to:

1. Audit workplace hazards and assess the level of risk to employees.
2. Define the properties necessary in the gloves to protect the employees.
3. Ensure that all gloves used in the workplace conform to the PPE Directive.
4. Compare the merits of the various types of protection available.
5. Keep full records of assessments and reasons for selecting a particular type of glove. If the risk should change in any way, for example, by the introduction of a new chemical or industrial process, the assessment and selection process must be repeated.

Article 6

Finally, Article 6 requires Member States to introduce written rules for workplace situations in which the use of PPE shall be considered compulsory. Employers will have to be aware of the rules and comply with them fully.

To remain in accordance with the regulations, employers must select Personal Protective Equipment that not only adheres to the applicable PPE legislation and relevant safety standards, but is also of demonstrably of good quality and best suited for the intended task.

Working with Ansell

Supporting Your Need to Make the Safest Choice

As a global leader in safety solutions, Ansell is well-equipped to help employers understand the legislative requirements for PPE and support the safest choice for their workforce. We offer a comprehensive portfolio of protective equipment that match the spirit and the letter of the European Regulations.

You can have full confidence that all Ansell safety products are compliant with the latest PPE standards, as well as manufactured, tested, packaged, and documented strictly in accordance with current European legislations.

Ansell frequently defines quality control requirements that go beyond the regulations required by law. Through our various Ansell ISO 17025 accredited test labs and tests at Notified Bodies, all of our claims are systematically tested to ensure they are substantiated at all times. We also provide documentation that includes highly detailed glove descriptions and material compositions to help guide you in selecting the right PPE.

Contact your Ansell representative if you require any further assistance on PPE selection or determining the best-suited solutions for specific tasks. Your representative will be able to schedule an assessment by our safety experts and provide best practice recommendations for your workplace.

For more information, visit us at **ansell.com**

Complying to EU PPE Regulation 2016/425

In February 2016, the European Council and European Parliament amended and approved a new PPE Regulation proposed by the European Commission. This New PPE Regulation is replacing the original PPE Directive 89/686/EEC that was introduced in 1992.

Following Brexit, this Regulation is also applicable to the UK. For the UK, the Regulation is called 'PPE Regulation 2016/425 as amended to apply in GB'. The same principle applies as explained in this sheet except that UKCA would be applicable instead of CE. Independent testing and certification are carried out by Approved Bodies based in the UK instead of Notified Bodies. For Northern Ireland, the use of the CE mark is still applicable.

The Regulation will now apply to private use as protection against heat (e.g., oven gloves) and to distributors selling PPE products. It provides additional conformity assessment requirements, such as the need for an internal production control system and valid Type-examination certificates for a maximum of 5 years. The Regulation also provides specific requirements for every economic operator involved in the supply chain, as well as additional documentation requirements linked to the Instructions for Use and Conformity Declarations.

The PPE regulation now specifies three classes based on risk definitions.

CE UKCA

Category I

Minimal Risk

For PPE of simple design offering protection from low level risks, (e.g., janitorial gloves) manufacturers are permitted to test and certify the PPE themselves.

Category II

Risks other than those listed in Categories I and III

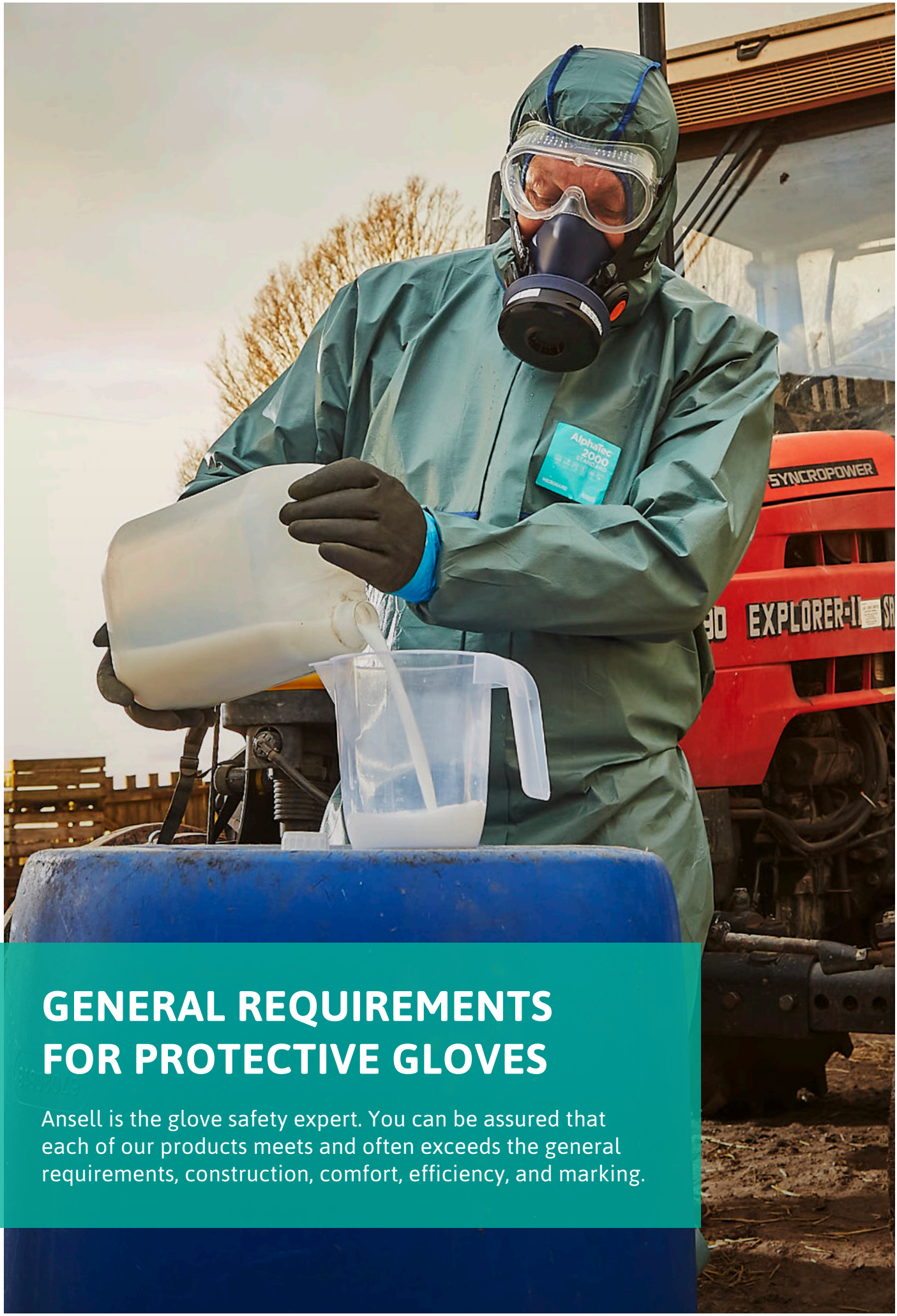
PPE designed to protect against intermediate risk (e.g., general handling gloves which require cut, puncture, and abrasion protection) must be subjected to independent testing and certification by a notified body. Only these approved bodies may issue a CE or UKCA marks. Without a proper CE or UKCA marks the PPE may not be sold or used. Each notified body has its own identification number. The name and address of the notified body that certifies the product must appear on the Instructions for Use that will accompany the gloves.

CE 0493 UKCA 0321

Category III

Very serious risks

PPE designed to protect against the highest levels of risk (e.g., chemicals, biological agents, electric shock and live working) must also be tested and certified by a notified body. In addition, the quality assurance system used by the manufacturer to guarantee homogeneity of production must be independently checked. The body carrying out this evaluation must also appear on the Instructions for Use and be identified by a number that appears alongside the CE mark and UKCA mark, in the example above this number is 0493 and 0321.



GENERAL REQUIREMENTS FOR PROTECTIVE GLOVES

Ansell is the glove safety expert. You can be assured that each of our products meets and often exceeds the general requirements, construction, comfort, efficiency, and marking.

EN ISO 21420:2020

Adopting the New EN ISO 21420 standards

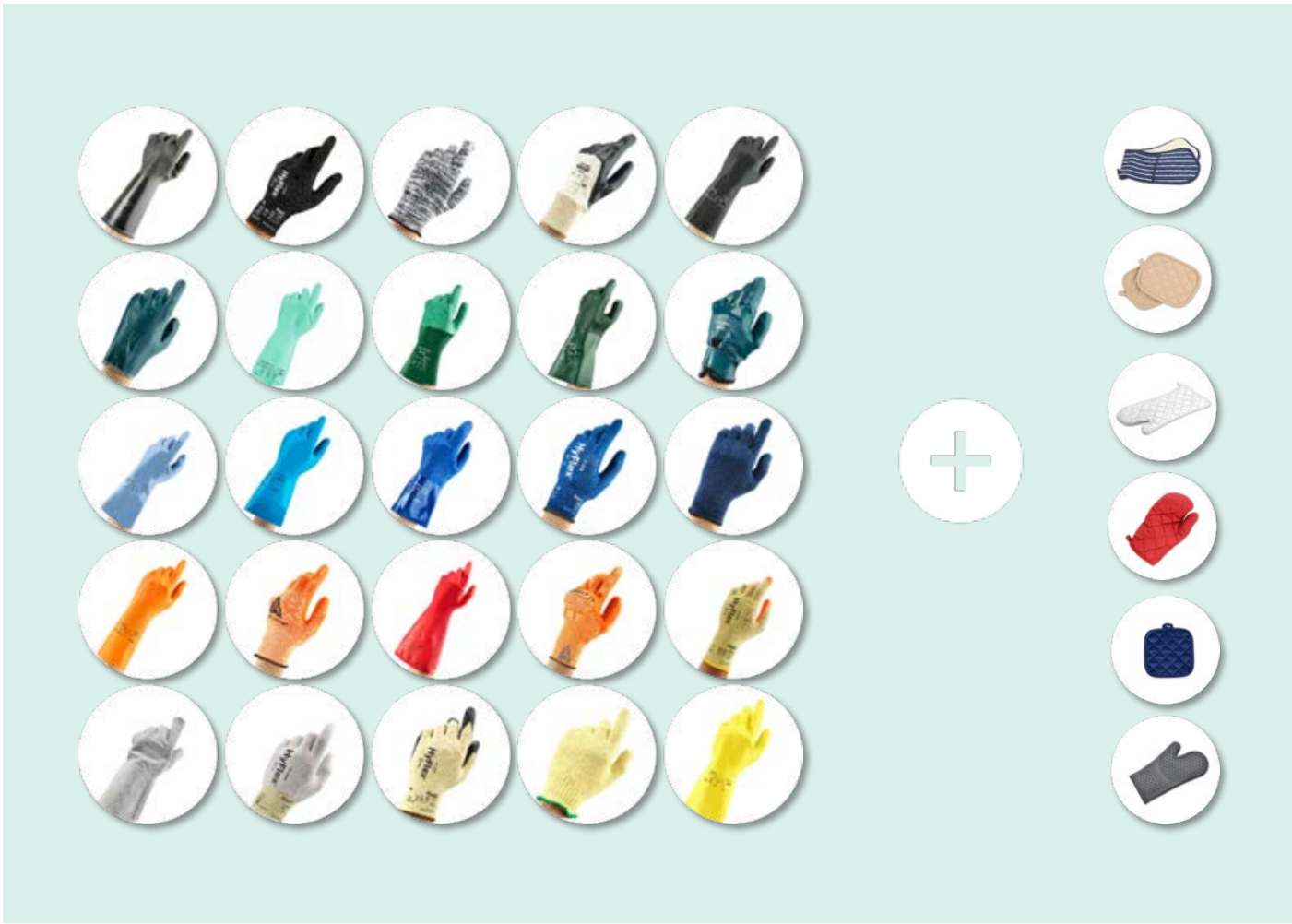
The new EN ISO 21420:2020 was approved in 2020 in line with the general requirements for protective gloves. This new standard will replace the previous EN 420:2003 and applies to any protective gloves that require the CE mark.

This standard defines the general requirements for design and construction, innocuousness, comfort, efficiency, marking and information applicable to all hand protection, including protective gloves.

What's Changing?

ENLARGED SCOPE

The scope of the standard has been enlarged. The new EN ISO 21420 standard now clarifies that the standard is applicable also applicable to arm protectors on top of protective gloves and protective hand protectors.



INNOCUOUSNESS

The requirement for testing natural rubber gloves for protein content which was a requirement of the previous EN 420:2003 standard has been deleted from the new EN ISO 21420 standard.

The new EN ISO 21420 standard provides additional requirements such as no release of nickels, no carcinogenic amines should be released from gloves, clearly defined maximum threshold for dimethylformamide and Polycyclic aromatic hydrocarbons should next exceed 1ppm.

EN 420:2003

- Cr (VI) in leather < 3 ppm
- PH between 3.5 and 9.5
- Natural rubber gloves shall be tested for natural rubber protein content as per EN 455-3

EN ISO 21420:2020

Alignment with REACH regulations:

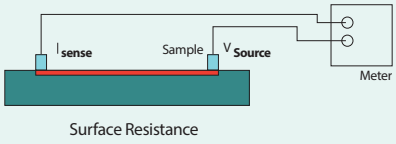
- Cr (VI) in leather < 3 ppm
- PH between 3.5 and 9.5
- No nickel release (< 0.5 µg/cm² per week)
- No carcinogenic amines be detectable
- Less than 1000 ppm (= < 0.1 %) w/w dimethylformamide
- Should not exceed 1 ppm for each PAH (Polycyclic aromatic hydrocarbons)

ELECTROSTATIC PROPERTIES

The previous EN 420:2003 standard defined anti-static properties could be tested based on the EN 1149 range of standards. For the new EN ISO 21420 standard, the new anti-static pictogram is introduced for gloves meeting EN 16350. The use of the EN 1149 testing methodology still applies under the new standard but will not form the basis to allow the use of the anti-static pictogram.

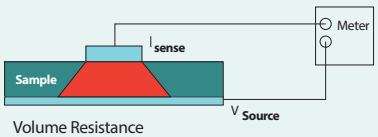
EN 420:2003

EN 1149-1 (surface resistivity) – Still valid



Surface Resistance

EN 1149-2 (vertical resistance)



Volume Resistance

- EN 1149-3 (charge decay)
- Test data as per these EN 1149 standards can be provided in the information to be supplied to the user. No pictogram allowed.

EN ISO 21420:2020

- For gloves to be used in ATEX environments, the electrostatic properties shall be tested as per EN 16350 (= EN 1149-2 test method)
-  Gloves meeting the requirement can be marked with the electrostatic pictogram
- Test data as per EN 1149-1 & 3 can still be provided in the information to be supplied to the user.

SIZING

The minimum required glove length which was a requirement in the previous EN 420:2003 standard has been deleted.

EN 420:2003		EN ISO 21420:2020		
Hand size	**Hand circumference (mm)**	**Hand length (mm)**	**Glove size**	**Minimum glove length**
6	152	160	6	220
7	178	171	7	230
8	203	182	8	Deleted
9	229	192	9	250
10	254	204	10	260
11	279	215	11	270

GLOVE LABELLING

The new EN ISO 21420 standard requires that the date of manufacturing and date of obsolescence (if applicable) is added on the product marking. If markings on the glove is not possible as a result of characteristics of the glove such as for single-use gloves, the marking requirements can be moved to the first packaging enclosure.

EN 420:2003

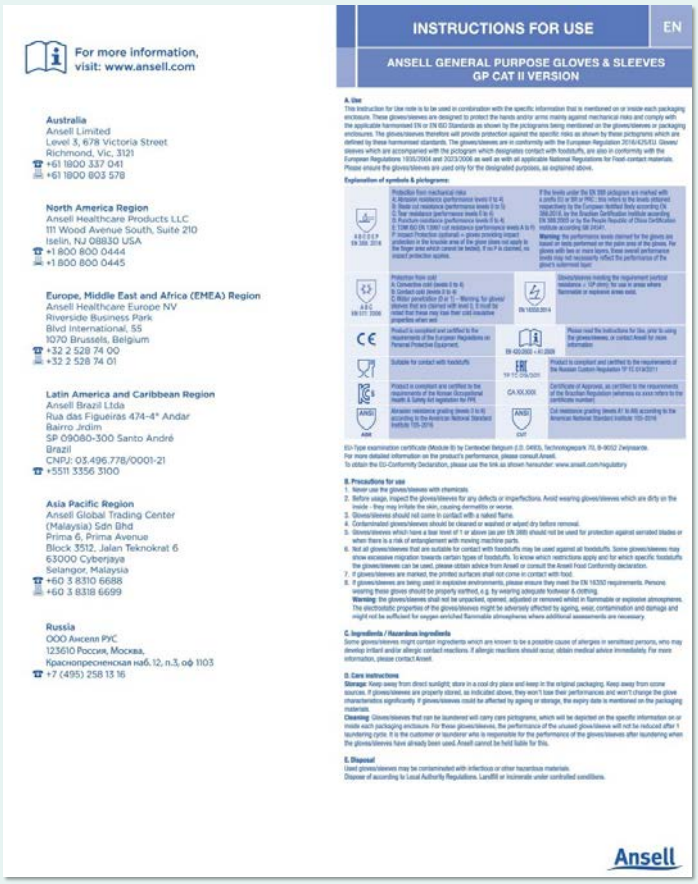
- Each protective glove to be marked with:
  - √ Name of manufacturer
  - √ Glove designation
  - √ Size Designation
  - √ Relevant pictograms + levels of performance + reference of standard
  - √ Date of obsolescence, if applicable
- Marking shall be clear and visible throughout the foreseeable life of the glove.
- If marking of gloves is not possible, the marking shall appear on the first packaging enclosure

EN ISO 21420:2020

- Requirements as per EN 420:2003 still remain
- Added "Date of manufacturing", at least month and year or any other mean ensuring traceability
- Date of obsolescence (behind an hourglass) if applicable

INSTRUCTION FOR USE

Under the new EN ISO 21420 standard the same requirements still exist with the addition to provide additional information.



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INSTRUCTIONS FOR USE EN

ANSELL GENERAL PURPOSE GLOVES & SLEEVES
GP CAT II VERSION

Ansell

EN 420:2003

- Minimum information needed:
  1. Name and address of manufacturer
  2. Glove designation
  3. Available sizes
  4. Relevant pictograms + performance levels + reference to the applicable standard & year
  5. Warnings and/or limitations of use + warning if contain NRL
  6. When protection is limited to part of the hand, it shall be explained
  7. Storage & care instructions
  8. Instructions for use/intended use of product; relevant information concerning combination with other forms of PPE
  9. List of substances known to cause allergies

EN ISO 21420:2020

- Additional Requests:
  1. Instructions to check integrity of gloves prior to use
  2. Instructions relevant to donning & doffing
  3. Information for the user to establish a date of obsolescence, if applicable
  4. If electrostatic properties are claimed, a written warning shall be provided to advise that all clothing and shoes worn with this type of glove shall also be designed taking the electrostatic risk into account
  5. If no cleaning is recommended, indicate the glove is not washable (this is excluded for SU gloves)

INFORMATION TO BE SUPPLIED UPON REQUEST

Under the EN ISO 21420 standard some additional information needs to be made available based upon request as only substances that can cause allergies (other than natural rubber) will be listed.

EN 420:2003
All list of substances contained in the glove

EN ISO 21420:2020
Only list of the substances contained in the glove cause allergies, other than natural rubber

The following is an example list of substances, or families of substances, which are known allergens that may be found in gloves:

- Thiuram disulfide
- Dithiocarbamates
- Mercaptobenzothiazole/ MBT derivatives
- 1,3-diphenylguanidine
- Diphenylthiourea, dibuthylthiourea
- Formaldehyde
- Bisphenol A
- Benzisothiazolinone
- Cethylpiridinium chloride
- Triphenyl phosphite, triphenyl phosphate, tricresyl phosphate
- Abietic acid derivatives
- Nickel

PICTOGRAMS

 **EN 388** Protection against mechanical risks	 **EN 421** Protection from radioactive contamination
 **EN ISO 374-1** Protection from dangerous chemicals	 **EN 659** Fire Fighters' gloves
 **EN ISO 374-5** Protection from Micro-organisms	 **EN 1082** Gloves against cuts and stabs by hand knifes
 **EN 407** Heat protection	 **EN 381** Chainsaw protective gloves
 **EN 511** Cold protection	 **EN 18889** Gloves for pesticide operators
 **EN 421** Protection from ionizing radiation	 **EN 16350** Electrostatic properties (ATEX)
 Suitable for Live working	 Protection against electric arc

MECHANICAL PROTECTION

Guidelines for gloves worn by workers who require protection against objects that can abrade, cut, or puncture the skin, without sacrificing comfort or dexterity on the job.

EN 388:2016+A1:2018 / ISO 23388:2018

SCOPE

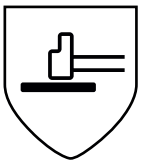
This standard applies to all kinds of protective gloves in respect of physical and mechanical aggressions caused by abrasion, blade cut, puncture, and tearing.

DEFINITIONS & REQUIREMENTS

Protection against mechanical hazards is expressed by a pictogram followed by four numbers (performance levels), each representing test performance against a specific hazard, and two letters.

The letter in the fifth position corresponds to an ISO Cut Resistance level as tested with a so-called TDM cut test machine. A letter "P" in the sixth position is for gloves certified to provide impact protection.

EN 388:2016



abcdef

The 'mechanical risks' pictogram is accompanied by a 6-unit code (a-f).

a. Abrasion Resistance
Based on the number of cycles required to abrade through the sample glove.

b. Blade Cut Resistance
Based on the number of cycles required to cut through the sample at a constant speed.

c. Tear Resistance
Based on the amount of force required to tear the sample.

d. Puncture Resistance
Based on the amount of force required to pierce the sample with a standard-sized point.

e. ISO Cut Resistance
Based on the force required to cut through a sample using a specified cut test machine (i.e., Tomodynamometer or TDM) under specified conditions.

f. EN Impact Protection
Based on the measured transmission of energy and force when the sample experiences a dropped load

PERFORMANCE LEVEL RATING

	1	2	3	4	5
a Abrasion Resistance *(cycles)*	100	500	2000	8000	–
b Blade Cut Resistance *(number)*	1.2	2.5	5.0	10.0	20.0
c Tear Resistance *(Newtons)*	10	25	50	75	–
d Puncture Resistance *(Newtons)*	20	60	100	150	–

	a	b	c	d	e	f
e ISO Cut Resistance *(Newtons)*	2	5	10	15	22	30
f EN Impact Protection	**PASS** (P) or **FAIL** (no marking)					

Level X can also be applied for a – f above, which means "not tested" or "not applicable"

These performance levels must be prominently displayed alongside the pictogram on the gloves and on the packaging that immediately contains the gloves.

CHEMICAL PROTECTIVE CLOTHING

Chemical protective clothing for industrial use or other applications where protection from chemicals is required. EU system of 6 protection types and corresponding standard explained.

GUIDE TO EUROPEAN STANDARDS FOR CHEMICAL PROTECTIVE CLOTHING

To assist you with the selection of appropriate protection solutions based on the exposure risk, the EU developed six types of chemical protective clothing (CPC).

Certification of a particular type offers an indication of your suit's protection against a particular hazard (ie. gas/vapour, liquid or dust). As a manufacturer, it is our responsibility to ensure that Ansell meets the requirements of these standards, where applicable. Please be aware that conformance to these type standards does not mean that your suit is 100% impervious to your hazard. Under these tests, products are only required to meet the minimum performance requirements specified. In the case of the Type 5 particulate test, for example, products are allowed individual leakages of up to 30%, providing the average for the suits tested is less than 15%. For more information contact your Ansell representative.

Current European types of chemical protective clothing		
Symbol	**EN "Types"**	**Definition**
	**EN 943-1/EN 943-2** Type 1	**Gas-tight chemical protective clothing** Protective clothing against liquid and gaseous chemicals, aerosols and solid particulates
	Type 1a	› **Gas-tight, self-contained breathing apparatus worn inside the suit**
	Type 1a-ET	› **Type 1a for Emergency Teams**
	Type 1b	› **Gas-tight, self-contained breathing apparatus worn outside the suit**
	Type 1b-ET	› **Type 1b for Emergency Teams**
	Type 1c	› **Gas-tight, with breathable air supplied via continuous flow airline**
	**EN 14605** Type 3	**Liquid-tight suits** Suits which can protect against strong and directional jets of liquid chemicals
	**EN 14605** Type 4	**Spray-tight suits** Suits which offer protection against saturation of liquid chemicals
	**EN ISO 13982-1** Type 5	**Dry-particulate protection** Suits which provide protection to the full body against airborne solid particulates
	**EN 13034** Type 6	**Reduced-spray suits** Suits which offer limited protection against a light spray of liquid chemicals
Additional standards		
Symbol	**EN "Types"**	**Definition**
	**EN 1073-1**	Ventilated protective clothing against radioactive particulate contamination
	EN 1073-2	Non-ventilated protective clothing against radioactive particulate contamination
	**EN 14126**	Protective clothing against infective agents (Type suffixed with "-B" – e.g. Type 3-B) indicates approval to this European norm
	**EN 1149-5**	Protective clothing with electrostatic properties
	**EN ISO 27065**	Protective clothing – protective suits for operators applying pesticides and for re-entry workers
-	**EN ISO 14116**	Protective clothing – limited flame spread materials, material assemblies and clothing
	**EN 12941**	Respiratory protective devices – powered filtering devices incorporating a helmet or a hood
	**EN 14594**	Respiratory protective devices – continuous flow compressed airline breathing devices

CPC types and standards in Europe

Quick Reference Overview

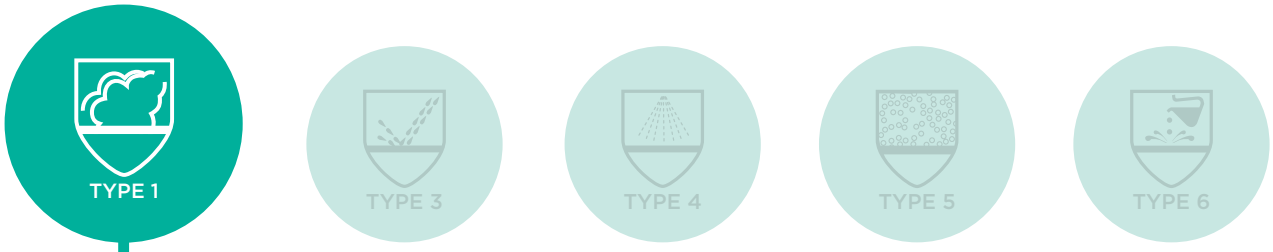
Type	Garment Protection Type	Product Standard	Full Garment Type Test	Garment Material Barrier Test	Garment Material Physical Tests (see EN 14325)
1	Gas-tight	EN 943	Pressure test ISO 17491-1	Permeation ISO 6529	Abrasion, flex cracking, flex cracking at low temp (optional), tear resistance, tensile strength, puncture resistance, resistance to igntion/flame, seam strength
1a	Encapsulating	EN 943-1, EN 943-2			
1b	Non-encapsulating				
1c	Air-fed ”Freeflow”	EN 943-1			
3/3PB	Liquid tight	EN 14605	Liquid jet test EN ISO 17491-3	Permeation ISO 6529	Abrasion, flex cracking, flex cracking at low temp (optional), tear resistance, tensile strength, puncture resistance, seam strength
4/4PB	Spray tight	EN 14605	Spray test EN ISO 17491-4 (method B)		
5	Particle tight	EN ISO 13982-1	Particle total inward leakage, EN ISO 13982-2	Evaluated as part of full garment test	Abrasion, flex cracking, flex cracking at low temp (optional), tear resistance, puncture resistance, seam strength
6/6PB	Low risk, low exposure liquid tight	EN 13034	Low level spray test EN ISO 17491-4 (method A)	Penetration ”Gutter test” EN ISO 6530	Abrasion, tear resistance, tensile strength, puncture resistance, seam strength

EN 943-1:2015 + A1:2019 | EN 943-2:2019 TYPE 1 (GAS-TIGHT) CHEMICAL PROTECTIVE SUITS

To assist you with the selection of chemical protective clothing the EU has developed six categories for "types" of chemical protective clothing.

Certification to a particular type offers an indication of your suit's protection against a particular hazard (gas, liquid or dust). This guide explains performance requirements for protective clothing providing ***protection against dangerous solid, liquid and gaseous chemicals, including liquid and solid aerosols (Type 1 gas-tight chemical protective suits).***

Type 1 suit: One-piece garment with hood, gloves and boots which, when worn with appropriate respiratory protective devices, provides the wearer a high degree of protection against harmful liquids, particles and gaseous or vapour-phase contaminants. Type 1 suits are divided into 3 different sub-types: **Type 1a, 1b and 1c**.



'Type 1' Protective Clothing Performance Requirements Include:

1. **Type 1**

2. **Resistance to outward leakage of gases (internal pressure test) - ISO 17491-1:2012, Method A2**
   This test defines Type 1

3. **Physical Requirements**
   EN 14325 includes a range of physical performance test requirements.

4. **Chemical Requirements**
   The EN 943 product standard together with EN 14325 specifies for chemical testing to apply to garment material, seams and components.

5. **Practical Performance and Other Requirements**
   Practical work simulation tests are specified and evaluated with pass/fail criteria. Visual acuity requirements are also included.

6. **ET (Emergency Teams) / EN 943-2**
   For Emergency Teams, the requirements for physical properties and chemical performance are higher. A battery of test chemicals is specified as the minimum for testing.

1 TYPE 1

Type 1a

Type 1a suit

Gas-tight chemical protective suit to be used in conjunction with a breathable air supply which is both independent of the ambient atmosphere and worn inside the suit, e.g. a self-contained open circuit compressed-air breathing apparatus.

Type 1b

Type 1b suit

Gas-tight chemical protective suit to be used in conjunction with a breathable air supply independent of the ambient atmosphere supplied from or worn outside the suit, e.g. a self-contained open circuit compressed air breathing apparatus.

Type 1c

Type 1c suit

Gas-tight chemical protective suit to be used in conjunction with breathable air providing positive pressure where the suit is the face piece, e.g. air lines where the wearer breathes from the suit.

Note: *A Type 2 was described in older editions of EN 943-1, but it has been removed because it was agreed for EN 943-1 to cover only gas-tight suits as defined by the internal pressure test.*

RESISTANCE *to Outward Leakage*

2 Resistance to outward leakage of gases (internal pressure test) - ISO 17491-1:2012, Method A2

This test defines type 1. The complete suit shall be pressure tested both before and after practical performance testing as specified in EN 943-1.

ISO 17491-1 specifies a method to assess the resistance of a gas-tight suit to outward leakage of air, for example through essential openings, fastenings, seams, interface areas between items, pores and any imperfections in the construction materials. The test is performed by inflating a suit with air and then monitoring the pressure inside it to establish its ability to maintain the pressure.

Although the hazard to the wearer arises from leakage in an inward direction, this test method is able to detect very small imperfections, such as holes, splits or tears by assessing the outward leakage of air on a suit that has been inflated, which also allows for the material to stretch and settle from the pressure before the actual test.

Pressure Test Type 1a

Pressure Test Type 1b

PHYSICAL *Performance Requirements*

3a Minimum Performance Requirements of Type 1 Chemical Protective Clothing

Tests and classifications according to EN 14325.

Property	Minimum Performance Class		
	EN 943-1	EN 943-2 Regular Robustness	EN 943-2 Enhanced Robustness
Abrasion Resistance (EN 14325, EN 530)	Class 3	Class 4	Class 6
Flex Cracking (EN 14325, ISO 7854:B)	Class 1	Class 1	Class 4
Flex Cracking @ -30 °C (ISO 7854:B) ***Note:*** *The -30 °C is optional in EN 943-1*	Class 2	Class 2	Class 2
Trapezoidal Tear Resistance (EN ISO 9073-4)	Class 3	Class 3	Class 3
Tensile Strength (EN ISO 13934-1)	Class 3	Class 4	Class 6
Puncture Resistance (EN 863)	Class 2	Class 2	Class 3
Resistance to permeation by chemicals (liquids and gases)	Class 3	Class 2*	Class 2*
Resistance to Ignition (EN 13274-4 method 3)	Pass	-	-
Resistance to Flame (EN 13274-4 method 3)	-	Class 1	Class 3

** Minimum 14 of 15 specified chemicals must achieve at least Class 2.*

3b Seams, Joins & Assemblages

Seams (joining two pieces of the garment material) are tested for seam strength and chemical permeation. Assemblages (joining different materials) are also required to be tested for chemical permeation. Joins i.e. non-permanent attachments of e.g. gloves or boots are subject to a 100 N pull-test requirement.

CHEMICAL *Performance Requirements*

4a Chemical Permeation - ISO 6529

Permeation is the process by which a hazardous chemical moves through a material on a molecular level. Molecules of the chemical absorb into the outer surface of the material. They then diffuse across the material and are released or desorbed from the inner surface.

Measuring Permeation

The resistance of a protective clothing fabric to permeation by a potentially hazardous chemical is determined by measuring the breakthrough time and the permeation rate of the chemical through the fabric. Using EN 14325:2018 for chemical protective clothing, cumulative permeation is also measured i.e. the total amount (weight) of permeated chemical per unit area.

Permeation Test Methods

There are various permeation test methods in use today. Which one to use depends on a number of factors including the country of use for the protective clothing, and the type of chemical (i.e. gas or liquid). In the EU, the EN 16523 is used for PPE in general but for type 1 chemical protective clothing specifically ISO 6529 is used as specified in EN 14325:2018.

The resistance of AlphaTec® clothing to permeation by a hazardous chemical is determined by measuring the breakthrough time, permeation rate and cumulative permeation of the chemical through the fabric. Permeation tests are carried out by independent, accredited laboratories in accordance with EN ISO 6529 and EN 16523.

4b Chemical Testing Requirements

The EN 943 requires chemical breakthrough time and cumulative permeation to be measured and classified according to EN 14325:2018.

For EN 943-1 the chemicals are chosen by the manufacturer in accordance with the intended use of the suit. A minimum performance of class 3 (> 60 minutes) is required.

For EN 943-2 emergency teams, there is a battery of 15 specified chemicals that must be tested.

The chemical test requirement applies to materials, seams/assemblages and components. Typically, these would be garment materials, visor, gloves and boots.

Zippers are also included but with a lower permeation breakthrough time requirement. Also, zippers have to be covered by a splash protective flap if not class 3 is achieved for all chemicals tested on the zipper.

PRACTICAL *Performance Requirements*

5a Practical Performance

EN 943-1 requires test subjects wearing suits to perform a series of movements and work simulation tasks at room temperature. A questionnaire is used for the suit to be evaluated and graded by the test subject. If present, the visor is assessed for visual acuity. Pass/fail criteria are applied in the form of a minimum score. The suit also has to pass the internal pressure test before and after the practical performance test.

For EN 943-2, slightly different movements and tasks are applied to better simulate typical tasks for emergency teams such as fire brigade “hazmat teams” (see section 6 below).

Examples of practical performance testing

5a Full Suit Tests for Type 1c

In addition to practical performance, there are tests for Type 1c suits relating to this product being an RPD (Respiratory Protective Device). EN 14594 is referenced and include testing of breathing resistance, carbon dioxide level etc.

Also, a total inward leakage test performed with a solid particulate aerosol or a gas is required.

ET (EMERGENCY TEAMS) / EN 943-2

6 ET (Emergency Teams) / EN 943-2 Minimum Requirements

For Emergency Teams, the requirements for physical properties and chemical performance are higher (table 3a above). A battery of 15 test chemicals is specified as the minimum for chemical testing (table below).

Minimum 14 of the 15 specified chemicals must achieve at least Class 2. (Class 1 is accepted for 1 chemical only and in this case, there must be a warning in the IFU for exposure to this chemical.)

The 15 chemicals are selected to represent a wide range of chemical groups, and small molecules that can be expected to permeate faster than corresponding larger ones are specified. This is to ensure a good barrier against as many chemicals as possible, which is desirable for responders to chemical emergencies where the chemical may not be known beforehand.

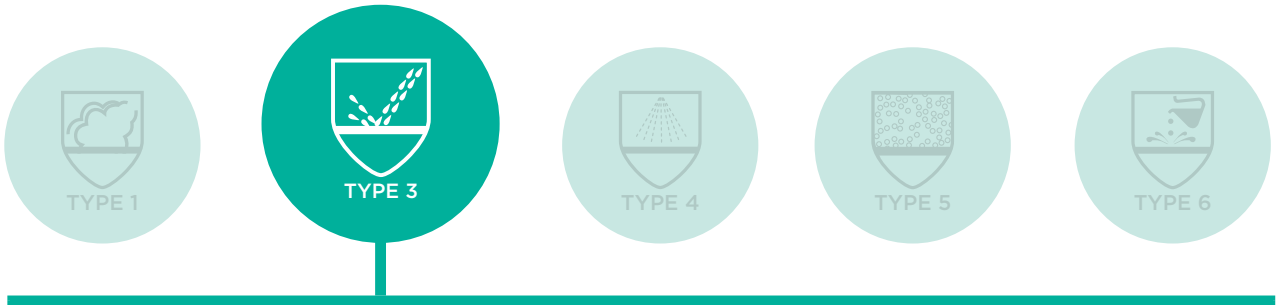
ET / EN 943-2 Test Chemicals	
Acetone	**Hexane**
Acetonitrile	**Hydrogen chloride (gas)**
Anhydrous ammmonia (gas)	**Methanol**
Carbon disulfide	**Sodium hydroxide, 40%**
Chlorine (gas)	**Sulphuric acid, 96%**
Dichloromethane	**Tetrahydrofuran**
Diethyl amine	**Toluene**
Ethyl acetate	

EN 943-2 practical performance requirements specify different movements and tasks to better simulate typical tasks for emergency teams such as fire brigade “hazmat teams”. This includes work at at -15 °C where e.g. fogging of the visor can be a big problem and reason for failure.

EN 14605:2005+A1:2009 TYPE 3 PROTECTIVE CLOTHING

To assist you with the selection of chemical protective clothing the EU has developed six categories for "types" of chemical protective clothing.

Certification to a particular type offers an indication of your suit's protection against a particular hazard (gas, liquid or dust). This guide explains performance requirements for protective clothing providing ***protection to the full body against liquid chemicals (Type 3 clothing).***



'Type 3' Protective Clothing Performance Requirements Includes:

EN ISO 13688:2013 General Requirements

This standard sets out the general requirements for protective clothing, i.e. materials shall not be known to cause skin irritation or have any adverse effect to health. This also details garment sizing and labelling that is required.

1

Jet Test - EN ISO 17491-3:2008

Test methods for clothing providing protection against chemicals. Part 3: Determination of resistance to penetration by a jet of liquid (jet test)

2

Chemical Permeation Test

Chemical permeation is the process by which a hazardous chemical moves through a material on a molecular level.

3

Seams, Joins & Assemblages Test

The Seam Strength of a coverall is required to meet the minimum performance class.

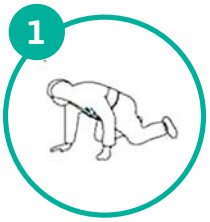
4

Material (Fabric) Test Requirements

EN 14325 comprises of a range of performance test methods which include:
Abrasion, Flex Cracking, Trapezoidal Tear, Tensile Strength & Puncture Resistance.

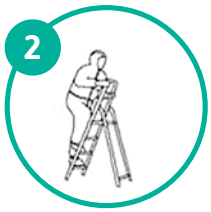
PROTECTIVE
Performance Requirements

7 movements is a test that has to be taken before the Jet Test and the Spray Test.



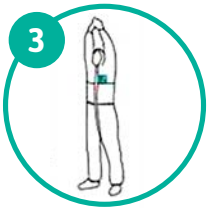
Movement 1:

Kneel on both knees, lean forward and place both hands on the floor (45±5) cm in front of the knees; crawl forward and backwards on hands and knees for a distance of three metres in each direction



Movement 2:

Climb a vertical ladder at least four steps, rungs to be as encountered on a typical ladder



Movement 3:

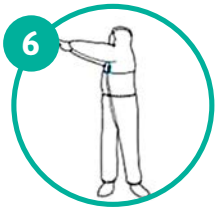
Position hands at chest level, palms out; reach directly overhead, interlock thumbs, extend arms fully upwards

Movement 4:

Kneel on right knee, place left foot on floor with left knee bent (90±10) °; touch thumb of right hand to toe of left shoe. Repeat movement with alternate posture, i.e. by kneeling on left knee and placing the right foot on the floor with knee bent at 90°

Movement 5:

Extend arms fully in front of body, lock thumbs together, twist upper body (90±10)° left and right



Movement 6:

Stand with feet shoulder width apart, arms at side; raise arms until they are parallel to the floor in front of the body; squat down as far as possible

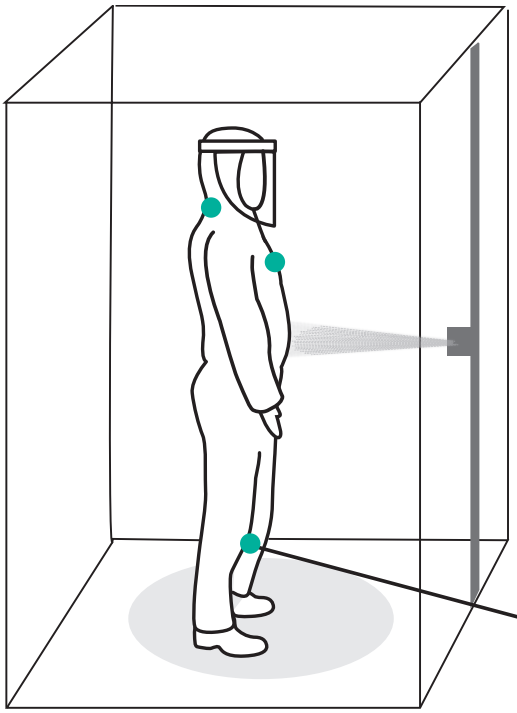
Movement 7:

Kneel as in movement 4, left arm hanging loosely at side; raise arm fully overhead. Repeat movement with alternate posture by alternating arms.

PROTECTIVE
Performance Requirements

1 Jet Test - EN ISO 17491-3:2008

1. A jet nozzle is positioned 1 metre away from the test spot in each case, in a horizontal line and at the angle most likely to cause penetration. Liquid with an exit pressure of 150 kPa (1.5 bar) from the nozzle specifically designed for the test, is directed from the jet at each test spot for 5 seconds, starting at the lowest test spot.
2. Test spots are selected from the most critical areas, including at least 3 spots on all types of joins, seams, assemblages, seam crossings, zips and covered zips.
3. The subject stands still in front of the jet. Once the jet spot has been completed, move to the next spot to be tested.
4. Connections between different parts of the suit (e.g. overlapping parts of jacket and trousers) or between the suit and other protective items (e.g. separate hood, gloves, boots) must have at least one spot tested for each type of connection line.
5. A jet of water, containing a fluorescent or visible dye tracer, is directed under controlled conditions at chemical protective clothing worn by a human test subject.
6. Inspection of the inside surface of the protective clothing and outside surface of absorbent clothing worn underneath allows any points of inward leakage to be identified.



A **jet** of water containing flourescent is sprayed onto the subject

1.5 bar pressure.

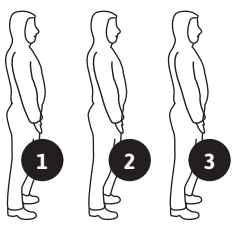
1 metre from nozzle to test suit.

Test spots are selected from the most critical areas

Test Requirements

If any penetration is greater than 3 times the total calibration stain area, then the product has failed. The calibration stain is 25 ± 5 µL (microlitres) of liquid which gives an area of at least 1 cm^2. The test is repeated on 2 further suits – and all 3 suits must pass!

3 Suits Tested



2 Chemical Permeation - ISO 6529 and EN 16523

Permeation is the process by which a hazardous chemical moves through a material on a molecular level. Molecules of chemical absorb into the outer surface of the material. They then diffuse across the material and are released or desorbed from the inner surface.

Measuring Permeation

The resistance of a protective clothing fabric to permeation by a potentially hazardous chemical is determined by measuring the breakthrough time and the permeation rate of the chemical through the fabric.

Permeation Test Methods

There are various permeation test methods in use today. Which one to use depends on a number of factors including the country of use for the protective clothing, and the type of chemical (i.e. gas or liquid).

The resistance of AlphaTec® clothing to permeation by a hazardous chemical is determined by measuring the breakthrough time and permeation rate of the chemical through the fabric. Permeation tests are carried out by independent, accredited laboratories in accordance with ISO 6529 and EN 16523.

AnsellGUARDIAN® PARTNER

Powerful NEW digital tool allows easy access to chemical permeation data for hazardous substances, including ASTM, EN and ISO standardised lists of challenge chemicals.

Our new digital solution is designed to simplify the selection of Ansell hand and body protection solutions. This tool offers an instant visual evaluation and an easy-to-use search functionality including the unique Chemical Abstracts Service (CAS) number system. For specific chemical protection challenges, an expert assessment is also available to provide a simplified set of choices, drawn from our broad portfolio of chemical protection solutions.

How does it works:

1. **Search for chemicals by CAS or Name**

CAS	CHEMICAL NAME
110-82-7	CYCLOHEXANE

2. **Search for products or materials**

CHEMICAL PERMEATION DATA

3. **View permeation and degradation charts and identify optimal solutions**

For up-to-the-minute chemical permeation data, please visit:
www.ansellguardianpartner.com

PHYSICAL
Performance Requirements

3 Seams, Joins & Assemblages

Perfomance Requirement	Reference
Chemical permeation to be tested on any seams exposed in use.	EN 14325, 4.11 (see below table)
Resistance to penetration by liquids. Tested as part of the Type 3 whole suit test.	EN ISO 17491-3 (Type 3)
Seam strength	EN 14325, 5.5 – the test method specified is EN ISO 13935-2

Seams, joins and assemblages of Type PB [3] clothing shall be tested to the jet test (EN ISO 17491-3).

4 Materials (Fabric) Test Requirements (Physical Test)

EN 14325 comprises of a range of performance test methods. These are listed below;

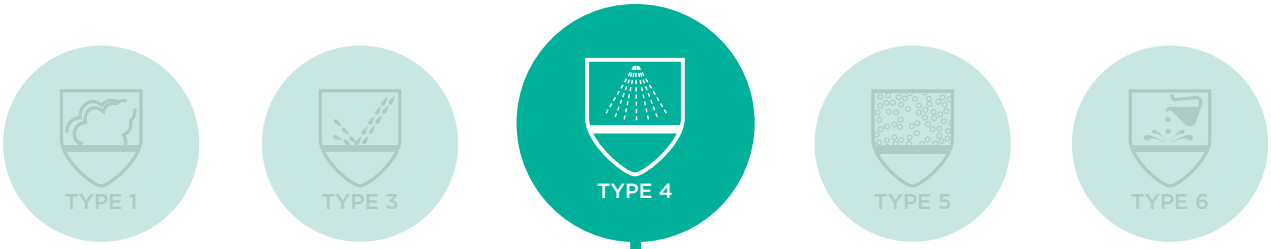
Test Methods	Clause in EN 14325	Minimum Performance Class
Abrasion (EN ISO 12947-2:2016)	4.4	Class 1
Flex Cracking (EN ISO 7854 Method B)	4.5	Class 1
Flex Cracking, -30 °C (EN ISO 7854) *Note: -30 degree is not required, only optional (a)*	4.6 (a)	Class 1
Trapezoidal Tear (EN ISO 9073-4)	4.7	Class 1
Tensile Strength (EN ISO 13934-1)	4.9	Class 1
Puncture Resistance (EN 863)	4.10	Class 1
Resistance to permeation by chemicals (EN 6529)	4.11	Class 1

(a) Only applicable if clothing intended for use at low temperatures.

EN 14605:2005+A1:2009 TYPE 4 PROTECTIVE CLOTHING

To assist you with the selection of chemical protective clothing the EU has developed six categories for "types" of chemical protective clothing.

Certification to a particular type offers an indication of your suit's protection against a particular hazard (gas, liquid or dust). This guide explains performance requirements for protective clothing providing ***protection to the full body against liquid chemicals (Type 4 clothing).***



'Type 4' Protective Clothing Performance Requirements Includes:

EN ISO 13688:2013 General Requirements

This standard sets out the general requirements for protective clothing, i.e. materials shall not be known to cause skin irritation or have any adverse effect to health. This also details garment sizing and labelling that is required.

1. ### Spray Test (High Level) - EN ISO 17491-4:2008 (Method B)

Test methods for clothing providing protection against chemicals. Part 4: Determination of resistance to penetration by a spray of liquid (spray test)

2. ### Chemical Permeation Test

Chemical permeation is the process by which a hazardous chemical moves through a material on a molecular level.

3. ### Seams, Joins & Assemblages Test

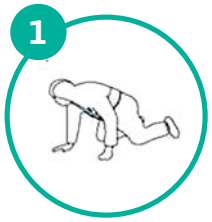
The Seam Strength of a coverall is required to meet the minimum performance class.

4. ### Material (Fabric) Test Requirements

EN 14325 comprises of a range of performance test methods which include:
Abrasion, Flex Cracking, Trapezoidal Tear, Tensile Strength & Puncture Resistance.

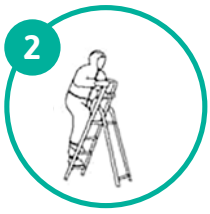
PROTECTIVE
Performance Requirements

7 movements is a test that has to be taken before the Jet Test and the Spray Test.



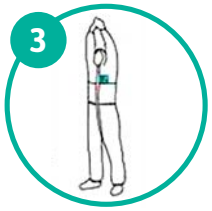
Movement 1:

Kneel on both knees, lean forward and place both hands on the floor (45±5) cm in front of the knees; crawl forward and backwards on hands and knees for a distance of three metres in each direction



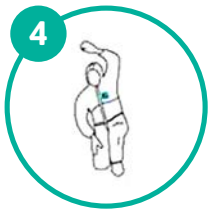
Movement 2:

Climb a vertical ladder at least four steps, rungs to be as encountered on a typical ladder



Movement 3:

Position hands at chest level, palms out; reach directly overhead, interlock thumbs, extend arms fully upwards

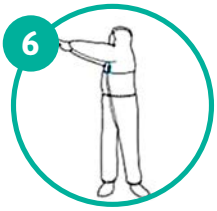


Movement 4:

Kneel on right knee, place left foot on floor with left knee bent (90±10) °; touch thumb of right hand to toe of left shoe. Repeat movement with alternate posture, i.e. by kneeling on left knee and placing the right foot on the floor with knee bent at 90°

Movement 5:

Extend arms fully in front of body, lock thumbs together, twist upper body (90±10)° left and right



Movement 6:

Stand with feet shoulder width apart, arms at side; raise arms until they are parallel to the floor in front of the body; squat down as far as possible

Movement 7:

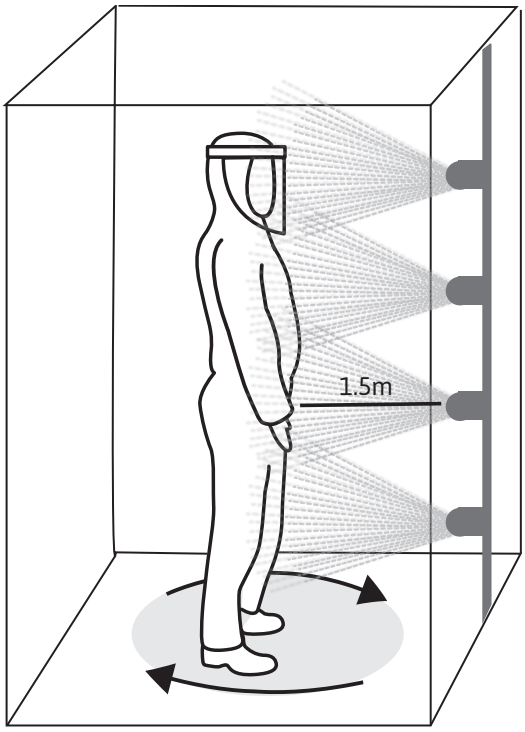
Kneel as in movement 4, left arm hanging loosely at side; raise arm fully overhead. Repeat movement with alternate posture by alternating arms.

PROTECTIVE
Performance Requirements

1 Spray Test - EN ISO 17491-4:2008, method B

1. The wearer enters the chamber and stands on a rotating platform (the platform turns at 360°/min).
2. An aqueous **spray**, containing a fluorescent or visible dye tracer, is directed under controlled conditions at chemical protective clothing worn by the human test subject.
3. The suit is sprayed from all sides by approx. 4.5 litres of the dyed water over the course of 1 minute (1 full rotation) from a series of spray nozzles of varying height.
4. There is a 1.5 metre gap between the spray nozzles and the test subject. The test subject performs a slow exaggerated walking action, raising their arms and legs throughout the test in order to expose all areas of the suit to the spray.
5. Inspection of the inside surface of the protective clothing and outside surface of absorbent clothing worn underneath allows any points of inward leakage to be identified.

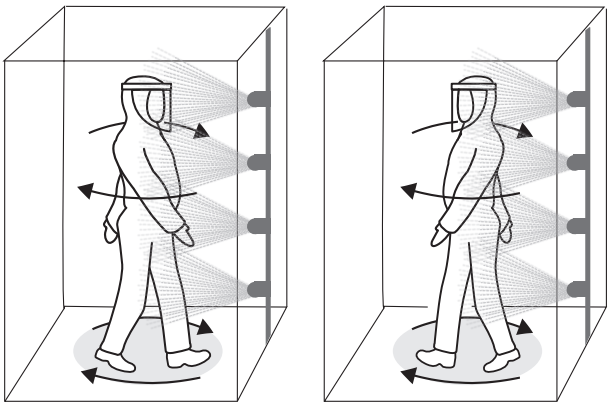
The test subject performs a slow exaggerated walking action, raising their arms and legs throughout the test in order to expose all areas of the suit to the spray.



A spray of water containing fluorescent dye is sprayed onto the subject

3 bar pressure.

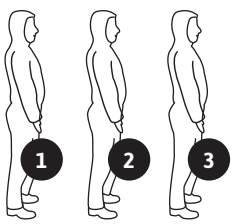
1.5 metre gap from nozzle to test suit.



Test Requirements

If any penetration is greater than 3 times the total calibration stain area, then the product has failed. The calibration stain is 25 ± 5 µL (microlitres) of liquid which gives an area of at least 1 cm². The test is repeated on 2 further suits – and all 3 suits must pass!

3 Suits Tested



2 Chemical Permeation - ISO 6529 and EN 16523

Permeation is the process by which a hazardous chemical moves through a material on a molecular level. Molecules of chemical absorb into the outer surface of the material. They then diffuse across the material and are released or desorbed from the inner surface.

Measuring Permeation

The resistance of a protective clothing fabric to permeation by a potentially hazardous chemical is determined by measuring the breakthrough time and the permeation rate of the chemical through the fabric.

Permeation Test Methods

There are various permeation test methods in use today. Which one to use depends on a number of factors including the country of use for the protective clothing, and the type of chemical (i.e. gas or liquid).

The resistance of AlphaTec® clothing to permeation by a hazardous chemical is determined by measuring the breakthrough time and permeation rate of the chemical through the fabric. Permeation tests are carried out by independent, accredited laboratories in accordance with ISO 6529 and EN 16523.

AnsellGUARDIAN® PARTNER

Powerful NEW digital tool allows easy access to chemical permeation data for hazardous substances, including ASTM, EN and ISO standardised lists of challenge chemicals.

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CAS	CHEMICAL NAME
110-82-7	CYCLOHEXANE

2. Search for products or materials

CHEMICAL PERMEATION DATA

3. View permeation and degradation charts and identify optimal solutions

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www.ansellguardianpartner.com

PHYSICAL
Performance Requirements

3 Seams, Joins & Assemblages

Perfomance Requirement	Reference
Chemical permeation to be tested on any seams exposed in use.	EN 14325, 4.11 (see below table)
Resistance to penetration by liquids. Tested as part of the full suit Type 4 test.	EN ISO 17491-4 (Type 4)
Seam strength	EN 14325, 5.5 – the test method specified is EN ISO 13935-2

4 Materials (Fabric) Test Requirements (Physical Test)

EN 14325 comprises of a range of performance test methods. These are listed below;

Test Methods	Clause in EN 14325	Minimum Performance Class
Abrasion (EN ISO 12947-2:2016)	4.4	Class 1
Flex Cracking (EN ISO 7854 Method B)	4.5	Class 1
Flex Cracking, -30 °C (EN ISO 7854) *Note: -30 degree is not required, only optional (a)*	4.6 (a)	Class 1
Trapezoidal Tear (EN ISO 9073-4)	4.7	Class 1
Tensile Strength (EN ISO 13934-1)	4.9	Class 1
Puncture Resistance (EN 863)	4.10	Class 1
Resistance to permeation by chemicals (ISO 6529)	4.11	Class 1

(a) Only applicable if clothing intended for use at low temperatures.

EN ISO 13982-1:2004+A1:2010 TYPE 5 PROTECTIVE CLOTHING

To assist you with the selection of chemical protective clothing the EU has developed six categories for "types" of chemical protective clothing.

Certification to a particular type offers an indication of your suit's protection against a particular hazard (gas, liquid or dust). This guide explains performance requirements for protective clothing providing ***protection to the full body against airborne solid particulates (Type 5 clothing).***

Please be aware that conformance to these type standards does not mean that your suit is 100% impervious to your hazard. Under this testing, suits are only required to meet the minimum performance requirements specified. In the case of the Type 5 particulate test for example, suits are allowed individual leakages of up to 30%, providing the average for the suits tested is less than 15%. Please see 'Whole Suit' Inward leakage test for further guidance.

'Type 5' Protective Clothing Performance Requirements Includes:

EN ISO 13688:2013 General Requirements

This standard sets out the general requirements for protective clothing, i.e. materials shall not be known to cause skin irritation or have any adverse effect to health. This also details garment sizing and labelling that is required.

1. ### Whole Suit Inward Leakage Test

This test indicates the barrier efficiency of the suit against particulates of a specific size distribution.

2. ### Seams, Joins & Assemblages Test

The Seam Strength of a coverall is required to meet the minimum performance class.

3. ### Material (Fabric) Test Requirements

EN 14325 comprises of a range of performance test methods which include: Abrasion, Flex Cracking, Trapezoidal Tear & Puncture Resistance.

PROTECTIVE
Performance Requirements

1 'Whole Suit' Inward Leakage Test - EN ISO 13982-2:2004

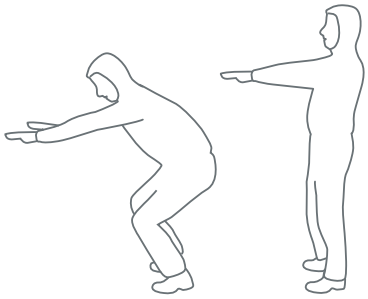
Protective clothing for use against solid particulates.
Test method for the determination of inward leakage of aerosols of fine particles into suits. This test is performed using "real people" and is designed to simulate everyday use. The garment is donned according to the manufacturers' instructions, including any protective equipment.

Did you know...
At least 5 test subjects are involved, each testing 2 suits. So at least 10 suits are tested!

Prior to Entering the Test Chamber

Prior to entering the test chamber the test subject is asked to repeat the following sequence of movements 3 times at what is termed "normal working speed";

1. Kneel on both knees, lean forward and place both hands on the floor 45 cm in front of the knees. Crawl forward on hands and knees over a distance of 3m and crawl backwards again over the same distance.



2. Stand with feet shoulder width apart, arms at side. Raise arms until they are parallel to the floor in front of the body. Squat down as far as possible.

3. Kneel on right knee, place left foot on floor with left knee bent 90°, left arm hanging loosely at side. Raise right arm fully overhead.

Once they have completed these movements, the suit is inspected visually for tears or rips in the fabric, seams, closures or connections to gloves, boots or mask (if any). Any damage is mentioned in the test report, but the test is discontinued if the damage is significant or has been hindered the test subjects' movement. If this happens, then the garment is deemed to have failed!

Pass Criteria

Inward leakage must be ≤ 30% for 82 of the 90 measurements. Average inward leakage (all movements and measurements for each suit) must be ≤ 15% for 8 of the 10 suits.

Did you know...
The standard allows 8 out of the 90 measurements to have individual leakages greater than 30%!

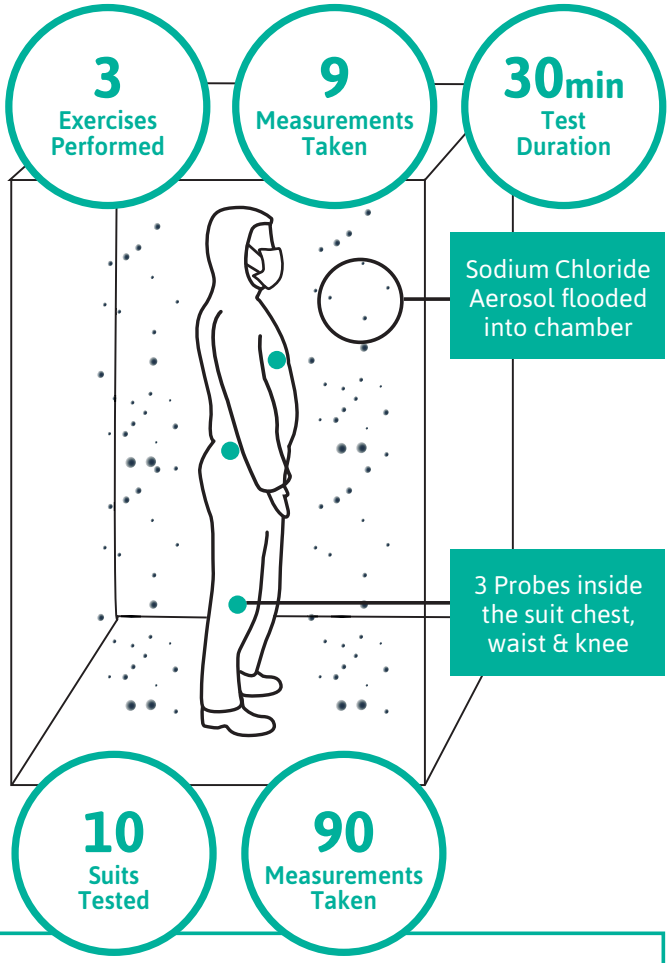
Example: AlphaTec® 3000 tested at IOM in October 2017 it passed 90/90 measurements <30% and all of the TILS results were <15% with an average of < 2.45% TILS which is well under the 15%!

Chamber Test

Sodium Chloride (salt) particulates are flooded into the chamber. The test subject is asked to perform various test exercises in sequence. These are;

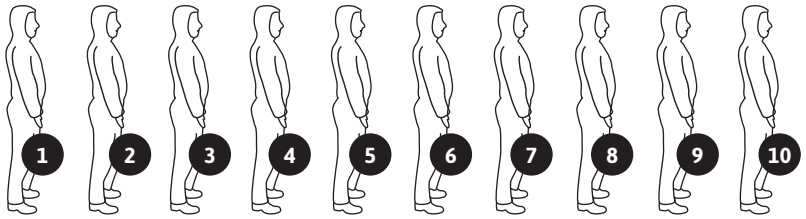
1. 9 minutes of standing still
2. 9 minutes of walking at 5 km/h
3. 9 minutes of continuous squatting at a frequency of five squats per minute, between standing up straight and knees completely bent, while keeping both hands during all squats on a grip at a height of 1 m (+/-0.05 m) above the standing surface.
4. A 3 minute rest is allowed (standing still) between the walking and squatting exercises.

Throughout the process, various measurements are taken from 3 probes inside the suit (chest, waist, knee) continually measuring the ratio of particle concentration inside and outside the suit. The test is then repeated.



Test Requirements

A total of 10 suits are tested
x 3 exercises performed
x 3 measurements taken
= 90 probe measurements



Inward Leakage Test Results Requirements

The Inward leakage (IL) test requires a result of ≤30% IL for 91.1% (or more) of all values measured (all exercises, all sampling positions all suits). So a minimum 82 out of 90 measurements must have 30% or less inward leakage.

Inward Leakage Test	Inward leakage Requirements	
	Inward Leakage %	Suit x / y
Individual Measurements	≤30%	82/90
Total Inward Leakage	≤15%	8/10

Note: The actual number of measurements can vary depending on how many suits are tested but 10 suits equates to 90 measurements.

PHYSICAL
Performance Requirements

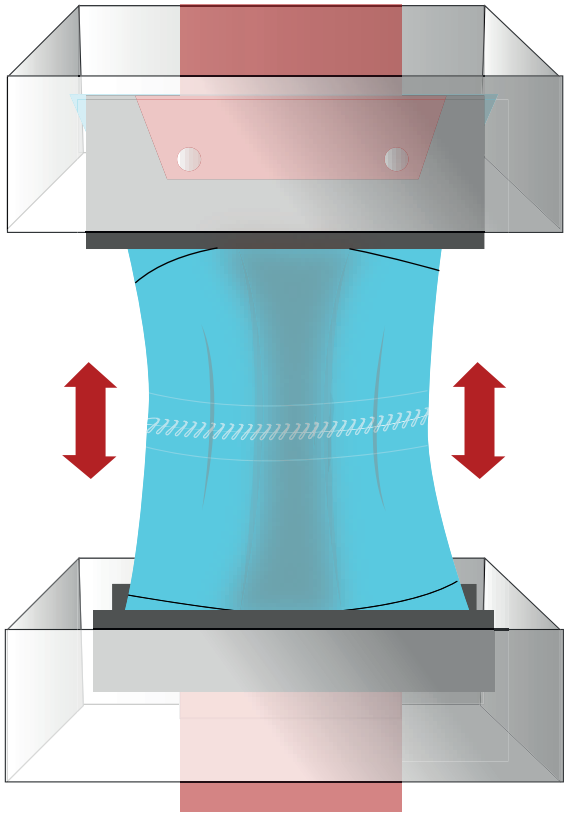
2 Seams, Joins & Assemblages Seam Strength Test - EN 14325 (Physical Test)

Seams should be constructed to minimise or prevent penetration of liquid through stitch holes or other components of a seam.

The seams, as well as joins and assemblages, are also tested for penetration as part of the whole suit inward leakage test described above.

Seam strength is determined and classified in accordance with EN 14325, Clause 5.5 and must obtain at least Class 1 (>30N).

The test method specified in clause 5.5 is EN ISO 13935-2



3 Materials (Fabric) Test Requirements (Physical Test)

EN 14325 comprises of a range of performance test methods. These are listed below;

Test Methods	Clause in EN 14325	Minimum Performance Class
Abrasion (EN ISO 12947-2:2016)	4.4	Class 1
Flex Cracking (EN ISO 7854 Method B)	4.5	Class 1
Trapezoidal Tear (EN ISO 9073-4)	4.7	Class 1
Puncture Resistance (EN 863)	4.10	Class 1

EN 13034:2005+A1:2009 TYPE 6 PROTECTIVE CLOTHING

To assist you with the selection of chemical protective clothing the EU has developed six categories for "types" of chemical protective clothing.

Certification to a particular type offers an indication of your suit's protection against a particular hazard (gas, liquid or dust). This guide explains performance requirements for protective clothing providing ***protection to the full body against liquid chemicals (Type 6 clothing).***

'Type 6' Protective Clothing Performance Requirements Includes:

EN ISO 13688:2013 General Requirements

This standard sets out the general requirements for protective clothing, i.e. materials shall not be known to cause skin irritation or have any adverse effect to health. This also details garment sizing and labelling that is required.

1. **Spray Test (Low Level) EN ISO 17491-4:2008 (Method A)**
   Test methods for clothing providing protection against chemicals. Part 4: Determination of resistance to penetration by a spray of liquid (spray test)

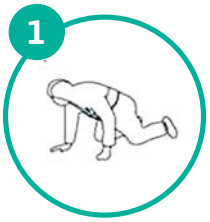
2. **Chemical Penetration and Repellency ("Gutter Test")**
   Liquid chemical penetration is a physical process whereby a liquid penetrates a fabric by passing through pores or holes in the fabric.

3. **Seams, Joins & Assemblages Test**
   The Seam Strength of a coverall is required to meet the minimum performance class.

4. **Material (Fabric) Test Requirements**
   EN 14325 comprises of a range of performance test methods which include:
   Abrasion, Flex Cracking, Trapezoidal Tear, Tensile Strength & Puncture Resistance.

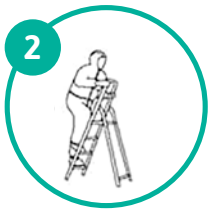
PROTECTIVE
Performance Requirements

7 movements is a test that has to be taken before the Jet Test and the Spray Test.



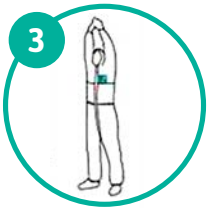
Movement 1:

Kneel on both knees, lean forward and place both hands on the floor (45±5) cm in front of the knees; crawl forward and backwards on hands and knees for a distance of three metres in each direction



Movement 2:

Climb a vertical ladder at least four steps, rungs to be as encountered on a typical ladder



Movement 3:

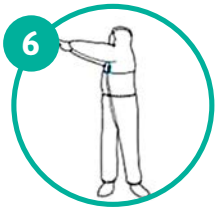
Position hands at chest level, palms out; reach directly overhead, interlock thumbs, extend arms fully upwards

Movement 4:

Kneel on right knee, place left foot on floor with left knee bent (90±10) °; touch thumb of right hand to toe of left shoe. Repeat movement with alternate posture, i.e. by kneeling on left knee and placing the right foot on the floor with knee bent at 90°

Movement 5:

Extend arms fully in front of body, lock thumbs together, twist upper body (90±10)° left and right



Movement 6:

Stand with feet shoulder width apart, arms at side; raise arms until they are parallel to the floor in front of the body; squat down as far as possible

Movement 7:

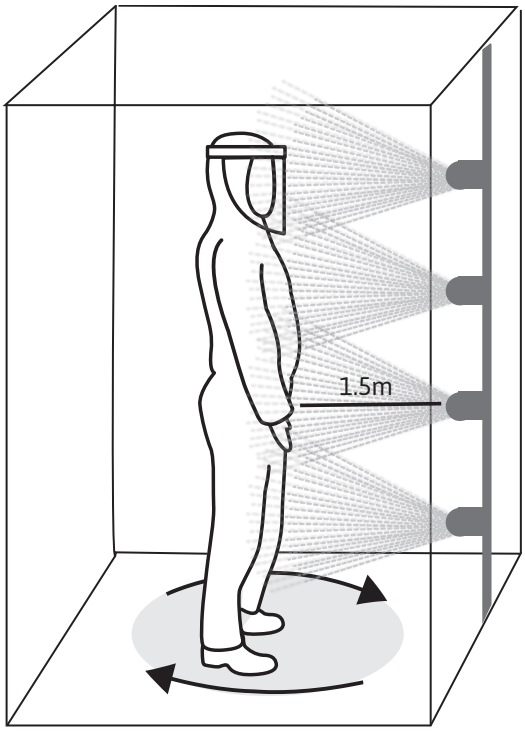
Kneel as in movement 4, left arm hanging loosely at side; raise arm fully overhead. Repeat movement with alternate posture by alternating arms.

PROTECTIVE
Performance Requirements

1 Spray Test - EN ISO 17491-4:2008, method A

1. The wearer enters the chamber and stands on a rotating platform (the platform turns at 360°/min).
2. An aqueous **spray**, containing a fluorescent or visible dye tracer, is directed under controlled conditions at chemical protective clothing worn by the human test subject.
3. The suit is sprayed from all sides by approx. 2 litres of the dyed water over the course of 1 minute (1 full rotation) from a series of spray nozzles of varying height.
4. There is a 1.5 metre gap between the spray nozzles and the test subject. The test subject performs a slow exaggerated walking action, raising their arms and legs throughout the test in order to expose all areas of the suit to the spray.
5. Inspection of the inside surface of the protective clothing and outside surface of absorbent clothing worn underneath allows any points of inward leakage to be identified.

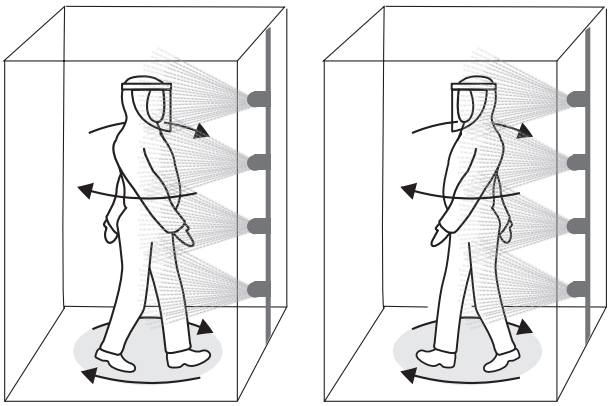
The test subject performs a slow exaggerated walking action, raising their arms and legs throughout the test in order to expose all areas of the suit to the spray.



A spray of water containing fluorescent dye is sprayed onto the subject

3 bar pressure.

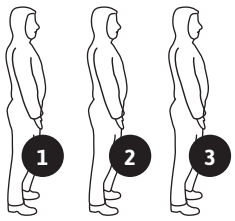
1.5 metre gap from nozzle to test suit.



Test Requirements

If any penetration is greater than 3 times the total calibration stain area, then the product has failed. The calibration stain is 25 ± 5 µL (microlitres) of liquid which gives an area of at least 1 cm². The test is repeated on 2 further suits – and all 3 suits must pass!

3 Suits Tested



2 Chemical Penetration and Repellency ("Gutter Test")

Liquid chemical penetration is a physical process whereby a liquid penetrates a fabric by passing through pores or holes in the fabric.

The European standard EN ISO 6530 *(often referred to as the gutter test)* measures liquid penetration through a fabric and liquid repellency by a fabric.

Table 1 shows the standard chemicals used for penetration and repellency testing according to EN ISO 6530;

The test is performed by placing the fabric to be tested in a gutter, inclined at 45°, which is lined with an absorbent fabric; 10ml of the pre-determined liquid chemical is then poured in within 10 seconds on to the top of the test fabric via a nozzle.

When testing in accordance with EN ISO 6530 for repellency to liquid chemicals the material is classified according to the **Table 2** for each chemical tested;

For liquid repellency a performance level of 3 shall be obtained for at least one of the chemicals listed in table 1.

Any liquid which penetrates the fabric within 1 minute is expressed as a percentage (%) of the original quantity poured onto the fabric.

The volume of liquid collected in the detector beaker (positioned at the bottom of the gutter) is also expressed as a percentage (%) of the original quantity. This measures the repellency of the fabric.

When testing in accordance with EN ISO 6530 for resistance to penetration by liquid chemicals the material is classified according to Table 3 for each chemical tested;

For resistance to penetration by liquids a performance level of at least 2 shall be obtained for at least one of the chemicals listed in table 1.

Caution must be applied when interpreting penetration results according to EN ISO 6530 as it only simulates exposure to small amounts of chemicals (10ml) for 1 minute.

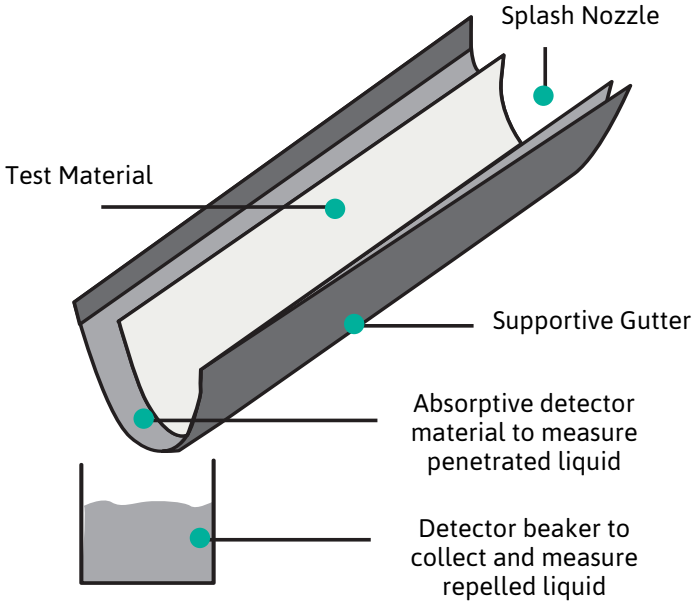


Table 1

Chemical	Concentration weight (%)	Temperature of chemical °c (+/- 2°c)
Sulphuric Acid	30 (aqueous)	20
Sodium Hydroxide	10 (aqueous)	20
0-Xylene	***100% Undiluted***	***20***
Butan-1-ol	***100% Undiluted***	***20***

Table 2

Class	Repellency Index
3	> 95%
2	> 90%
1	80%

Table 3

Class	Penetration Index
3	< 1%
2	< 5%
1	< 10%

PHYSICAL
Performance Requirements

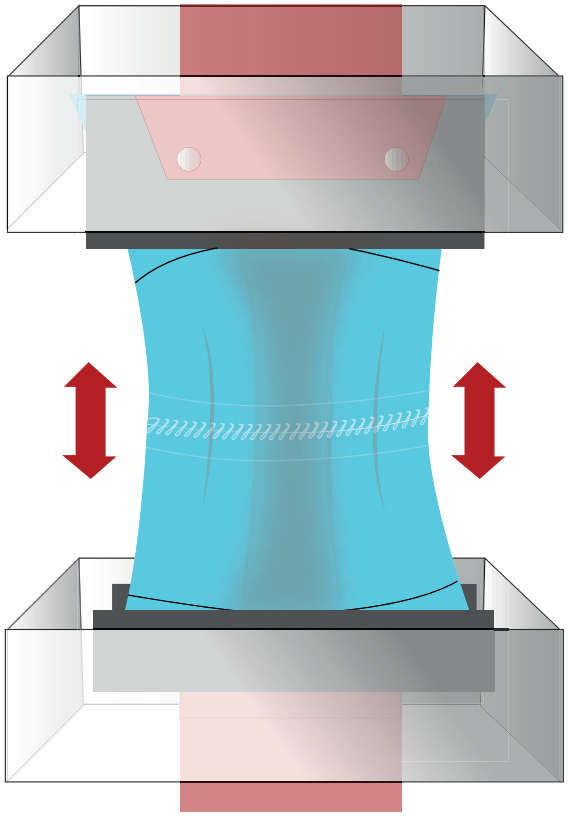
3 Seams, Joins & Assemblages Seam Strength Test - EN 14325 (Physical Test)

Seams should be constructed to minimise or prevent penetration of liquid through stitch holes or other components of a seam.

The seams, as well as joins and assemblages, are also tested for penetration as part of the full suit spray test.

Seam strength is determined and classified in accordance with EN 14325, Clause 5.5 and must obtain at least Class 1 (>30N).

The test method specified in clause 5.5 is EN ISO 13935-2



4 Materials (Fabric) Test Requirements (Physical Test)

EN 14325 comprises of a range of performance test methods. These are listed below;

Test Methods	Clause in EN 14325	Minimum Performance Class
Abrasion (EN ISO 12947-2:2016)	4.4	Class 1
Trapezoidal Tear (EN ISO 9073-4)	4.7	Class 1
Tensile Strength (EN ISO 13934-1)	4.9	Class 1
Puncture Resistance (EN 863)	4.10	Class 1
Repellency to liquids (EN ISO 6530)	4.12	Class 3*
Resistance to penetration by liquids (EN ISO 6530)	4.13	Class 2*

** The performance class requirement must be achieved for at least one of the tested chemicals.*

PROTECTIVE CLOTHING FOR INFECTIVE AGENTS

Protective clothing that provide protection from biological hazards such as bacteria, virus etc.

EN ISO 14126:2003

This European Standard specifies requirements and test methods for re-usable and limited use protective clothing providing protection against infective agents. Clothing worn by surgical teams or drapes laid on patients to prevent cross-contamination during surgical interventions are not covered by the scope of this standard.

Full body garments will have the garment integrity tested and classified using the chemical protective clothing type tests and designations. The suffix -B is then added to the chemical type designation to indicate infective agent protection. For example, for protection from blood-borne pathogens with a high level of exposure, you may consider “Type 4-B” protective clothing.

The EN 14126 standard for protective clothing against infective agents measures the ability of a suit or gown to protect users against bacteria, fungi and viruses. The EN 14126 uses different test methods to measure the penetration resistance of the garment material to infective agents using different kinds of exposure.

EN 14126

Tests required by EN 14126

- **ISO 16603 Penetration under pressure using synthetic blood**
  The garment material will be classified according to the level of performance given by the pressure used in this test, followed by the subsequent bacteriophage test ISO 16604 which is performed at the same pressure and is the pass/fail criteria for the level of performance. Just passing the ISO 16603 synthetic blood penetration test is not enough, you have to prove with the ISO 16604 test that the material actually is a barrier to infective agents at that pressure level.
- **ISO 16604 Resistance to penetration by viruses**
  This standard describes a test method for measuring the resistance of protective garment materials to penetration by blood-borne pathogens. It uses a surrogate microbe under conditions of continuous liquid contact under pressure. Protective clothing “pass/fail” determinations are based on the detection of viral penetration at the pressure used in the ISO 16603 penetration test above.
- **ISO 22610 Resistance to penetration by bacteria**
  This is a test to determine the resistance to penetration by infective agents due to mechanical contact with substances containing contaminated liquids.
- **ISO/DIS 22611 Resistance to penetration by biologically contaminated aerosols**
- **ISO 22612 Resistance to penetration by contaminated dust**

CHEMICAL & MICRO-ORGANISM HAND PROTECTION

Guidelines for gloves worn by workers who require protection from chemicals and/or micro-organisms that could irritate the skin.

EN ISO 374:2016

SCOPE

This standard specifies the capability of gloves to protect the user against chemicals and/or micro-organisms.

DEFINITIONS

Penetration

Penetration is the movement of a chemical and/or micro-organism through porous materials, seams, pinholes, or other imperfections in a protective glove material at a non-molecular level.

Permeation

The rubber and plastic films in gloves are the barriers to chemicals. It is therefore necessary to measure breakthrough times, or the time taken for the hazardous liquid to come in contact with the skin. Each chemical tested is classified in terms of breakthrough time performance level 0 to 6.

BREAKTHROUGH TIME	PROTECTION INDEX	BREAKTHROUGH TIME	PROTECTION INDEX
> 10 minutes	Level 1	> 120 minutes	Level 4
> 30 minutes	Level 2	> 240 minutes	Level 5
> 60 minutes	Level 3	> 480 minutes	Level 6

Degradation

Sometimes chemical protective gloves can act as sponges, soaking up the liquids and holding them against the skin. This degrades the glove. Degradation is the deleterious change in one or more properties of a protective glove material due to contact with a chemical. Indications of degradation are flaking, swelling, disintegration, embrittlement, colour change, dimensional change, change in appearance, hardening, softening, etc.

REQUIREMENTS

Chemical protective gloves:

Penetration

A glove shall not leak when tested with an air and water leak test, and shall be tested and inspected in compliance with the acceptable quality level.

Permeation

A glove shall pass the minimum requirements of Type C, at least Level 1 (more than 10 min) against one chemical on the list of chemicals defined in part 1.

Degradation

The change of puncture resistance after chemical contact shall be tested for all claimed chemicals on the glove and the result mentioned in the instructions for use.

Long gloves

If the length of the chemical protective glove is ≥ 40 cm, the cuff area must also be tested for permeation.

Micro-organism protective gloves:

Penetration

These gloves have the same requirements as for chemical gloves, if protection against bacteria and fungi is claimed.

Virus protection

These gloves have an additional test as per ISO 16604, if virus protection is claimed.

Long gloves

If the length of the chemical protective glove is ≥ 40 cm, the cuff area must also be tested for virus penetration.

WARNING:

The chemical data information does not necessarily reflect the actual duration in the workplace.

EN ISO 374-1:2016+A1:2018

EN ISO 374-1:2016
Type C

EN ISO 374-1:2016
Type B

XYZ

EN ISO 374-1:2016
Type A

UVWXYZ

Marking Chemical Protective Gloves

The 'chemical resistant' glove pictogram must be accompanied by digit code letters for Type A and Type B gloves. Type C marked gloves are without any digit code letter.

These codes letters refer to a list of chemicals defined by the standard.
The minimum breakthrough timefor a Type C glove is 10 mins for one chemical, for a Type B it is 30 mins for at least 3 chemicals, and for Type A it is 30 mins for atleast 6 chemicals on the list.

Marking & Information

- CE mark
- Care & storage instruction
- Instructions and limitations of use
- Degradation results on claimed chemicals
- A list of substances used in the glove which are known to cause allergies
- A list of all substances in the glove shall be made available upon request
- Name and address of notified body that certified the product

DEFINED 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%	1310-73-2	Inorganic base
L	Sulphuric acid 96%	7664-93-9	Inorganic mineral acid, oxidizing
M	Nitric acid 65%	7697-37-2	Inorganic mineral acid, oxidizing
N	Acetic acid 99%	64-19-7	Organic acid
O	Ammonia 25%	1336-21-6	Organic base
P	Hydrogen peroxide 30%	7722-84-1	Peroxide
S	Hydrofluoric acid 40%	7664-39-3	Inorganic mineral acid
T	Formaldehyde 37%	50-00-0	Aldehyde

Check the chemical tool

on Ansell's website at http://industrialcatalogue.ansell.eu/en/chemicalagents

EN ISO 374-5:2016

EN ISO 374-5:2016

EN ISO 374-5:2016

VIRUS

Marking Gloves Protective Against Micro-Organisms

For gloves protective against bacteria and fungi, the biohazard pictogram is applied. For this the protective glove must be tested according to EN 374-2:2013 for leakage proofness.

For protection against bacteria, fungi, and virus, the biohazard pictogram is accompanied with the term "VIRUS", underneath. For this protective standard, the glove must be tested according to EN 374-2:2013 for bacteria and fungi and tested according to ISO 16604: 2004 (Method B) using the bacteriophage penetration test.

***Note:** With this standard, protective gloves against micro-organisms can be claimed with or without chemical protection and vice versa.*

EN 16778:2016 For measuring dimethylforamide (DMF or DMFa) in gloves

SCOPE

This standard specifies a test method for the determination of dimethylformamide (CAS 68-12-2) in glove materials.

DEFINITIONS

Dimethylformamide, also often abbreviated as DMF, DMFa, or DMFo, is a volatile solvent that is hazardous by inhalation and can also penetrate the skin. No specific regulatory guidance currently exists related to dermal contact exposure. This EN 16778 Standard defines a harmonized test method (NOT a requirement nor a limit) to measure DMFa content in glove materials.

TESTING METHODOLOGY

Two test samples – as shown per below illustration below – from one pair of gloves are tested under specific conditions defined in this standard.

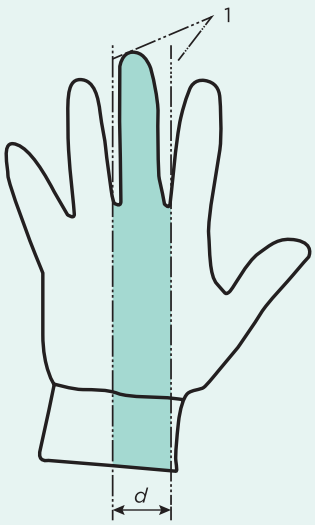


Figure 1
Cutting of the test piece

Key:
1 cut
d (30 ± 5) mm

Note: The shaded area is the test piece

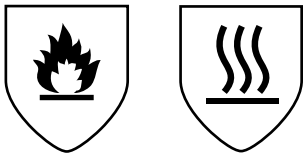
Extraction is carried out during 30 minutes at 70°C, using methanol as the extraction medium.

The DMFa is then analysed and measured by gas chromatograph/mass spectrometry. Result is based on the average of two obtained values and can be made available upon request.

THERMAL PROTECTION

Guidelines for gloves worn by workers who require protection from heat, cold, or fire and, other thermal conditions.

EN 407:2020 / ISO 23407



Glove Against Heat and/or Fire

The use of suitable protective equipment is crucial when dealing with hot materials or other thermal hazards. Understanding the way these gloves are tested and rated will help you select the right gloves for your needs. Ansell provides you the tools to help you familiarise yourself with all there is to know about the latest regulatory updates. The EN 407 was updated and the PPE Regulation 2016/425 was recently established to provide enhanced assessment of PPE for hand protective equipment.

OVERVIEW OF CHANGES	
Title of standard:	Modified to include private use hand protective equipment.
EN 388 requirements adjusted	Requirement to meet minimum EN abrasion 1 deleted; minimum EN tear Level 1 remains
Private use hand protective equipment (e.g. oven gloves):	Added to the scope
Minimum length requirement added:	For gloves claimed to protect against molten metal splashes, a minimum glove length is required, to be in line with the welders' gloves standard
Test methods improved: To follow the state of the art	• For flame resistance (now also called Limited Flame Spread), test ignition time became 10 seconds (versus 15 seconds in old standard) • If Level 3 or 4 is claimed for flame resistance or for large quantities of molten metal, the glove should be removable within 3 seconds • Performance claims in all tests will be based on lowest individual result reported and not the mean • Other areas of gloves also to be tested. No sign of melting may occur
IFU	Specific warning statements added
New pictogram	New pictogram added for non-flame resistant gloves

Private protection equipment against thermal risks — examples

ADOPTING THE REVISED EN 407:2020 STANDARD

- This standard specifies levels of thermal performance, test methods and marking for hand protective equipment against heat and/or fire
- Minimum glove length for protection against molten metal splashes (small splashes & large quantities)
- The protective gloves shall meet the EN 407:2020 requirement
- Gloves of Level 3 and 4 for the flammability & large quantities of molten metal test shall be manufactured and lab tested to ensure they can easily be removed, within 3 seconds, in case of emergency

  If this is not achieved, a clear warning is to be mentioned in the IFU
- Gloves shall meet at least EN tear Level 1

Glove Size	Minimum glove length (mm)
6	300
7	310
8	320
9	330
10	340
11	350

Glove length for protection against molten metal splashes

Performance Level		1	2	3	4
A	**Limited Flame Spread** After flame time and after glow time (finger & seams areas)	<15 s no require	< 10 s < 120 s	< 3 s < 25 s	< 2 s < 5 s
B	**Contact Heat (10°C increase)** Contact temperature and Threshold time (glove palm and, where relevant, other areas)	100 °C > 15 s	250 °C > 15 s	350 °C > 15 s	500 °C > 15 s
C	**Convective Heat (24°C increase)** Heat Transfer index (glove palm & back)	> 4 s	> 7 s	> 10 s	> 18 s
D	**Radiant Heat (24°C increase)** Heat transfer (back of glove)	> 7 s	> 20 s	> 50 s	> 95 s
E	**Small Drops Of Molten Metal (40°C increase)** Number of droplets (glove palm & back & cuff)	> 10	> 15	> 25	> 35
F	**Large Quantities Of Molten Metal (damage to a simulated PVC skin)** Mass of molten iron (glove palm & back & cuff)	30g	60g	120g	200g

1. Test method as per EN ISO 15025: *Burning (Flammability Resistance)*

The first test subject the gloves to an ignition and is measured by how long the gloves continue to burn and glow after the source of ignition is removed.

Test Principle

- A burner is place below the glove.
- Glove is tested after an ignition time of 10 seconds.
- After flame time and After glow time are recorded.

2. Test method as per EN ISO 12127-1: *Contact Heat Resistance*

The second test is to test the capability of the glove to resist heat upon contact based on a certain temperature range.

Test Principle

- 3 tests specimens are cut from the palm area of three gloves. Reinforcements where applicable shall be removed. Front of fingers also need to be tested if these are different from the palm.
- Other areas of the gloves are to be tested if they are different from the palm and claimed against contact heat.
- Each specimen of material is placed on a calorimeter and a hot plate is heated up to the required contact temperature.
- The heated plate is put in contact with the test specimen.
- The threshold time is determined after a 10°C increase of the calorimeter (= second degree burn) after > 15 seconds

3. Test method as per EN ISO 9151: *Convective Heat Resistance*

The third test is based on how long the glove is able to delay the transfer of heat from a flame.

Test Principle

- 3 test specimens (from each material assembly from both palm & back of glove) are subjected to a heat source coming from the flame of a gas burner. Reinforcements on the gloves, where applicable, shall be removed.
- The heat passing through the specimen is measured by means of a small copper calorimeter on top of and in contact with the specimen.
- The threshold time is determined after a 24°C increase of the calorimeter

4. Test method as per EN ISO 6942: *Radiant Heat Resistance*

This fourth test determines how long the glove is able to delay the transfer of heat when exposed to a radiant heat source.

Test Principle

- 2 specimen taken from the back of a pair of gloves. Reinforcements on the gloves, where applicable, shall be removed.
- Test specimen is exposed to a radiant heat source
- The heat passing through the specimen is measured through the calorimeter which is in contact with the specimen.
- The threshold time is determined after a 24°C increase of the calorimeter.

5. Test method as per EN 348: *Resistance to Small Drops of Molten Metal*

The fifth test measures the number of motel metal drops that are required to heat the glove to a certain level.

Test Principle

- 4 tests specimen are taken from palm, back and cuff. Reinforcements on the gloves, where applicable, shall be removed.
- The number of molten metal drops required to cause a 40°C temperature rise in a sensor behind the specimen is measured.

6. Test method as per EN ISO 9185: *Resistance to Large Quantities of Molten Metal*

The sixth test measures the weight of molten metal that is required to cause smoothing or pinholing on a simulated skin placed directly behind the glove sample.

Test Principle

- 3 tests specimen are taken from palm, back and cuff. Reinforcements on the gloves, where applicable, shall be removed.
- Samples are tested by pouring molten iron onto it.
- Damage is assessed by placing a PVC skin simulant directly behind the test specimen and noting damage to the skin simulant after pouring.
- The minimum quantity to cause damage to the skin simulant is observed and used to attribute the performance level.

PERFORMANCE REQUIREMENTS

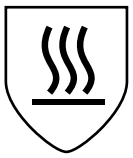
- **Limited flame spread test** is failed if signs of melting would occur inside the glove, or if holes appear, or if seams come apart.
- For **contact/convective/radiant heat & small splashes**, maximum performance Level 2 can be claimed if the test on Limited flame spread does not achieve at least Level 3. No signs of melting nor holes should appear on innermost layers. For small splashes, also no signs of melting on outer layer.
- For **large quantity test**, also maximum performance Level 2 can be claimed if the test on Limited flame spread does not achieve at least Level 3. No signs of melting nor holes should appear on innermost layers, and also no materials shall ignite during the test.

MARKING AND INFORMATION

- **2 pictograms would be applicable but cannot be used together**
- **If limited flame spread is claimed (= at least Level 1 in the flammability test):**

A B C D E F

- **If no limited flame spread is claimed:**

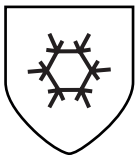


X B C D E F

- **Marking of gloves and first packaging enclosure as per EN 407:2020**
- **Instructions for Use as per EN 407:2020, with following additions:**
  - Clear information about the **area of protection**
  - A **clear warning** that the products must not come in contact with a naked flame if no flame protection is claimed
  - A **clear warning** that the gloves cannot be easily removed in case of an emergency, if they fail the removal test
  - If the removal test is only done in dry conditions, a warning that the glove should not be used in wet conditions
  - Information about reinforcements where applicable
  - When the glove is claimed to protect against large quantities of molten metal, a **warning** to leave the working place and take off the glove in the event of a molten splash, including an indication that the glove may not eliminate all risks of burns

EN 511:2006

EN 511



abc

SCOPE

This standard applies to any gloves that protect, against convective and contact cold down to -50°C.

DEFINITIONS & REQUIREMENTS

Protection against cold is expressed by a pictogram followed by a series of three performance levels, relating to specific protective qualities.

The 'cold hazard' pictogram is accompanied by a 3-digit number:

a. Resistance to Convective Cold *(performance level 0–4)*
Based on the thermal insulation properties of the glove, which are obtained by measuring the transfer of cold via convection.

b. Resistance to Contact Cold *(performance level 0–4)*
Based on the thermal resistance of the glove material when exposed to contact with a cold object.

c. Penetration by Water *(0 or 1)*
0 = water penetration
1 = no water penetration

All EN 511-rated gloves must achieve at least performance level 1 for abrasion and tear.

FR CHEMICAL PROTECTIVE CLOTHING

Chemical protective clothing for industrial use or other applications where accidental exposure to flames may be a risk.

EN ISO 14116:2015

Protective clothing – Protection against flame – Limited flame spread materials, material assemblies and clothing

DEFINITIONS & REQUIREMENTS

The EN ISO 14116:2015 standard specifies the performance requirements for the limited flame spread properties of materials and protective clothing in order to reduce the possibility of the clothing burning when in occasional and brief contact with small flames and thereby constituting a hazard. Additional requirements for clothing are also specified, including design requirements, mechanical requirements, marking, and information supplied by the manufacturer.

When protection against heat hazards is necessary, in addition to protection against flame, this standard is not appropriate.

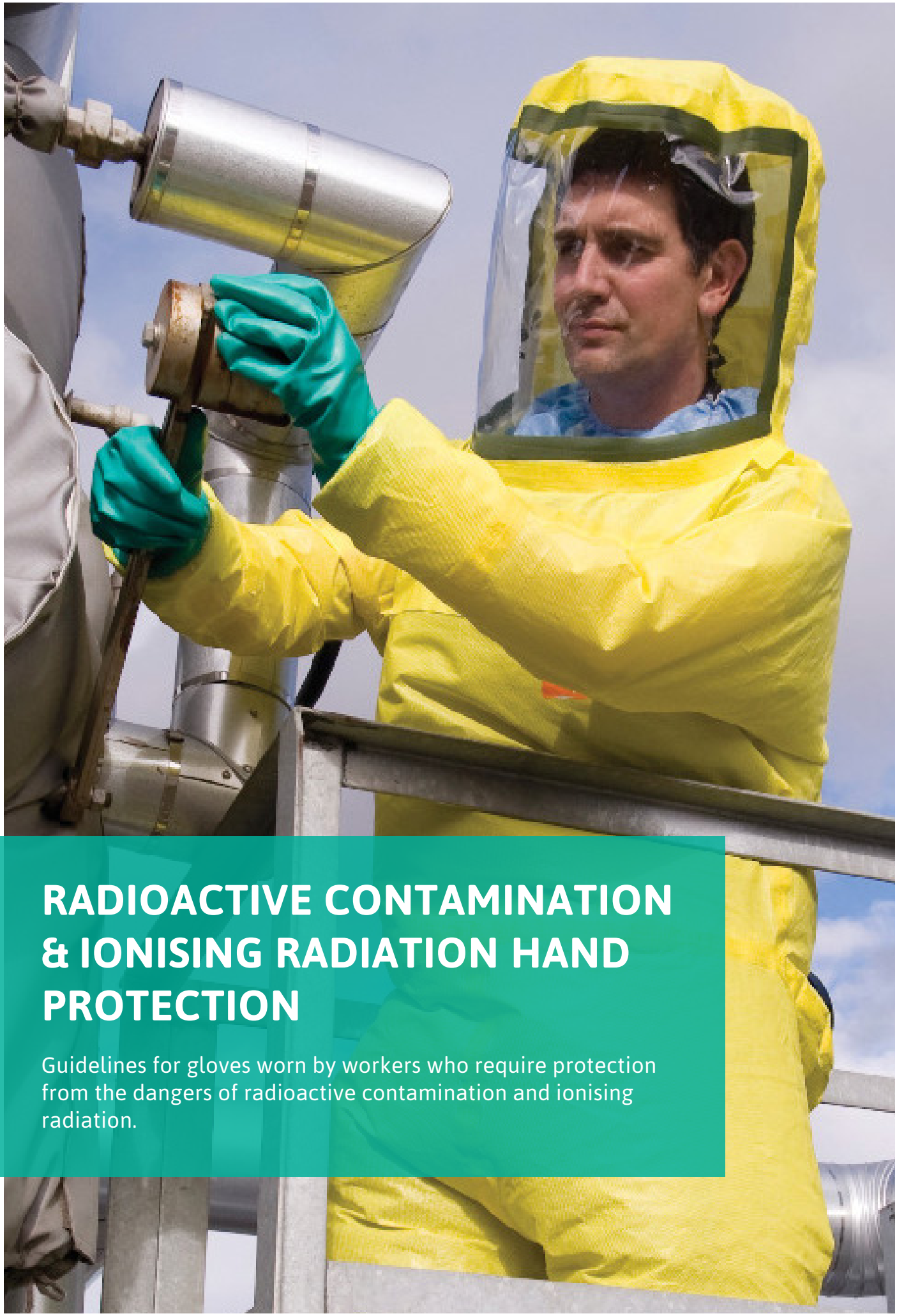
A classification system is given for materials and garments which are tested according to ISO 15025, Procedure A.

- Parts/components covered by flame requirements
- One single limited flame spread index figure (1, 2 or 3)
- Re-usables to be tested before and after washing
- Approval to EN ISO 14116:2015 alone does not allow you to use the fire protection pictogram

PROPERTIES	REQUIREMENT
Flame Spread	No specimen shall permit any part of the lowest boundary of any flame or the boundary of any hole to reach the upper or either vertical edge.
Flaming Debris	No specimen shall give flaming or molten debris.
Afterglow	Afterglow time shall be ≤2 s. A glowing inside the charred area is defined in ISO 15025 as afterglow without combustion and, for the purpose of this clause, shall not be regarded as afterglow.

PROPERTIES	REQUIREMENT
Flame Spread	No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.
Flaming Debris	No specimen shall give flaming or molten debris.
Afterglow	Afterglow time shall be ≤2 s. A glowing inside the charred area is defined in ISO 15025 as afterglow without combustion and, for the purpose of this clause, shall not be regarded as afterglow.
Hole Formation	No specimen shall give hole formation of 5mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection.

PROPERTIES	REQUIREMENT
Flame Spread	No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.
Flaming Debris	No specimen shall give flaming or molten debris.
Hole Formation	No specimen shall give hole formation of 5mm or greater in any direction, except for an interlining that is used for specific protection other than flame protection.
Afterglow	Afterglow time shall be ≤2 s. A glowing inside the charred area is defined in ISO 15025 as afterglow without combustion and, for the purpose of this clause, shall not be regarded as afterglow.
Afterflame	Afterflame time shall be ≤2 s.



RADIOACTIVE CONTAMINATION & IONISING RADIATION HAND PROTECTION

Guidelines for gloves worn by workers who require protection from the dangers of radioactive contamination and ionising radiation.

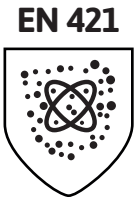
EN 421:2010

SCOPE

This standard applies to gloves that protect from ionising radiation and radioactive contamination.

DEFINITIONS & REQUIREMENTS

The nature of protection is shown by a pictogram relating to the specific protective qualities.



Radioactive Contamination

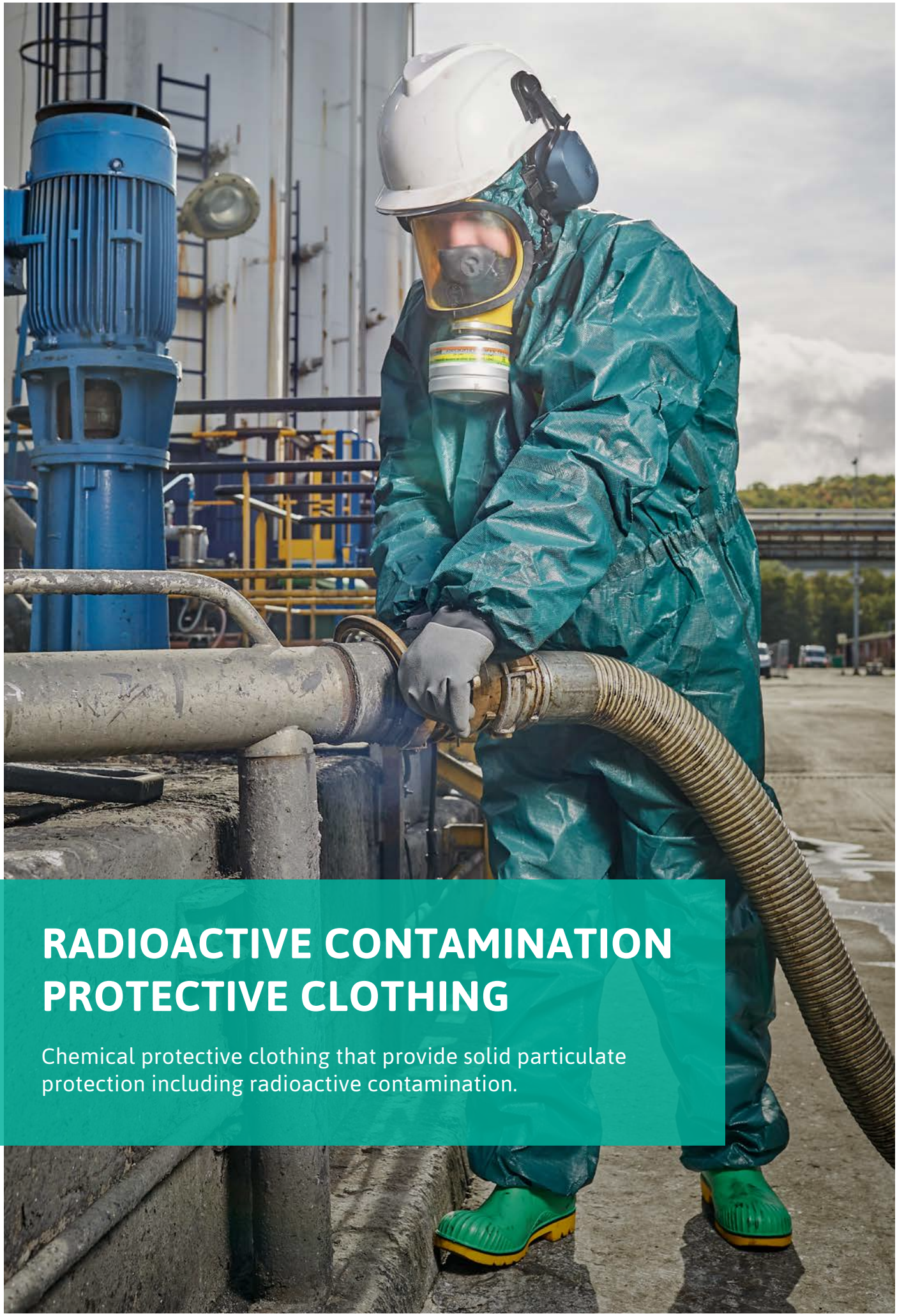
To protect from radioactive contamination, the glove has to be **liquid proof** and needs to pass the penetration test defined in EN 374.

For gloves used in containment enclosures, the glove shall pass an additional specific air pressure leak test.

Materials may be mottled by their behaviour to ozone cracking. This test is optional and can be used as an aid to selecting gloves.

Ionising Radiation

To protect from ionising radiation, the glove has to contain a certain **amount of lead or equivalent metal**, quoted as lead equivalence. This lead equivalence must be marked on each glove.



RADIOACTIVE CONTAMINATION PROTECTIVE CLOTHING

Chemical protective clothing that provide solid particulate protection including radioactive contamination.

EN 1073-1:2016+A1:2018

EN 1073-1:2016

Class	Nominal protection factor
5	50 000
4	20 000
3	10 000
2	5 000
1	2 000

DEFINITIONS & REQUIREMENTS

Protective clothing against solid airborne particles including radioactive contamination - Part 1:
Requirements and test methods for compressed air line ventilated protective clothing, protecting the body and the respiratory tract

This standard specifies the requirements and test methods for protective clothing, ventilated by an independent supply of air from an uncontaminated source, protecting the body and the respiratory system of the wearer against solid airborne particles including radioactive contamination. This standard does not apply to protection against ionizing radiation.

EN 1073-2:2002

EN 1073-2:2002

Class	Nominal protection factor
3	500
2	50
1	5

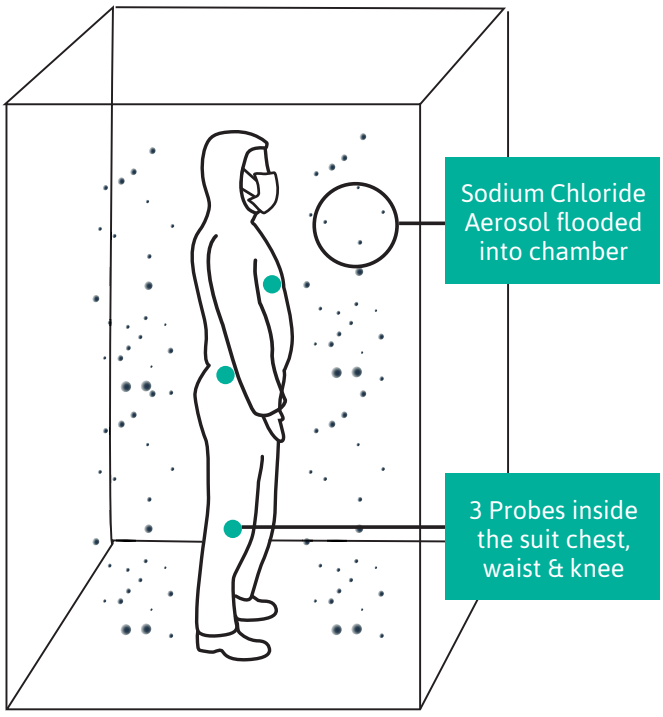
DEFINITIONS & REQUIREMENTS

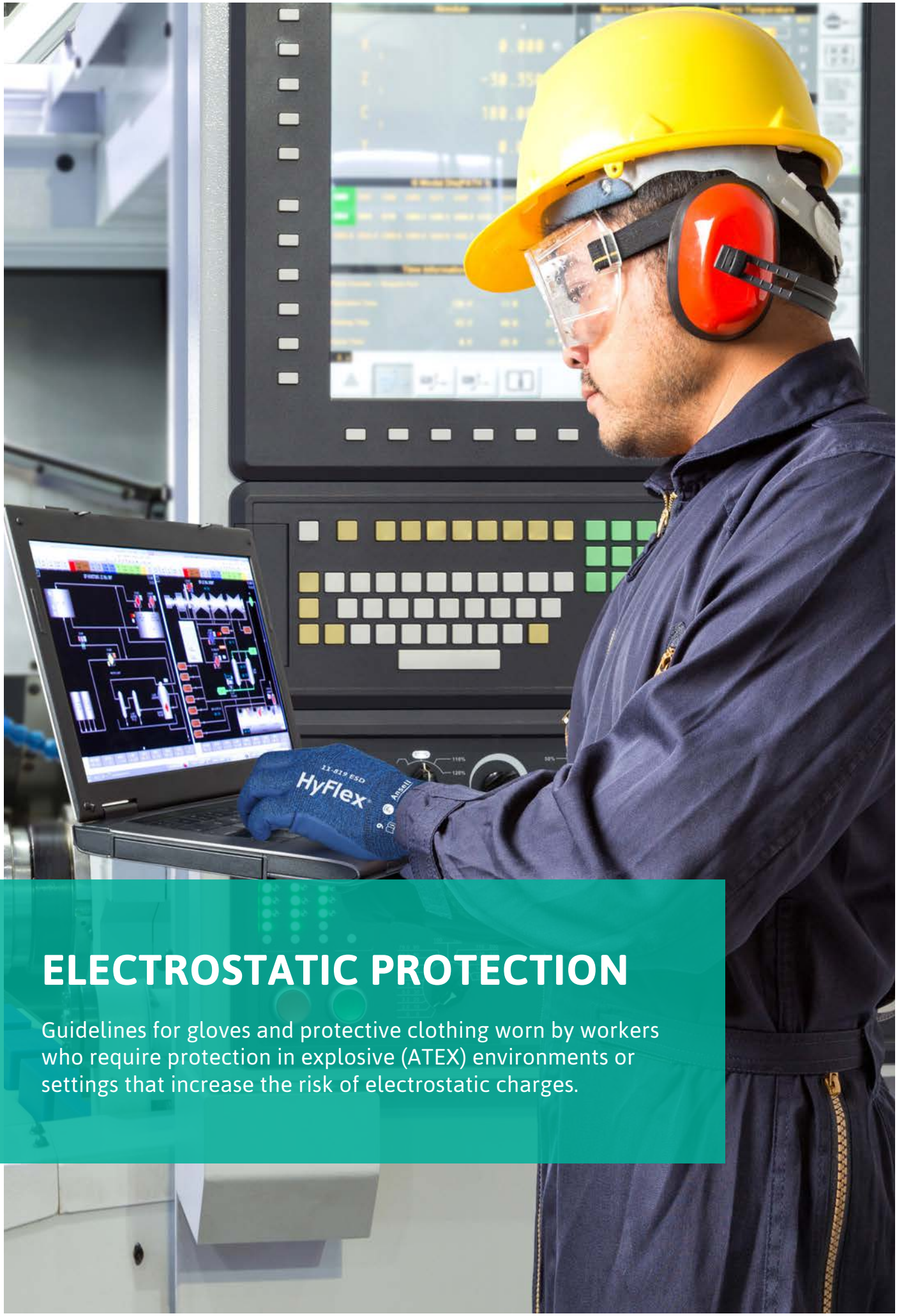
Protective clothing against radioactive contamination – Part 2:
Requirements and test methods for non-ventilated protective clothing against particulate radioactive contamination.

TOTAL INWARD LEAKAGE TEST

The total inward leakage test is based on the same principle as the Type 5 inward leakage test on *page 32* above. The suits are worn by test subjects performing a series of movements in a chamber with a controlled concentration of a sodium chloride aerosol and the inward leakage is measured using sampling probes fixed on the test subject wearing the suit.

The measured inward leakage in relation to the concentration inside the test chamber provides the basis for calculating the nominal protection factor which is then classified according to the levels in the tables above.





ELECTROSTATIC PROTECTION

Guidelines for gloves and protective clothing worn by workers who require protection in explosive (ATEX) environments or settings that increase the risk of electrostatic charges.

EN 1149

SCOPE

This standard specifies the requirements and test methods for materials used in the manufacturing of electrostatic dissipative protective clothing to avoid electrostatic discharges.

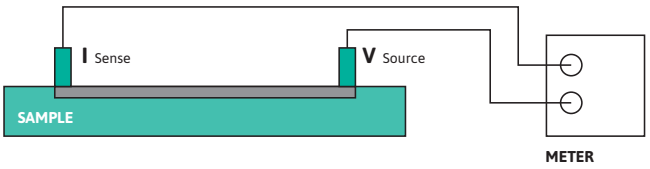
DEFINITIONS

For protective clothing to be considered dissipative the requirements described in EN 1149-5 below need to be fulfilled using the test methods in parts -1 and/or -3 for the garment materials as well as the requirements for garments and components provided in part -5.

For gloves as per EN 420: 2003, it is defined that the electrostatic properties shall be tested as per the test methods described in EN 1149.

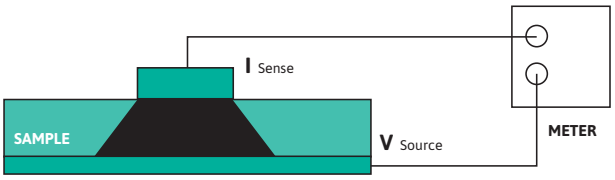
EN 1149-1: 2006

Part 1 defines the test to measure surface resistivity/ resistance (Ω) = resistance in ohms along the surface of the material, between two specified electrodes (resting on the test specimen) and a potential of 100±5V.



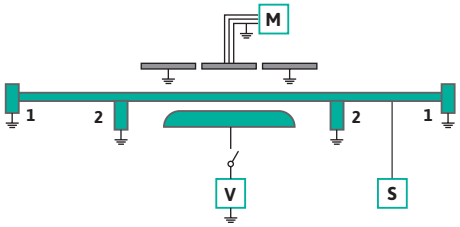
EN 1149-2: 1997

Part 2 defines the test to measure vertical resistance (Ω) = resistance in ohms through a material, between two electrodes placed on opposite surfaces of the test specimen and a potential of 100±5V.



EN 1149-3: 2004

Part 3 defines the test to measure the half decay time T_{50} (s) = the time it takes for a material to achieve a 50% decay of a charge induced on the material via an electrode. Also the Shielding factor S is measured.



M: Measuring Device
V: Voltage Supply
S: Sample
1: Sample Clamping Ring
2: Support Ring

EN 1149-5: 2018

Part 5 defines the criteria for a clothing material to be dissipative:

- Surface resistance < $2.5x10^9$ Ω or
- Charge decay time T_{50} < 4s or Shielding factor > 0.2
- For vertical resistance (Ω), there are no set criteria defined.
- Requirements for materials made of layers or having attachments.
- There are dimensional limits for non-dissipative materials and attachments.
- Requirements are also provided for components that may be non-dissipative or conductive.

EN 16350

EN 16350

SCOPE

This standard requires each material in the glove to have a low vertical resistance, defined to be <10^8 ohms. It is for use in explosive environments where EN 1149 may not always be appropriate.

DEFINITIONS & REQUIREMENTS

- Vertical resistance for each material < 1.0 X 10^8 ohm (in case of unbonded materials, they shall be tested together)
- Test to be carried out according EN 1149-2 (temperature 23°C and R.H. 25%)

MARKINGS

Glove markings should match those of EN ISO 21420

ELECTRICAL INSULATION PROTECTION

Guidelines for insulating gloves and mitts, which are worn in conjunction with leather protective gloves for workers who require protection from mechanical and thermal hazards.

EN 60903:2003

SCOPE

This standard applies to insulating gloves and mitts (both lined and unlined) designed to protect the wearer from electrical shock in live working conditions. Rubber insulating gloves should normally be used in conjunction with leather protector gloves, which are worn over the insulating gloves to provide mechanical protection.

REQUIREMENTS

An insulating glove for live working is a Category III product as defined by the PPE regulation. A certified glove for live working needs to be compliant with the EN 420 requirements, pass all required tests and meet several requirements as per EN 60903 including mechanical, thermal (for low temperature), flame retardancy, and ageing.

Depending on their application specific properties (= resistance), **rubber insulating gloves** can be additionally tested:

- **Acid:** satisfactory mechanical and di-electrical performance after immersion in high concentrated sulfuric acid.
- **Oil:** satisfactory mechanical and di-electrical performance after immersion in oil.
- **Ozone:** satisfactory surface quality (cracking) and di-electrical performance after contact with a high concentration of ozone.
- **Very low temperature:** satisfactory if no tearing, breaking or cracking when folded after 24h at -40°C.
- **Harmful physical irregularities** are not allowed and each single glove must be individually inspected and **di-electrically** tested.

The insulating gloves can cover six different protection classes from 500 to 36,000 Volts AC and from 750 to 54,000 Volts DC depending on their single wall thickness.

Class of glove	Maximum use voltage (V AC)	Maximum use voltage (V DC)	AC Proof test voltage (V AC)	DC Proof test voltage (V DC)	Maximum thickness
00	500	750	2.500	4000	0.5
0	1000	1500	5.000	10000	1.0
1	7500	11250	10.000	20000	1.5
2	17000	25500	20.000	30000	2.3
3	26500	39750	30.000	40000	2.9
4	36000	54000	40.000	60000	3.6

Periodic inspection and electrical retesting
Classes 1, 2, 3, and 4, even those held in storage, should be visually and di-electrically re-tested every 6 months.
For classes 0 and 00, the visual inspection is sufficient.

MARKING AND INFORMATION

In addition to the identity of the manufacturer, product, and size designation, the relevant standards (EN 60903 and EN 420: "CE"-mark), and the relevant pictogram (double triangle and open book pictogram), the marking can include — if applicable — a category that denotes the gloves' resistance to these specific hazards:

CATEGORY H: Oil resistance

CATEGORY A: Resistance to acid

CATEGORY Z: Resistance to ozone

CATEGORY C: Resistance to very low temperatures

CATEGORY R: Categories H + A + Z (above)

Note:
Composite Gloves
For insulating gloves made of specific material (non-natural rubber) additional tests in abrasion (weight reduction) and cut (minimum level 2) are required. Electrical insulating gloves are provided with additional integrated mechanical protection. Composite gloves are identified with an additional mechanical symbol (hammer) and they are usually worn without over-gloves.

CE 0493

Class of glove	Thickness (mm)	
	Gloves	Composite gloves
00	0.50	1.8
0	1.0	2.3
1	1.5	2.8
2	2.3	3.3
3	2.9	3.6
4	3.6	4.2

Note: *Gloves of categories A, H, Z and R may require additional thickness which shall not exceed 0.6 mm.*

WELDING PROTECTION

Guidelines for gloves worn by workers who require protection from heat and flame during manual welding, cutting, and allied processes.

EN 12477:2001

SCOPE

This standard applies to protective gloves for use in manual metal welding, cutting, and allied processes.

REQUIREMENTS

EN 12477: Protective gloves for welders
Standard for manual metal welding

Compliance with EN 420 except for lengths:
- 300 mm: Size 6
- 310 mm: Size 7
- 320 mm: Size 8
- 330 mm: Size 9
- 340 mm: Size 10
- 350 mm: Size 11

Requirements (EN LEVELS)	**Type A**	**Type B** (HIgh Dexterity, TIG, welding)
Abrasion	2	1
Cut	1	1
Tear	2	1
Puncture	2	1
Burning Behaviour	3	2
Contact Heat	1	1
Convective Heat	2	-
Small Splashes	3	2
Dexterity	1	4

Type B gloves are recommended when high dexterity is required (e.g., TIG welding), while Type A gloves are recommended for other welding processes. Type A or B is to be marked on the product, its packaging, and in the instructions for use.

PROTECTIVE GLOVES FOR FIRE FIGHTERS

Information for firefighters' protective gloves which protect the hands during normal firefighting, including search and rescue.

EN 659:2003+A1:2008 – PROTECTIVE GLOVES FOR FIRE FIGHTERS

SCOPE

This standard specifies requirements, test methods, marking and information for firefighters' protective gloves which protect the hands during normal firefighting, including search and rescue.

REQUIREMENTS

1. Gloves shall meet the EN standard for general requirements
2. Minimum glove length:

Glove Size	6	7	8	9	10	11
Fits	hand size 6	hand size 7	hand size 8	hand size 9	hand size 10	hand size 11
Minimum length of glove (mm)	260	270	280	290	305	315

3. Abrasion resistance in the palm: at least performance **level 3**
4. Cut resistance, both on the palm and the back of the glove, at least performance **level 2**
5. Tear resistance on the palm of the glove, at least performance **level 3**
6. Puncture resistance on the palm of the glove, at least performance **level 3**
7. Burning behavior, performance **level 4**
8. Convective heat resistance, both on the back and the palm of the glove, at least performance **level 3**
9. Radiant heat resistance, tested in the back of the gloves, at least performance **level 2**
10. Contact heat resistance, tested on the palm of the glove, shall at least meet **10 seconds at 250°C**; to be tested both after wet and dry conditioning
11. The lining material closest to the skin, tested at a minimum temperature of **180 °C**, shall not melt, drip or ignite
12. Glove, tested at 180°C, shall not shrink more than **5%**
13. Dexterity, at least performance **level 1**
14. Seam breaking force shall be at least **350 N**
15. Time for removal of a pair of gloves, whether they are dry or wet, shall not be greater than **3s**
16. Resistance of glove material to water penetration (optional) to be tested for textile as per EN 20811 and results are to be reported, whilst for leather, this is to be tested as per EN ISO 20344 and results shall be reported according to table.

Performance level	Time of Penetration (min)
1	30
2	60
3	120
4	180

17. Whole glove integrity test, as per ISO 15383 needs to pass, if requested for the end user in case waterproof gloves are needed
18. Resistance to liquid chemical penetration, as tested per EN ISO 6530 for 10 seconds, **no penetration shall occur with sulphuric acid 30%, sodium hydroxide 40%, hydrogen chloride 36% and o-xylene**
19. Gloves meeting the above are to be marked with:

OTHER REGULATIONS

REACH

Registration, Evaluation, Authorisation and Restrictions of Chemicals

What is REACH?

Workers in the European Union are reporting an increasing incidence of allergies, asthma, and certain forms of cancer that are suspected to be a result of exposure to workplace chemicals. In 2003 the European Commission responded with a proposal to create a new regulatory agency for workplace chemical exposure called REACH, which stands for Registration, Evaluation, Authorisation & Restriction of Chemicals. The REACH program, based on that proposal, was enacted on June 1, 2007. It has improved the protection of human health for EU workers by prioritising dangerous substances, increasing the responsibility of employers to provide protection from identified chemical risks, and educating them about how to comply.

The Purpose of REACH

The goal of REACH is to protect both human health and the environment by eventually eliminating, or severely restricting, Substances of Very High Concern (SVHC) from the EU market. Currently more than 900 chemicals have been identified as SVHC. REACH encourages manufacturers to search for safer alternatives and solutions.

Flow

1. Specify the most concerning properties of chemicals
2. Identify and prioritize chemicals with these properties
3. Define restriction criteria for these properties
4. Restrict and/or ban chemicals with these profiles

Substances of Very High Concern (SVHC) Used in Articles

In 2008 REACH published the first official Candidate List of SVHC chemicals. Every 6 months the list is amended to incorporate updated information. Companies that manufacture articles containing over 0.1% of any of these chemicals have an obligation to inform all those involved in their supply chain. Companies are also required to register the articles in a SCIP (Substance of high Concern In Products) database if they import more than 1 ton per year of any chemical on the list for manufacturing use. Companies who comply with these regulations have permission to continue using SVHCs until an official restriction or ban is in place.

Ansell and REACH

All Ansell products fully comply with the legal requirements of REACH and its amendments. We ensure the pre-registration of all required chemicals used in our gloves and are actively looking for ways to replace SVHC chemicals subject to regulation, prior to their restriction or ban.

The Ansell REACH statement can be found on our website and more information is available through the Ansell customer service or regulatory department.

Kingdom of Saudi Arabia PPE legislation

Saudi Standards, Metrology and Quality Organization (SASO) has made the decision to implement a Saudi Product Safety Programme (SALEEM) by launching the **SABER platform** for online Certification as of 1st January 2019.

Under SALEEM, product and shipment conformity program is operated via an online system called **SABER**. This SABER has been gradually implemented by technical regulation. Importers of products regulated by the technical regulation are required to register the products in the SABER system to obtain the Certificate of Conformity, after passing the assessment.

This PPE Technical Regulation MA-165-18-04-04, which got published end 2018, entered in application since November 2019, whereas for products not complying with the regulation, these can be marketed until **7th December 2020**.

The Regulation applies to personal protection equipment which are designed to protect the users' health and safety from possible risks and does not apply to personal protection equipment to be used for medical or military utilizations.

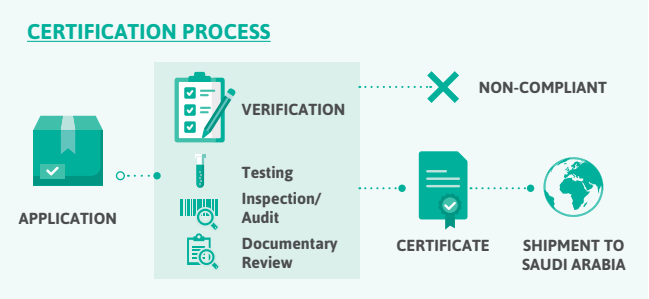
This technical regulation requires PPE to follow defined conformity assessment procedures that need to be followed by the suppliers to ensure compliance of these products with specific requirements aiming to protect the consumer's health and safety.

Certification is based on three steps and is to be executed by a local approved certification body:

- **Product Certification of Conformity (PCOC)** - Review of technical documents (including test reports)
- **Shipment Certification of Conformity (SCOC) -** Ensure there is an existing valid PCOC for that product in the shipment
- **Plant audits**

The certification body needs to validate that the PPE comply with specified conformity assessment procedures and documents in the factories and also have the right's to collect random samples of the product from the production to ensure compliance with requirements stated in this regulation.

Registration application to be done through an entity that has a valid trading licence in Saudi Arabia, through SABER platform.



United Arabic Emirates PPE legislation

In 2016, the Emirates Authority for Standardization & Metrology (ESMA) developed a new PPE Regulation, called **UAE Cabinet Decision No. 34 of 2016**.

This Regulation will apply to any PPE, except for use by armed forces.

This PPE regulation specifies the requirements and certification methodologies, based on three classes of risks (equivalent to the three categories defined under the European PPE regulation 2016/425), where: DIRECTIVE 7.

Category I

or PPE to protect from minimal risks: Manufacturers an issue a self-declaration, have an Instructions for Use in pace in both English and Arabic and issue an ECAS logo on the product packaging.

Category II:

Risks other than those listed in Categories I and III. PPE designed to protect against intermediate risk (e.g., general handling gloves which require cut, puncture, and abrasion protection) must be subjected to yearly certifications by a local independent certification body on the basis of lab tests or existing accredited lab test reports (no older than 5 years from the issuance date). A Quality Plan needs to be available as well as a Declaration of Conformity and Instructions for Use in English and Arabic.

Moreover, the applicant needs to have a valid Trading license for the UAE.

Once certified, the ECAS label must be applied on the product packaging.

For Category II, an EQM certification (mandatory for category III) can be voluntary applied.

Category III

PPE designed to protect against very serious risks (e.g., chemicals, biological, electric shock, etc) must also be certified by a local independent certification body, same as for the Category II products (except no age limit on the test report provided that the product has not undergone any changes), but also including plant audits.

This is called EQM certification and is valid for 3 years.

علامة الجودة الإماراتية
Emirates Quality Mark

Ansell is committed to providing the safest and highest quality hand and body protection available. We guarantee that by choosing our PPE you are meeting the relevant PPE Standards and offering the best in protection for your workers.

For more info, visit www.ansell.com/enresourcecenter

WARNING: No glove completely prevents or eliminates the potential for cuts or abrasions. These gloves are not intended or tested to provide protection against powered blades, serrated, or other sharp or rotating equipment, nor will they completely prevent or eliminate the potential for abrasion-related injuries. Users are encouraged to always use caution and care when handling sharp materials. Product users should conduct all appropriate testing or other evaluations to determine the suitability of Ansell products for a particular purpose or use within a particular environment. ANSELL DISCLAIMS ALL WARRANTIES OTHER THAN AS EXPRESSLY PROVIDED.

Ansell